

Use of Second Life EV Batteries for Energy Storage Systems

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2020: A Bad Year... but Not for Clean Energy

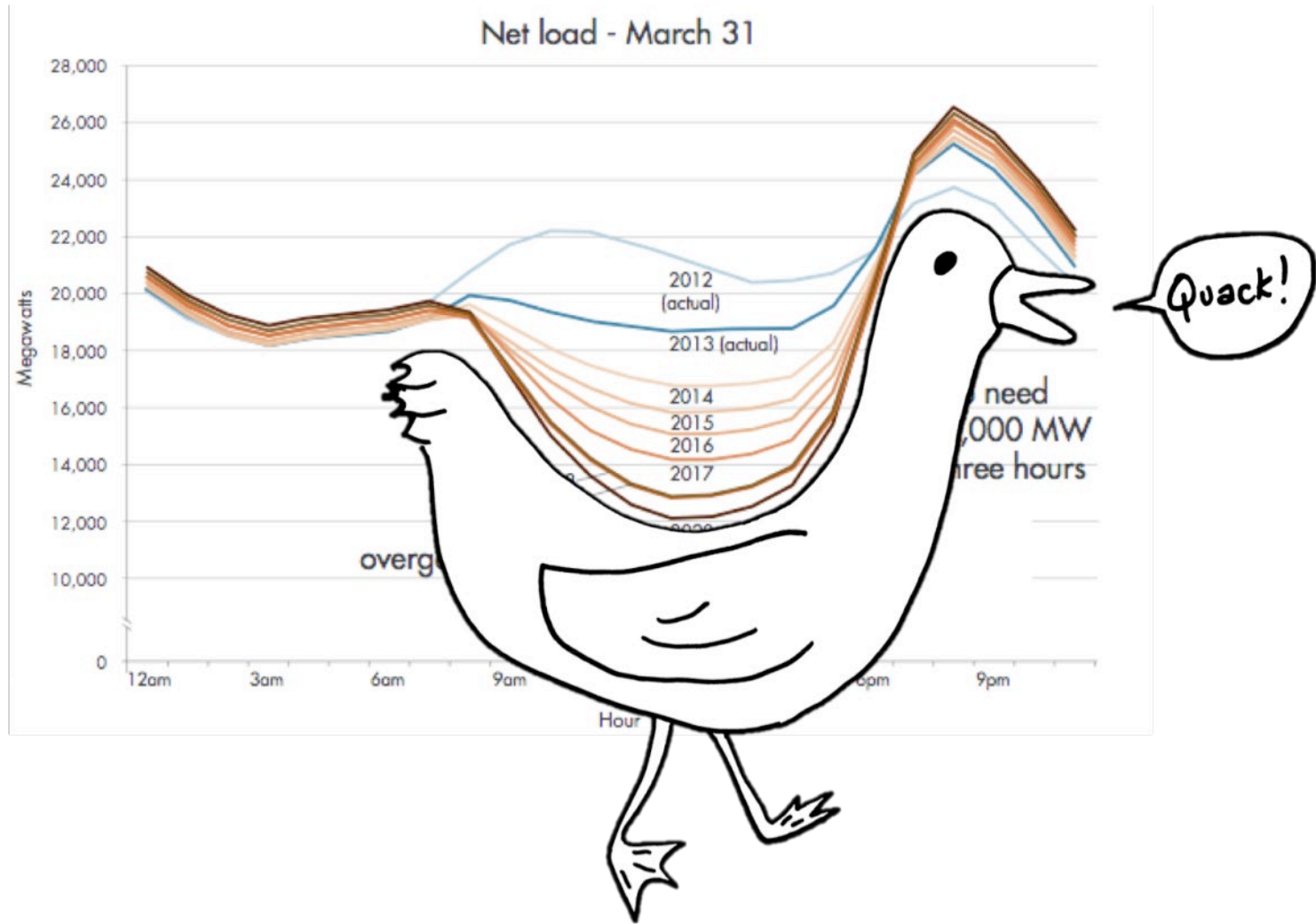


**1/3 of Americans
Live in a Community
Committed to 100%
Clean Electricity**

**100% of California
New Car Sales
Will be Electric
by 2035**

**Biden Administration has
Aggressive Plans for
Clean Energy Stimulus**

Problem #1: Net demand

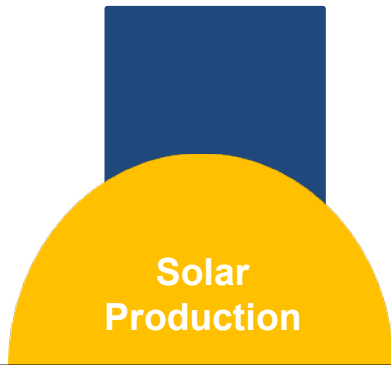


