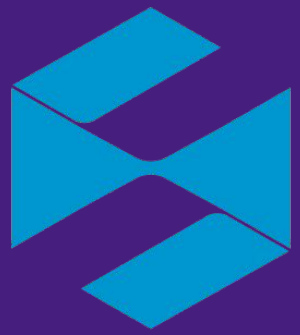
資料 2

eMotorWerks
An Enel Group Company

From Vehicle Electrification to Vehicle-Grid Integration (VGI)

27 November 2018

Presented by Preston Roper



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Agenda

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> eMotorWerks | Past, Present & Future

> U.S. Electricity Policy | What's Needed

> Blueprint for Japan | Electricity Market & Policy

A snapshot of today

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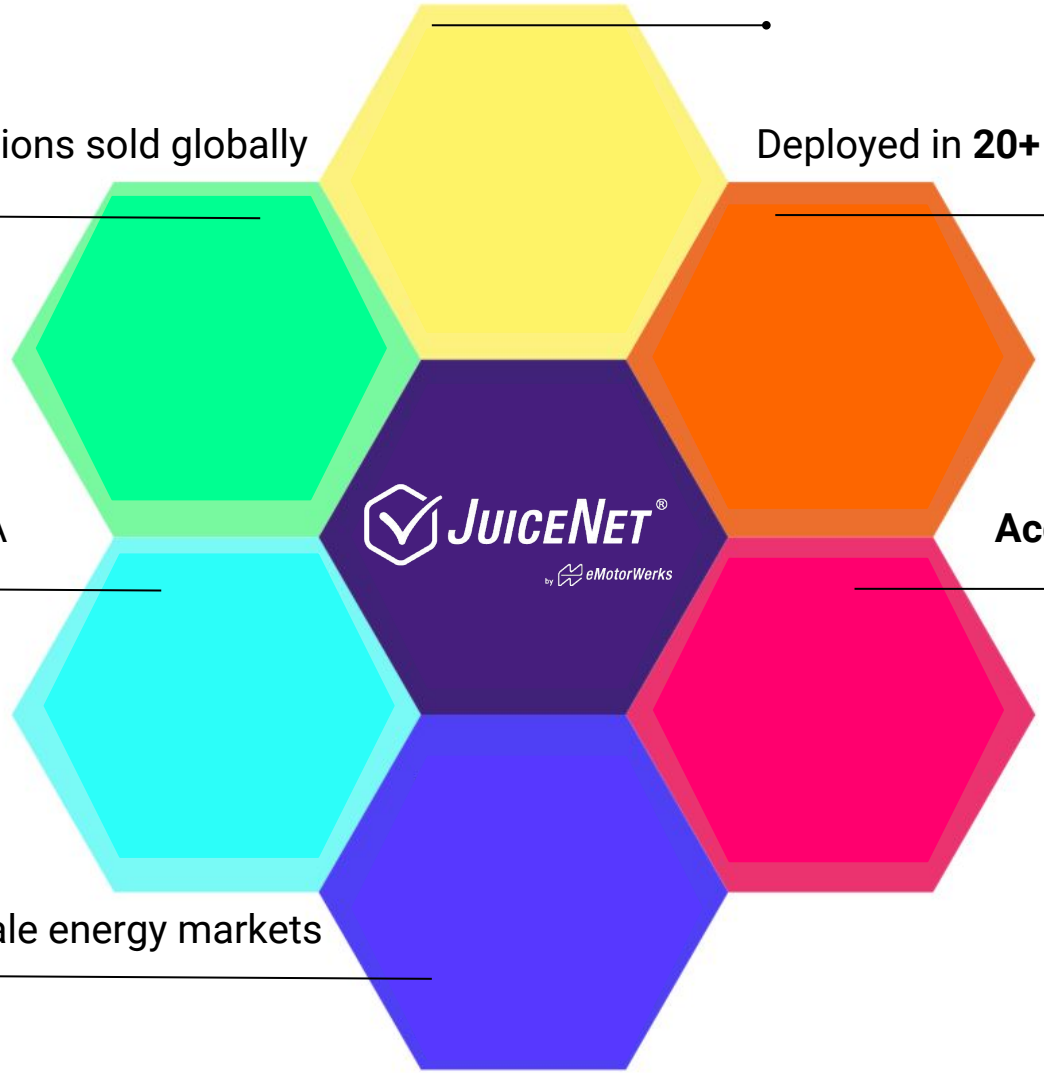
#1 EVSE on Amazon for 4 years

40,000+ EV charging stations sold globally

Deployed in **20+ countries** around the world



30MW Virtual Battery Capacity in CA

Acquired by Enel Group in October 2017

Only EVSE to participate in wholesale energy markets

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Grid Services Milestones

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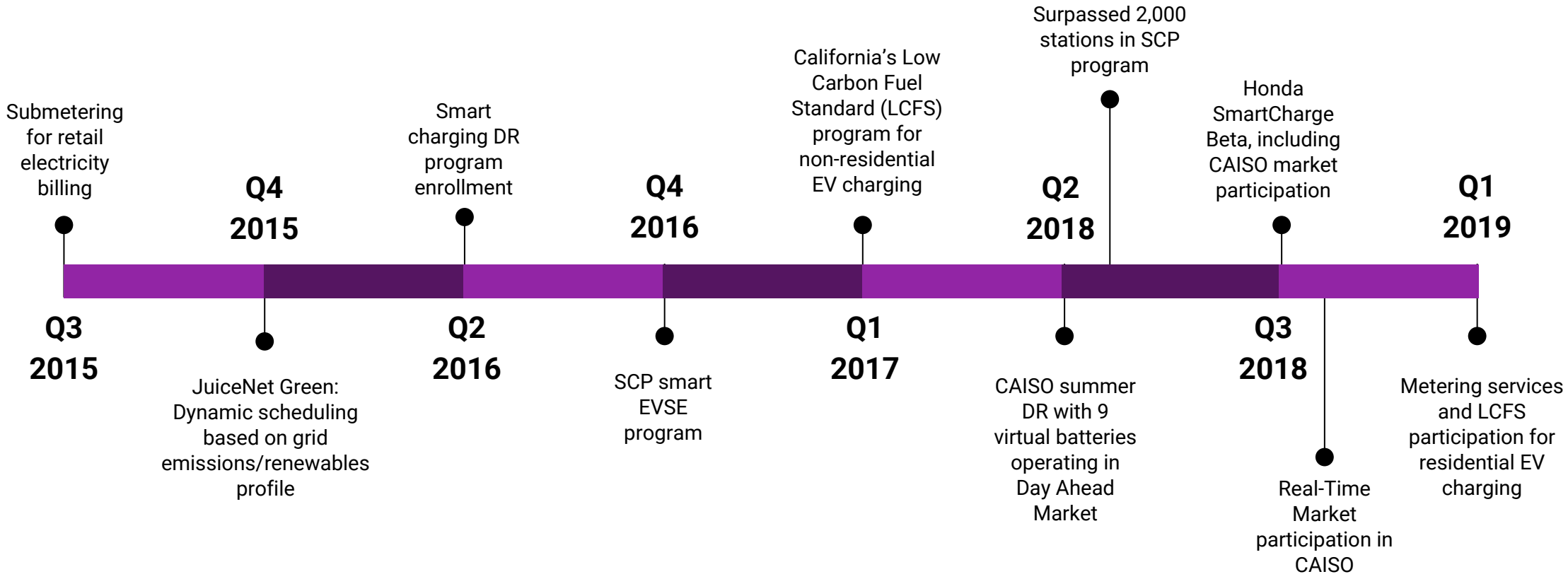

eMotorWerks is leading the way in leveraging EV charging to serve the grid

Our Shared Vision With Enel X

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Transformation of the energy sector through sustainability, innovation, digitalization and customer choice:

E-Mobility | EV charging infrastructure and services

E-Industries | Distributed generation & demand management systems

E-Home | Consumer solutions, focusing on smart home solutions

E-City | Fiber optic, lighting, signaling and security solutions


Electric, carbon-free horizon.
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EV Charging, A Large & Highly Flexible Load

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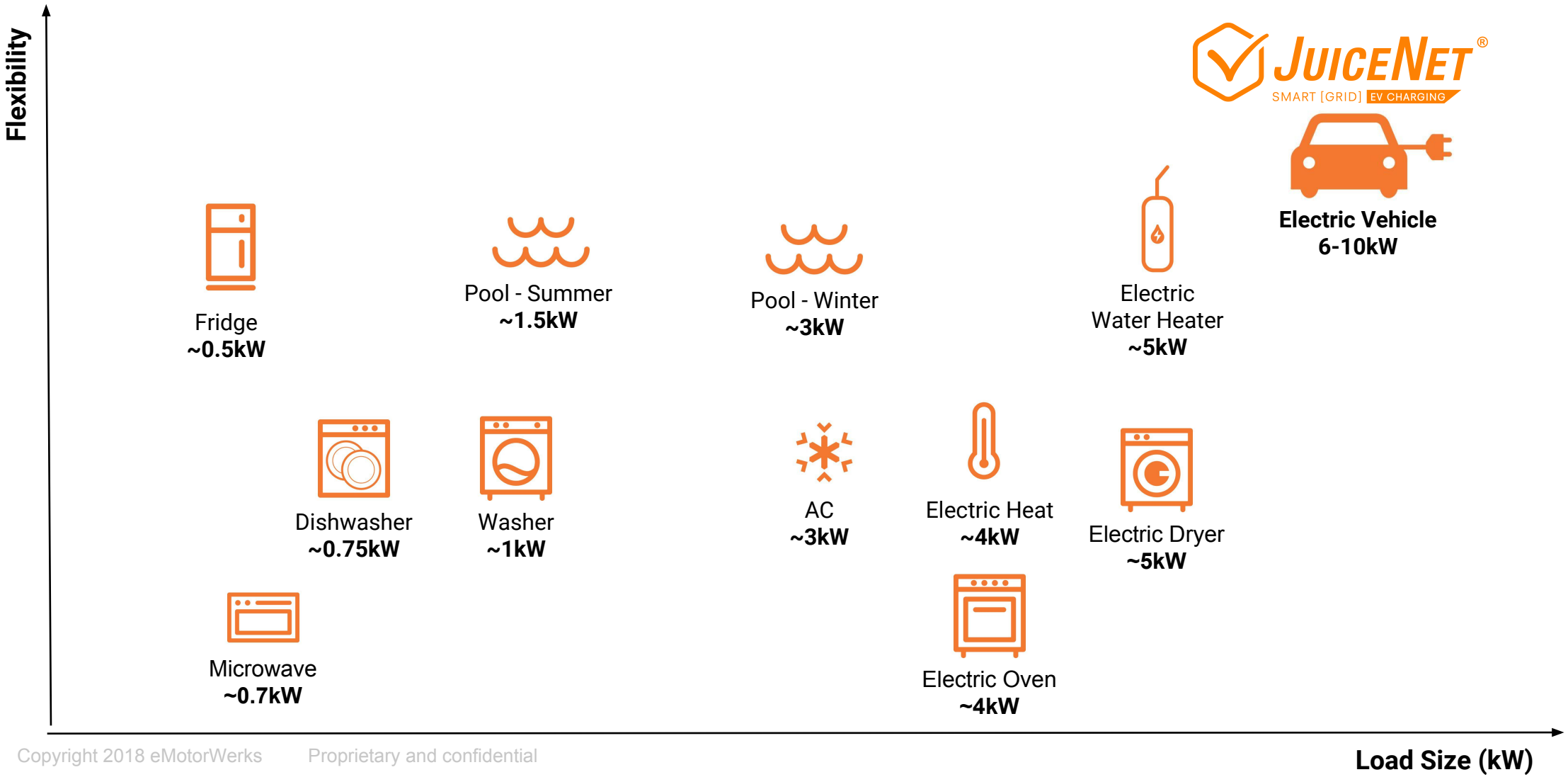

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“Clean vehicles enable a clean electricity grid[1]”

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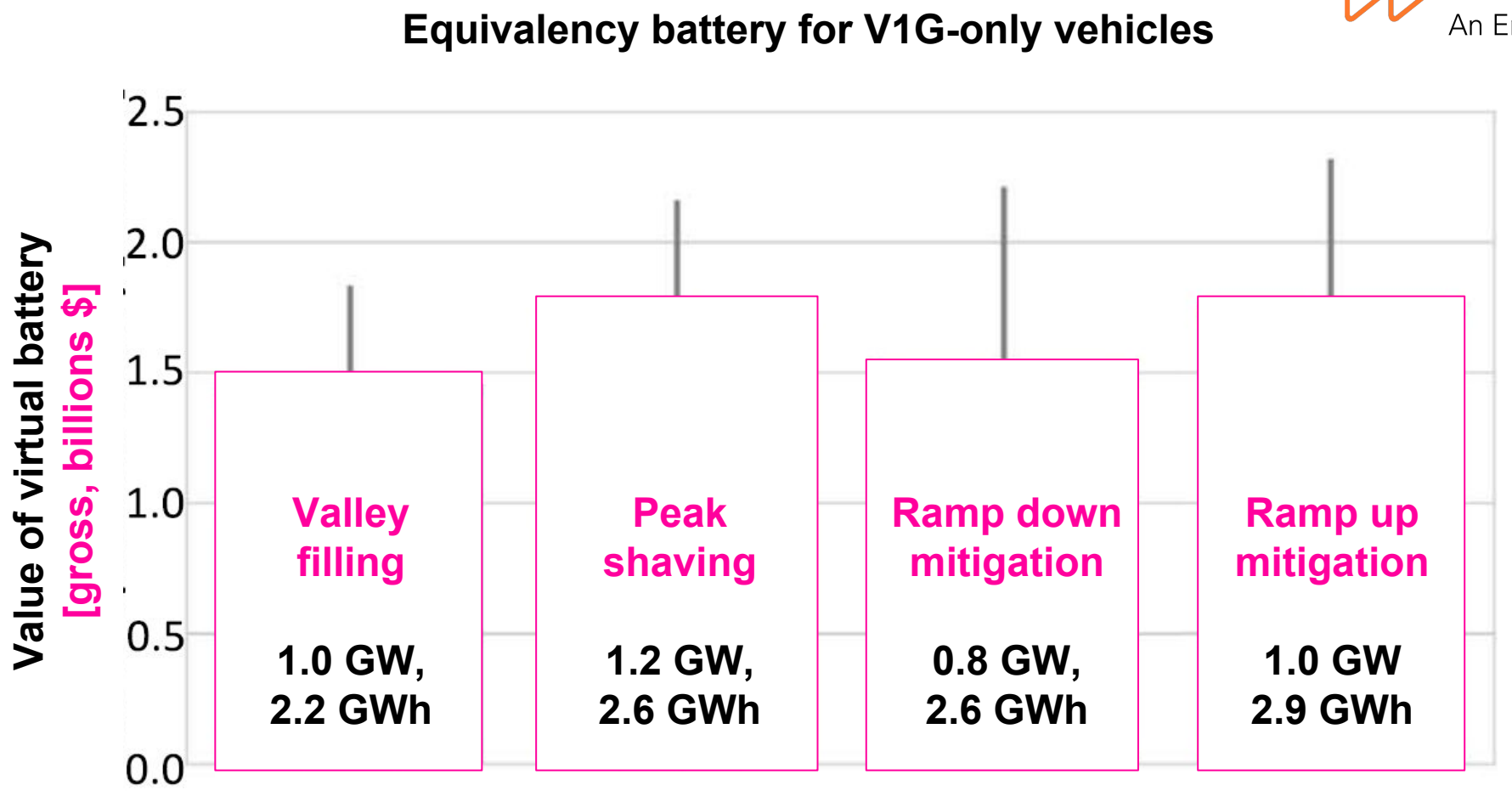

1.5M Smart Charging EVs[2] can save $1.3 - 1.6B in renewables integration net costs

[1] http://iopscience.iop.org/article/10.1088/1748-9326/aabe97/meta
[2] Governor Brown Executive Order B-16-2012 - 1.5 million ZEVs by 2025