Problem #2: Need for Solar After Sunset



Old Electricity Rates

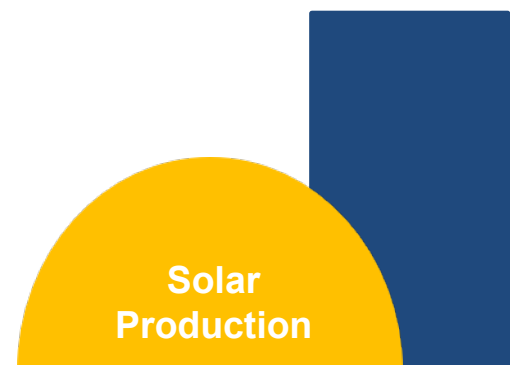
\$\$\$ Peak Prices



Morning Midday Evening


New Electricity Rates

\$\$\$ Peak Prices



Morning Midday Evening

Representative Economics (IRR):

24%  12%

+

8%  18% 2-4 Year Payback

Problem #3

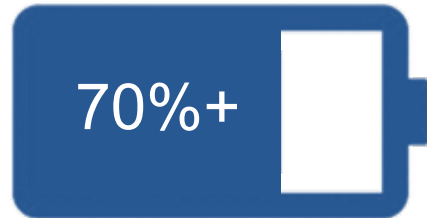
Electric Vehicle Battery Waste



California Law:
Recycle (\$\$\$)

- OR -

Reuse ✓



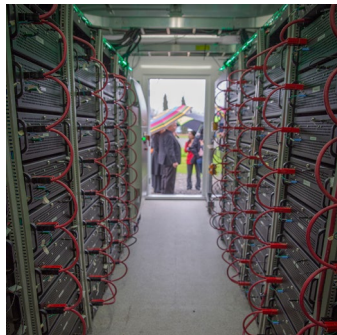


Mission:

**Reuse EV Batteries for
Lower-Cost, More Sustainable Energy Storage**

2010 — **2018** — **2019** — **2020** — **2021**

**1st Used EV
Battery Project**



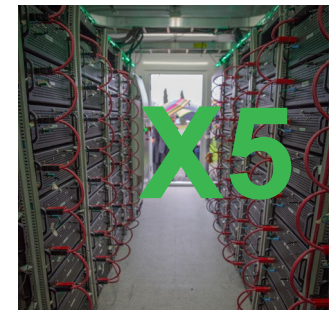
**Commercial-Scale
Demonstration**

BIG IDEAS



**2019 NATIONAL
FINALIST**

CalSEED



**Product
Launch**



**America's
SEED FUND**
SBIR.STR

Conventional Wisdom



EV Battery Lifetime
8-10 Years

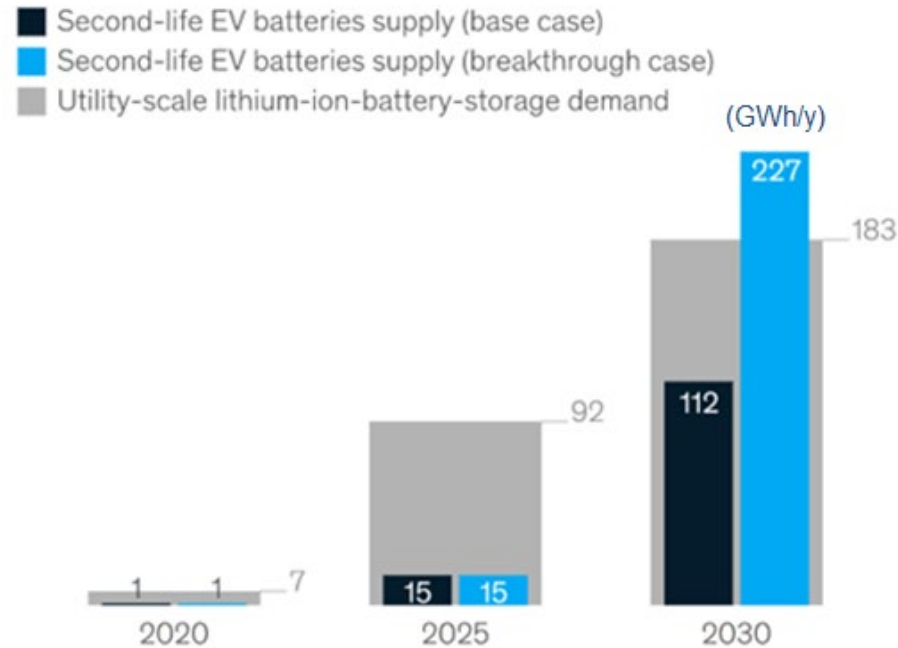


EoL Battery Capacity
60%-80%



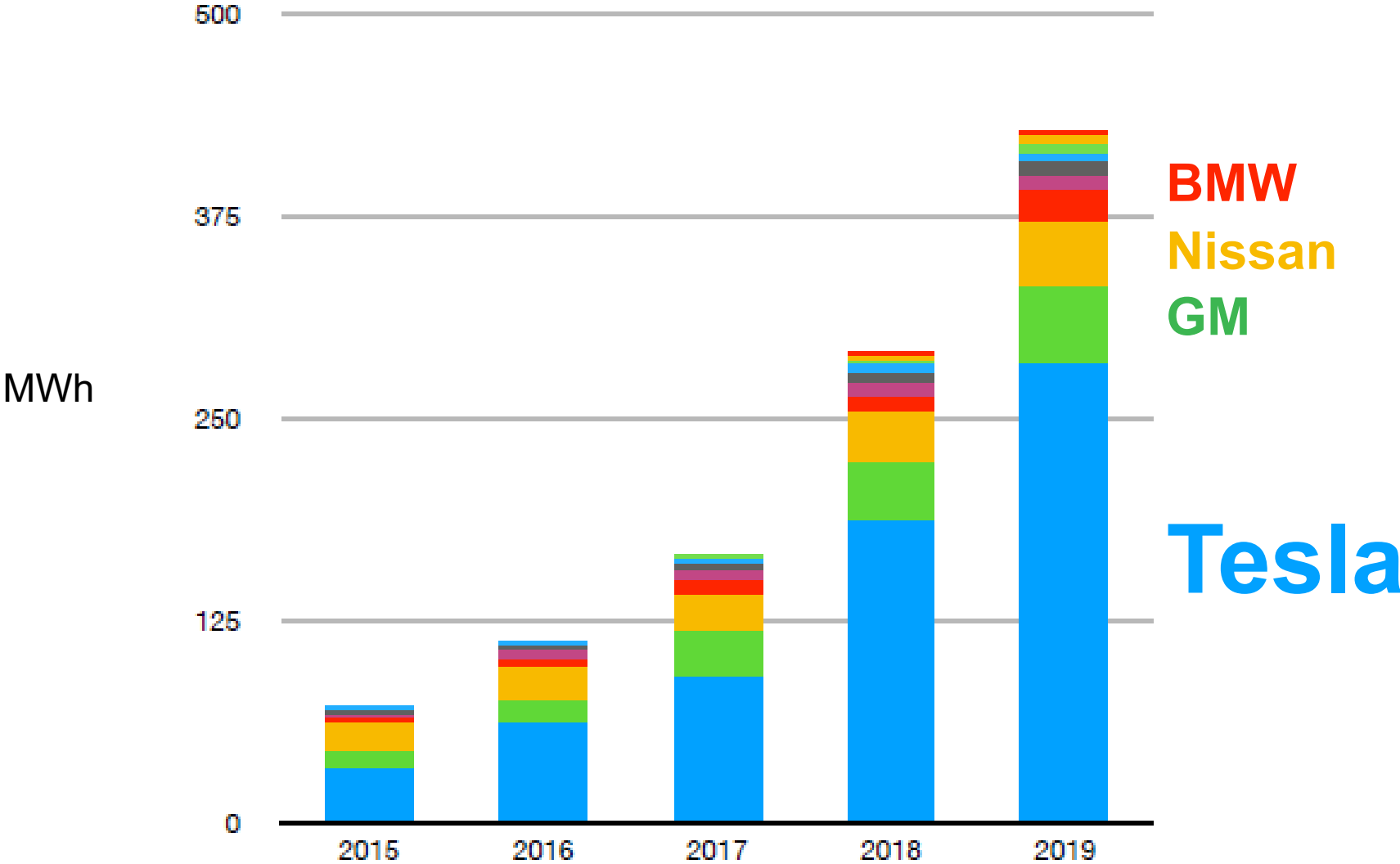
Repurposing Rate
Near 100%

Global Second-Life EV Battery Supply from Passenger Vehicles



To paraphrase...
“Second-life battery volumes will exceed ESS demand”

LEV Batteries Reaching End-of-Life by OEM (USA)