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Residential Load Profile **& No EV Charging**

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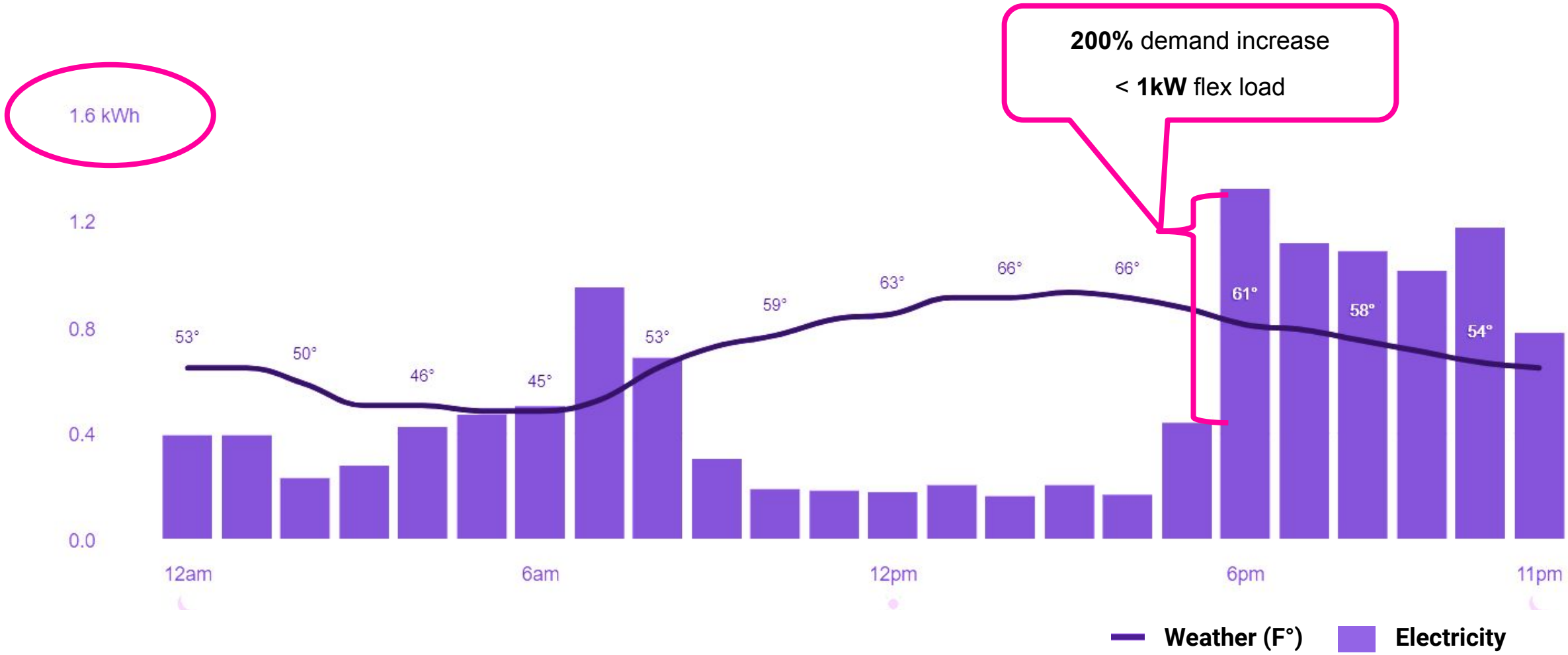

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Residential Load Profile **With EV Charging**

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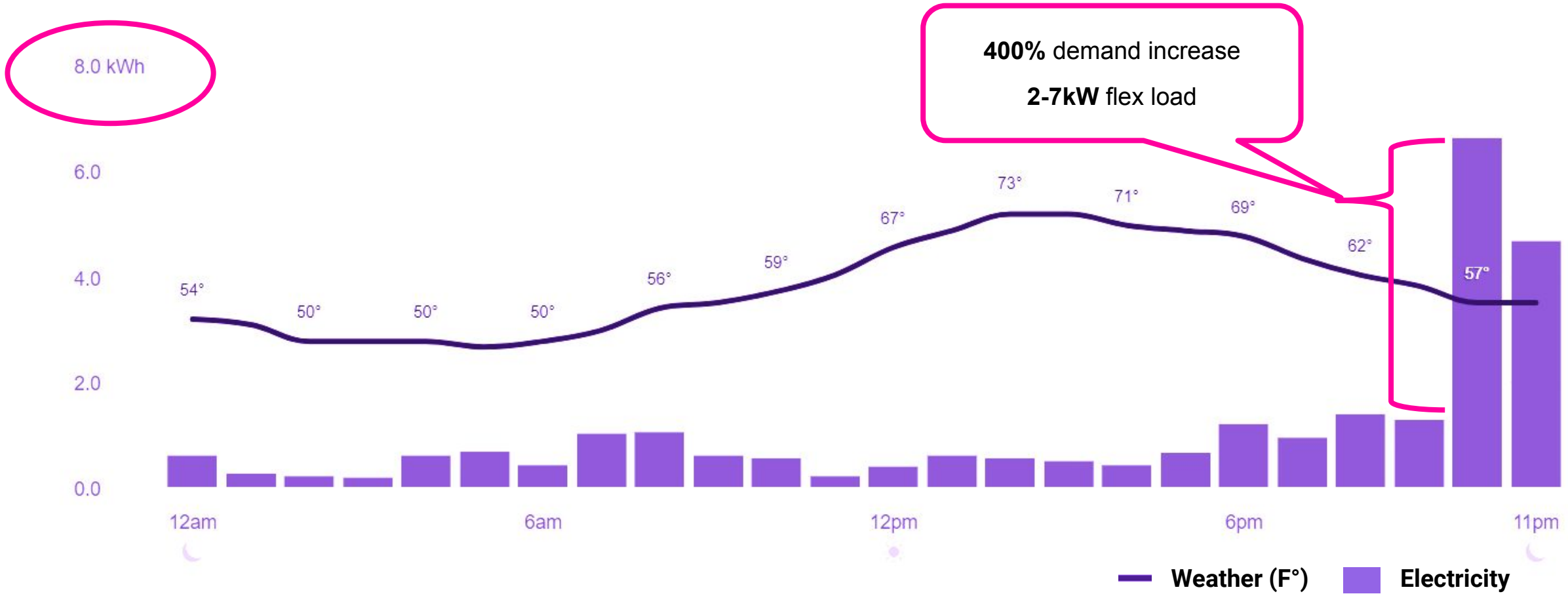

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JuiceNet Enterprise: a suite of benefits

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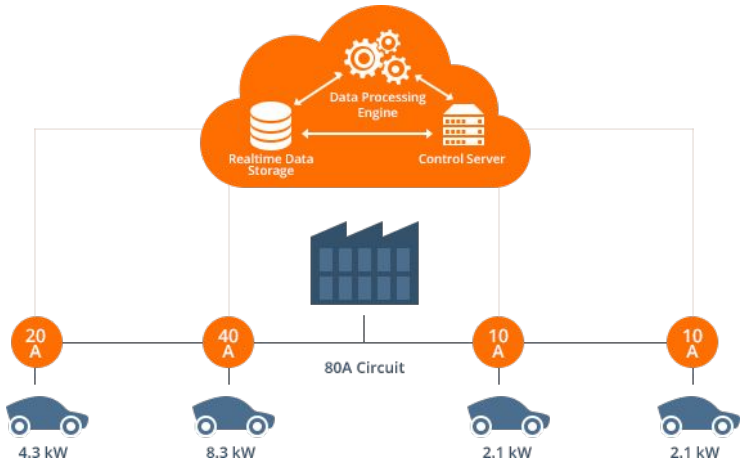
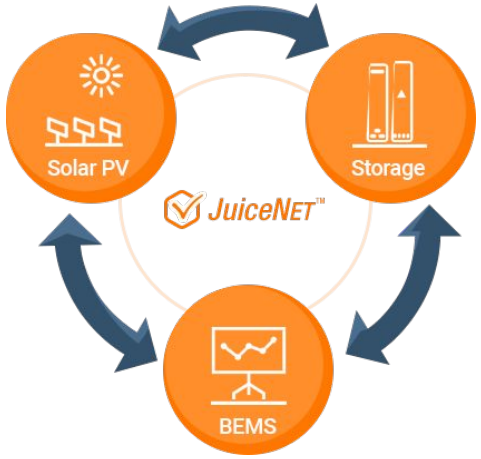
Future proof your site.
Intelligent load balancing ensures that your electrical infrastructure today supports your EV charging needs of tomorrow



Don't pay. Get paid.
Participate in energy markets and get paid by utilities and grid operators for charging at the right time

Take control.
Manage charging access, set load groups and access historical charging data



Optimize.
Coordinate your EV charging load with your on site generation and energy management systems

Save.
Minimize unwanted demand peaks and reduce utility demand charges

Convenient.
Level 2 charging and the industry's best user experience for tenants, employees and guests

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How JuiceNet Works - Architecture

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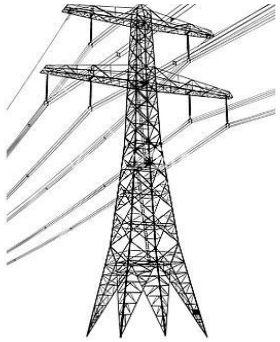

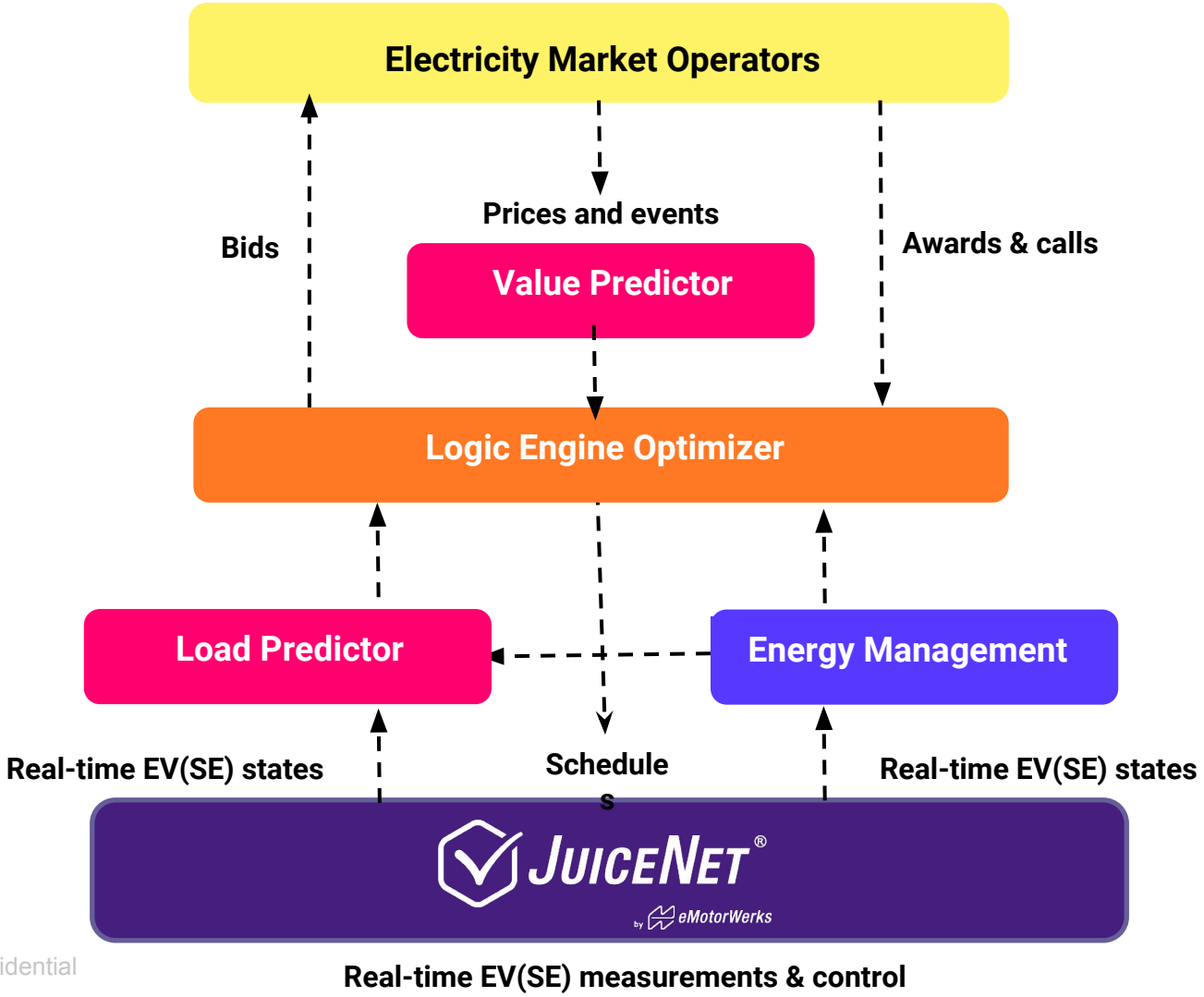

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Virtual Batteries from Today's EV charging

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Smart charging = VGI = V1G = demand response = energy services = grid services

1. **Reduce consumption by stop / delay charging only**
2. **Flexible & fast response deliverable from all types of EV charging**
3. **Increase or reduce load using EV charging, and integrate more renewables into the grid to reduce system-wide average costs**

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Virtual Battery In Action

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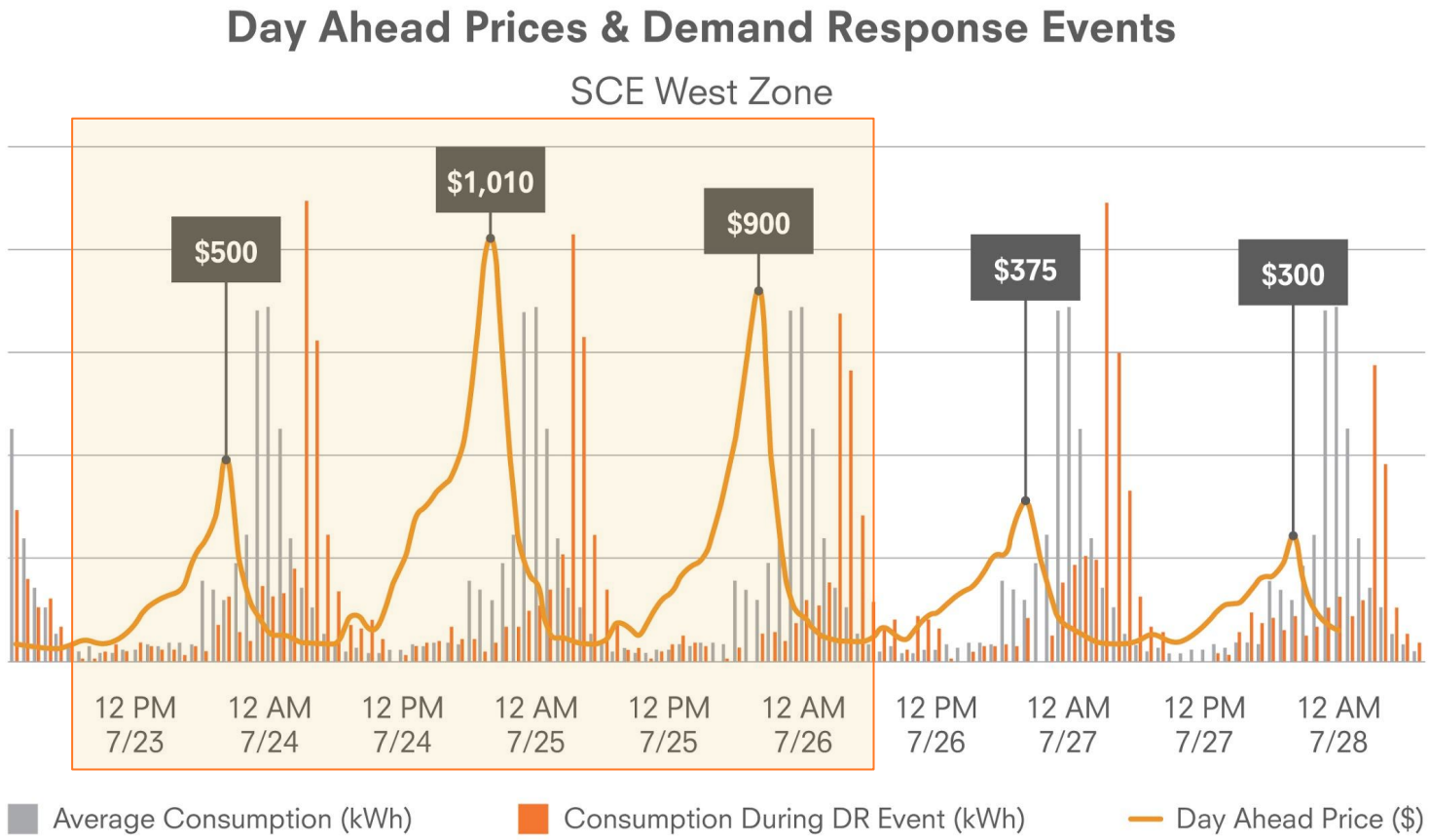