Battery Supply Options



Automotive



Micromobility



Data Center



Brands



Source

Auto Manufacturers
& Auto Recyclers

Shared eBike & eScooter
Network Operators

Decommissioner

Demonstration Results¹

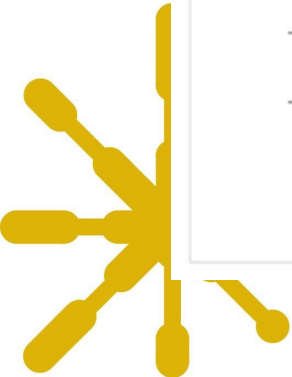
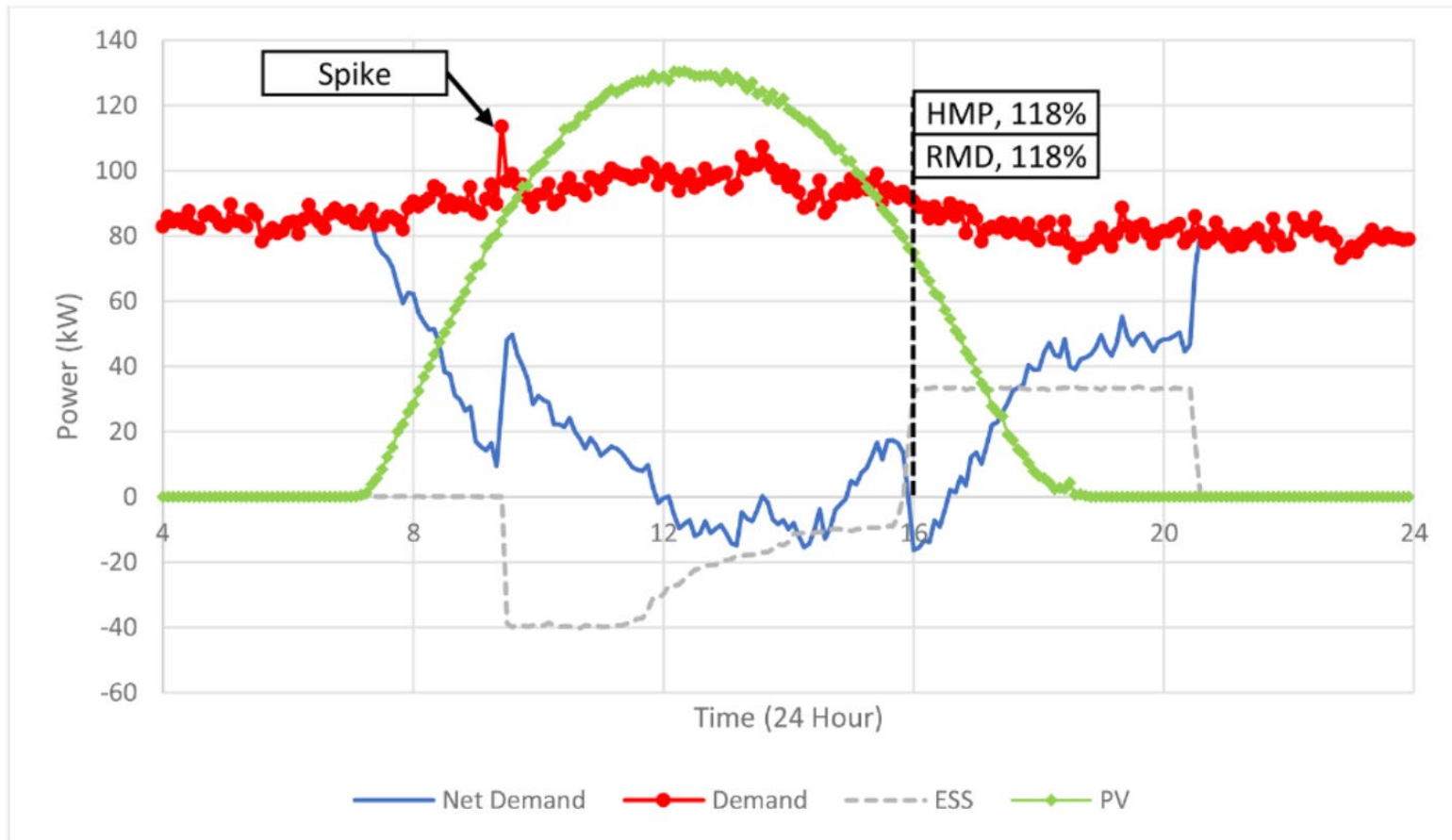