3 CAISO Flex Alert Days

- No Maintenance Days
- Day Ahead $$$ @ Price Cap
- All eMotorWerks' CAISO Resources dispatched for multiple hours
- Dispatched EVSE network to shift demand to lowest cost intervals

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Smart Grid EV Concierge Services

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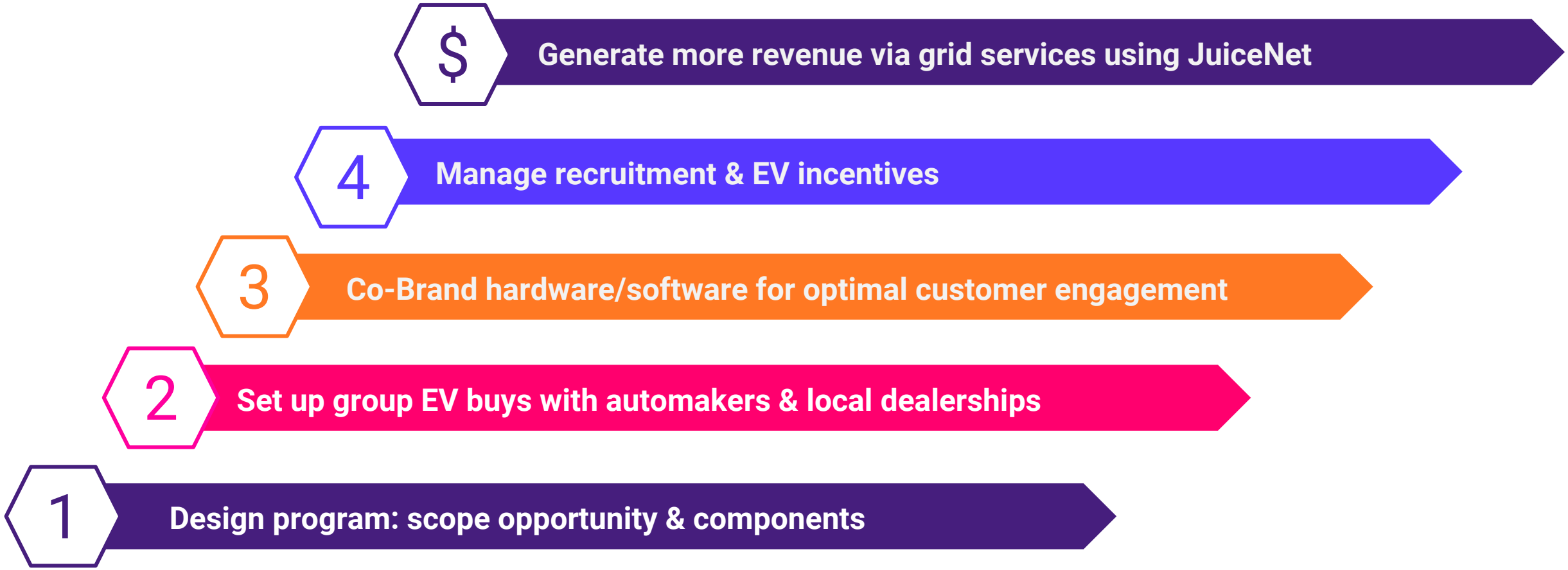
Helping utilities leverage $100B EVSE opportunity



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Utility Case Study: Sonoma Clean Power

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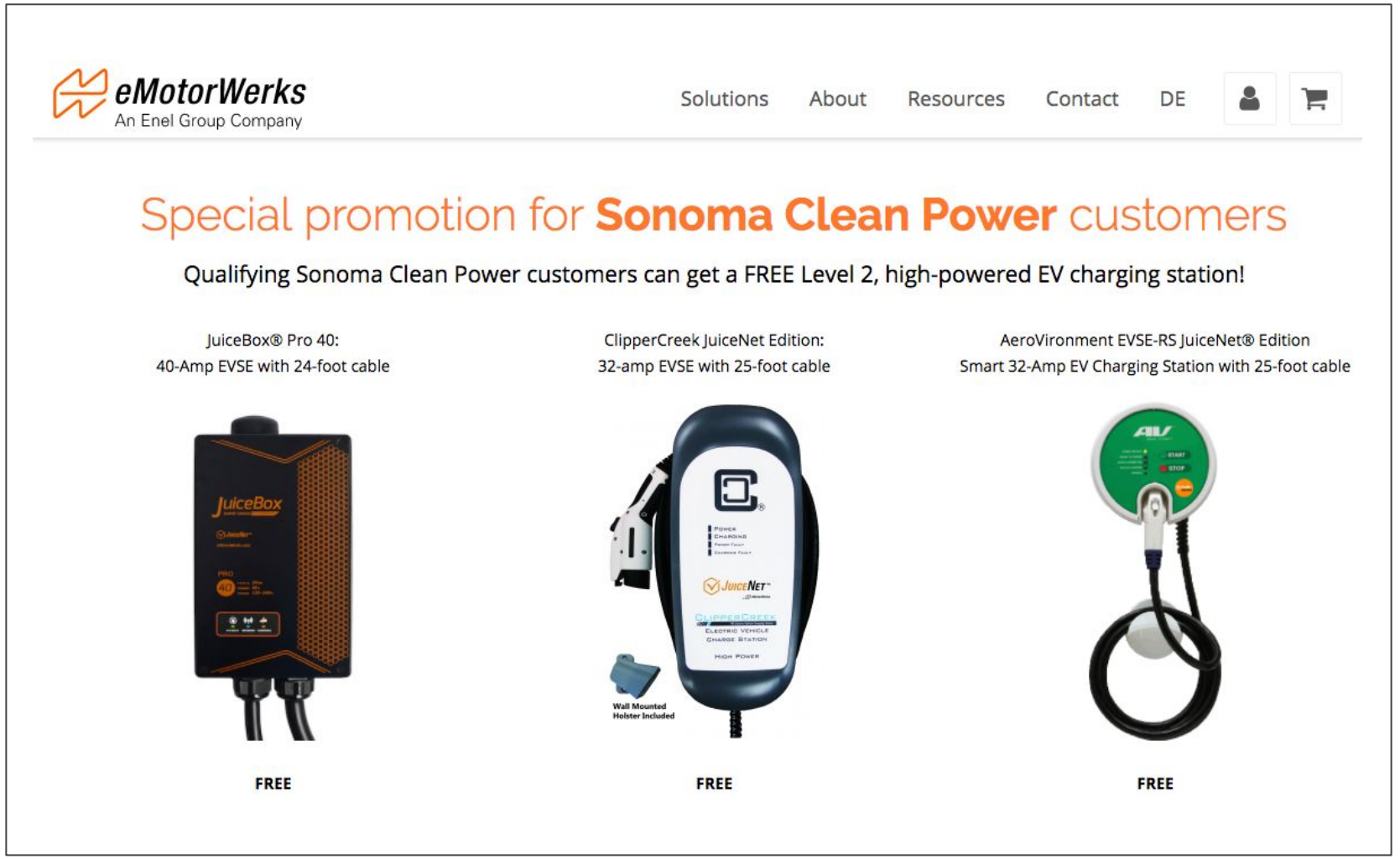

SCP ~ 230,000 customers

Introduced EV Incentives to create customer demand:

- EV group buy
- 100% clean energy tariff option
- Up to $1,000 (EVSE & enrollment) per household
- Nearly 2,000 EVSE delivered, multi-vendor
- 93% opt-in to participate in energy services
- Data analytics, potential 5MW of peak dispatchable
- Capacity for energy market participation
- **Phase 1 results: Increased EV sales by 2x**

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Energy Service Solar Self-Consumption Case

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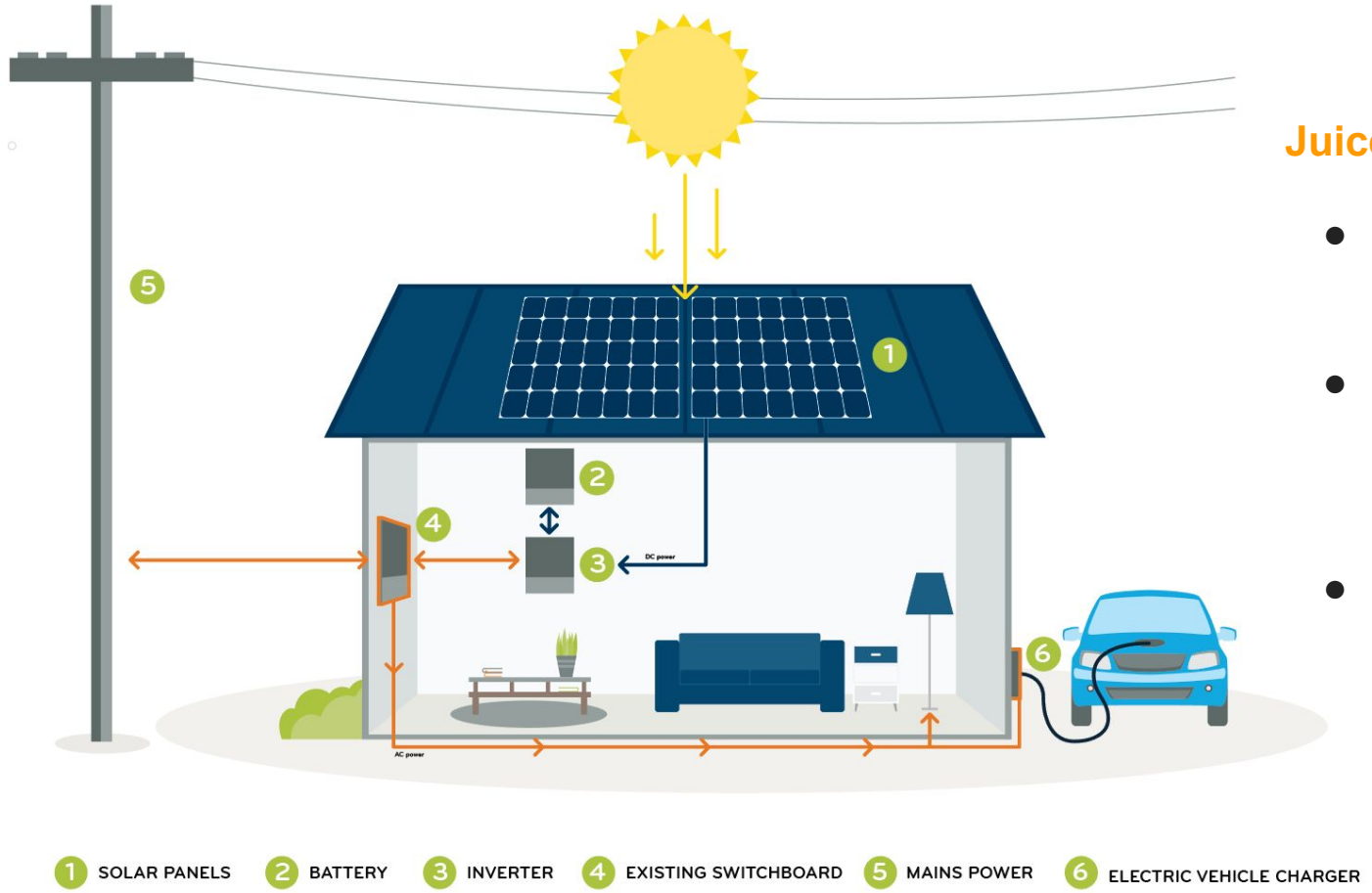
Generate up to $1,000 per year in energy cost savings in non-NEM markets like Germany



JuiceNet for Solar

- The JuiceMeter on the solar inverter output measures real-time solar production
- The JuiceBox modulates the charging rate to match solar production and maximize self-consumption
- And the customer enjoys savings on their energy bill due to the grid retail rate being higher than the solar feed-in tariff

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Second-by-second control to maximize benefits

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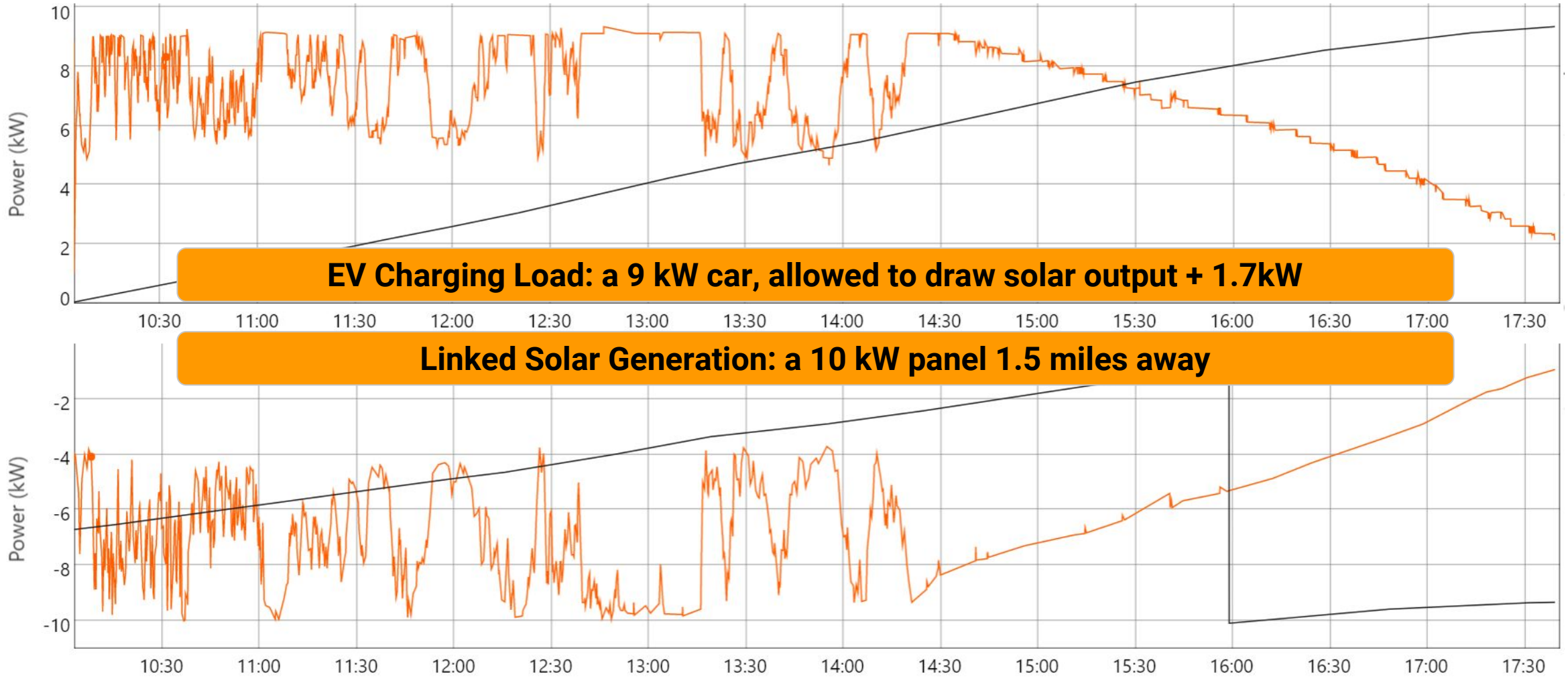