Mondavi Institute
Davis, CA

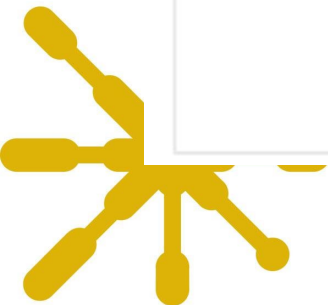
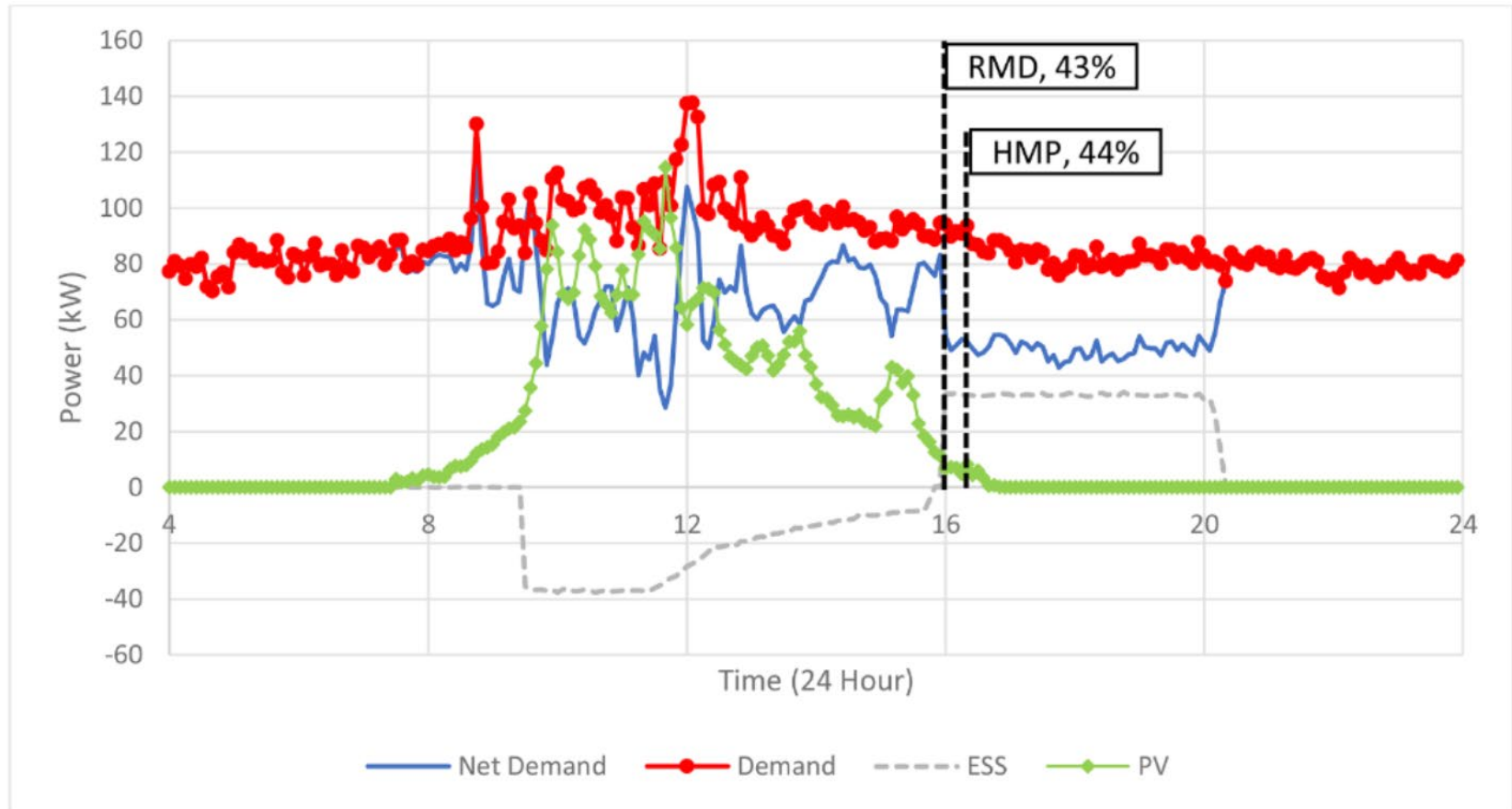
Peak-time energy use	↓ 33%
Max peak-time demand	↓ 49%
Electricity bill	↓ 35%
Carbon footprint	↓ 34%
Solar self-consumption	↑ 60%
Annual Degradation	2%

1. Source: Final Project Report to CEC

How it works on sunny day



Cloudy day



Technology



Safety

Efficiency

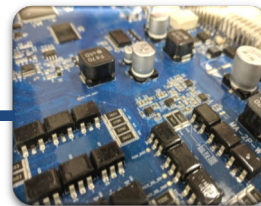
Lifetime: 7+ Years



Rapid Battery Testing



Optimized Reassembly



Monitoring & Controls



Non-Destructive
Battery Fire Suppression

Go-To-Market



2018



2021



2022



**Demonstrate
Concept**

**Launch
Product**

**Scale
Deployment**

✓ **Secure Used
Nissan LEAF
Battery Supply**



Value Proposition



Savings



Resiliency



Sustainability