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Creating a Virtuous Cycle

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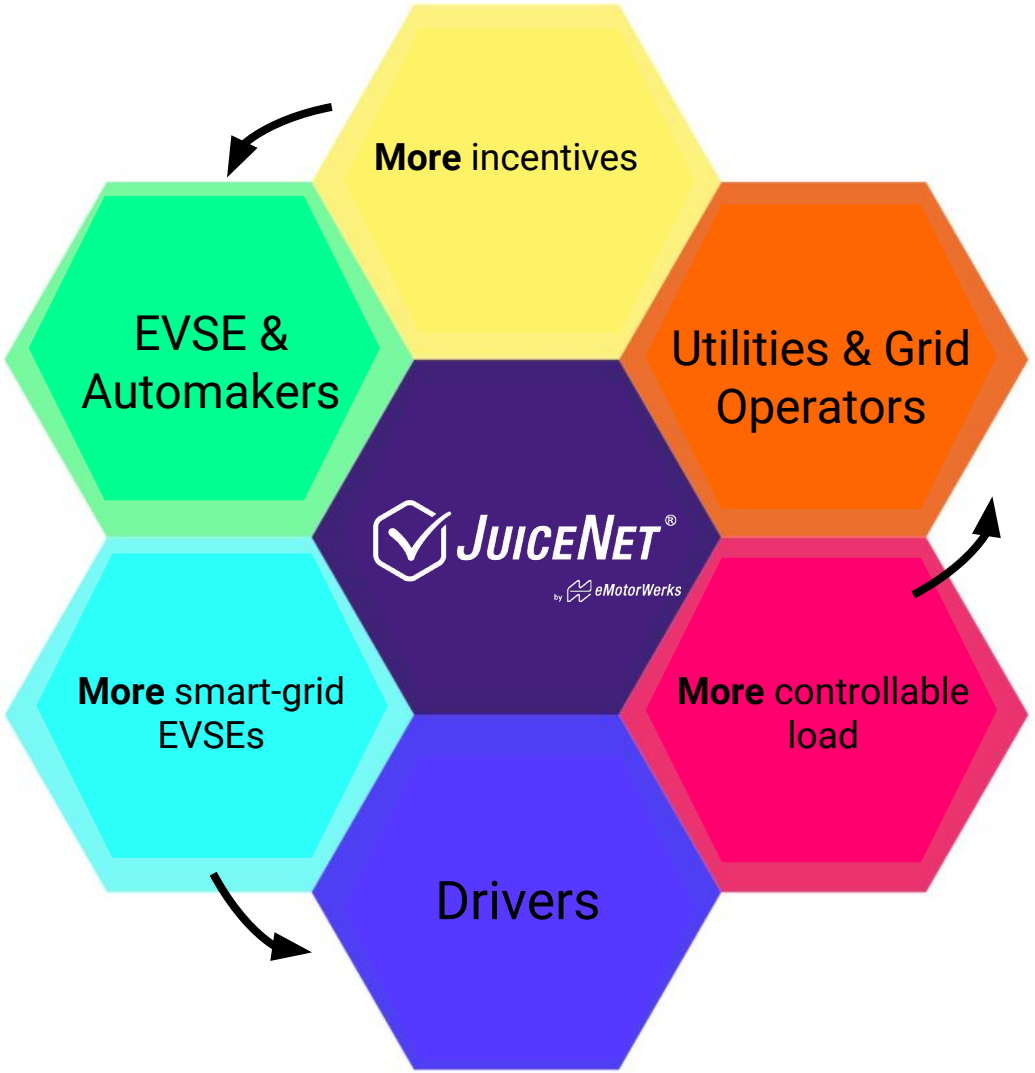

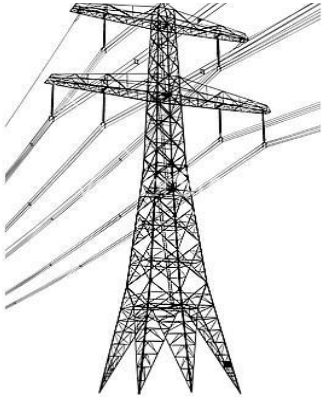

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Case In Point: Honda SmartCharge Program

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Electric vehicles offer consumers one of the best opportunities to leverage the smart grid, and JuiceNet is the only platform to deliver both flexibility to the grid and value to EV drivers.

EV Driver

$

Charge schedule + Dispatchable EV load

HONDA

JUICENET® by eMotorWerks

SmartCharge

$

Charge schedule + Dispatchable EV load

California ISO

SOUTHERN CALIFORNIA EDISON®

ISO/Generator/Utility

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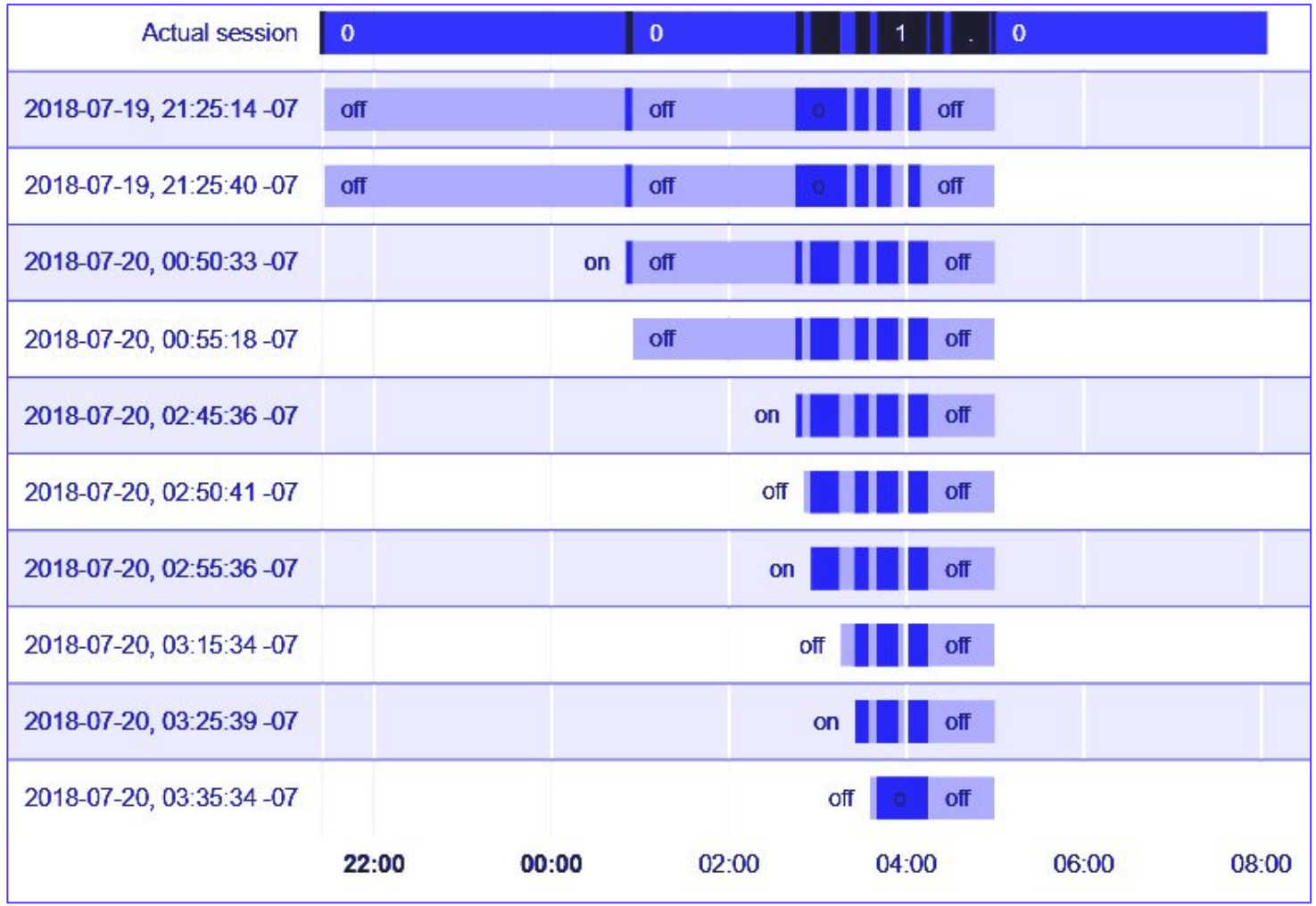
Honda SmartCharge Scheduling



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Honda FIT drivers participate in the wholesale market and eMotorWerks dynamically stops and starts charging in real-time as market prices change.

JuiceNet Benefits

- Reduce energy costs via market participation by controlling charging times
- Participate in smart grid programs and generate new revenue streams (in applicable geographies)
- Increase grid reliability and support EV adoption

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JuiceNet®
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EXERGY

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VGI Services Market Transformation

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Making batteries on wheels, virtual batteries for the grid

What CA and other states need to learn before a VGI Services Market Transformation:

- **What** - the reliability & economic products to be procured (including wholesale vs distribution level)
- **How** - contracting / market mechanisms
- **When** - vehicles are available to provide services
- **Where** - vehicles will reside when providing the services

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Objectives of Policy Engagement

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Drive Widespread Electric Vehicle Adoption

Unlock Opportunities for Smart Charging & EVSE Submetering

Deploy Smart EV Chargers

Engage in rulemakings to inform favorable EV investment program design / utility RFP requirements

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Why Smart Charging Policy Matters

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For drivers that see a price when charging, Time-of-Use (TOU) rates are a proven way to shift EV charging. Example – PG&E's EV Residential Rate

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Advantages

TOU rates alone provide an effective signal to charge at beneficial times

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Smart Charging capabilities (embedded metering & control) can achieve TOU benefits without having to change tariff structure. Example – customer incentives for only charging during off-peak, while still on non-TOU tariff

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Smart Charging can be used in tandem with TOU to maximize the value of EV charging load to achieve specific outcomes. *Example – AEP has non-modifiable TOU settings on smart EV charger, plus DR events*

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Policy Priorities

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- Initiate a Market Transformation for V1G flexibility services by creating new products, values, and interoperability and submetering standards, e.g., capacity value for consuming surplus renewable energy and avoiding curtailments

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- Unlock new pathways for V1G wholesale market service provision, e.g., frequency regulation

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- Create VGI industry association to advocate for VGI solutions on behalf of EVSE manufacturers, EVSPs, utilities and automakers

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- **Additional EVSE Priorities:**

  Sales tax exemption :: Air quality district rebates :: Federal & state incentives

  Interoperability + submetering standards

- **Complementary regulation:**

  ZEV mandates :: renewable portfolio standards (RPS) :: carbon taxes

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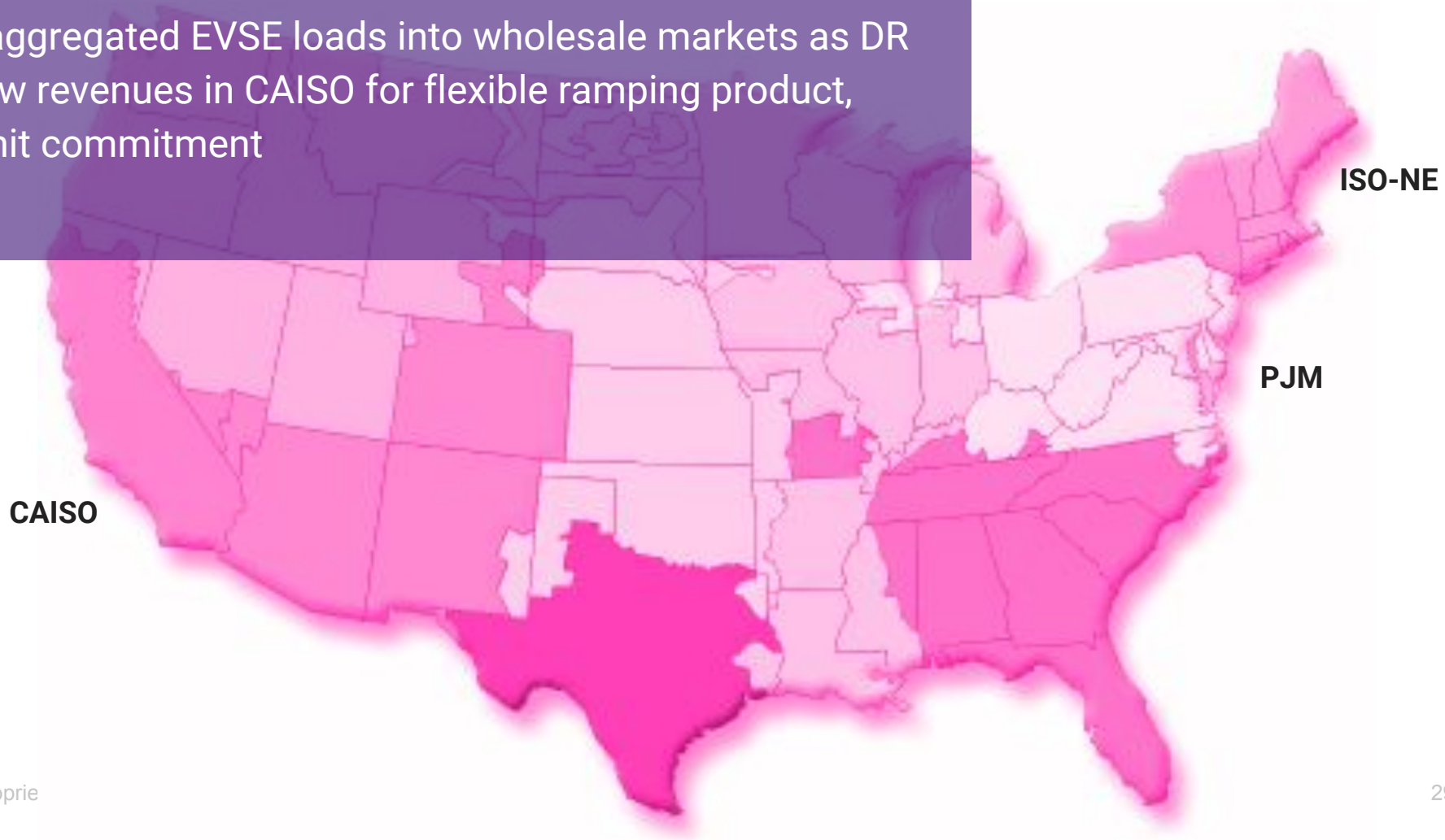
ISO / RTOs priorities

- Integrate aggregated EVSE loads into wholesale markets as DR
- Access new revenues in CAISO for flexible ramping product, residual unit commitment



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Leveraging Japan's History of Auto Innovation

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Today, with **over 130,000 electric vehicles** on the road in Japan, utilities could have access to a **92 MW virtual battery** and reduce expensive energy storage infrastructure costs.

Honda Fit

Mitsubishi i-MiEV

Nissan Leaf

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Japan VGI Opportunities

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To reduce transportation sector CO_2 emissions, which currently represent ~19% of total emissions in Japan, consider an EV and smart infrastructure growth strategy by:

- Mandating smart charging to create cost-effective grid flexibility with V1G capabilities

  Example - under the Automated and Electric Vehicles Act 2018, Smart Charging is to be defined and made mandatory in the UK

- Increasing EV subsidy to reduce the the up-front cost of purchasing an EV

- Placing additional policies & incentives such as “make ready”, LCFS, smart EV rates, etc.

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Thank you.

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