

NISSAN MOTOR COMPANY



# CEC EPIC S9 Workshop

## Smart Charging and V2X

Nissan North America  
Corporate Planning  
June 30, 2014

# Nissan LEAF

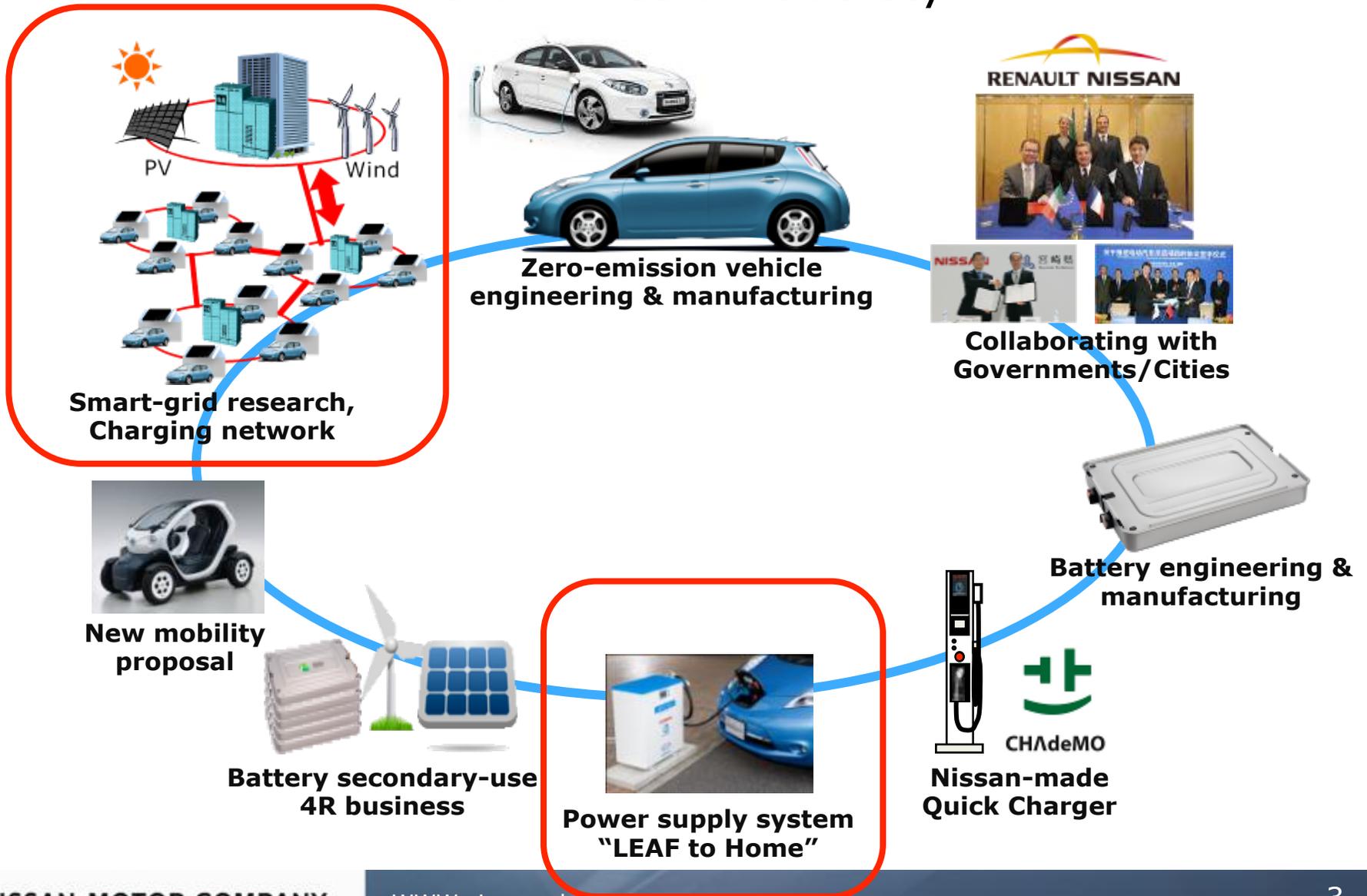
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- May 2014 milestones
  - 50,000 US sales / 115,000 global
  - Record month: 3,117 Nissan LEAF sales



# A COMPREHENSIVE APPROACH

## Zero Emission Society



# Nissan Smart Charging

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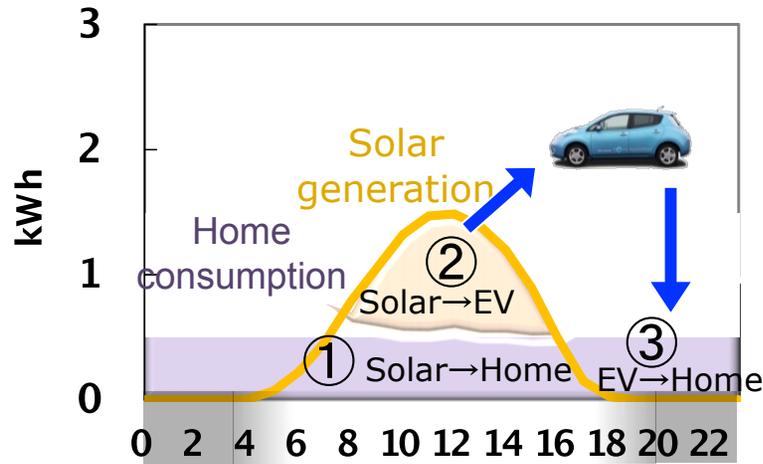
- Participating in smart charging project in Maui
  - Funded by NEDO
  - Hitachi is project lead
  - Stop/stop charging via telematics



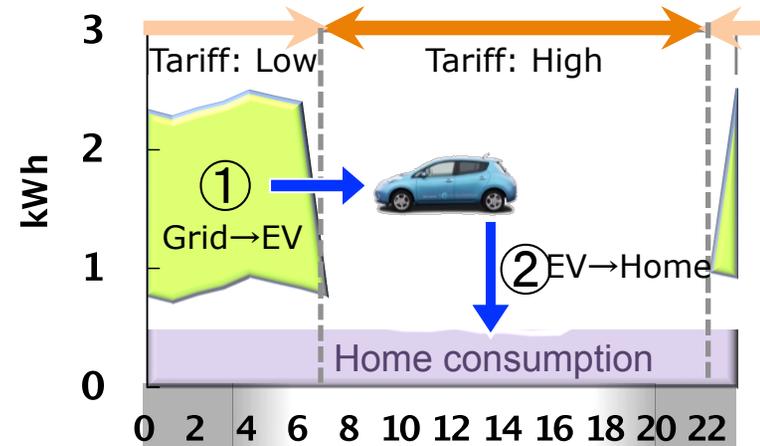
- Current Status
  - Limited US markets that use TOU pricing
  - Limited customer value; higher value for utilities and other stakeholders

# V2X Opportunities

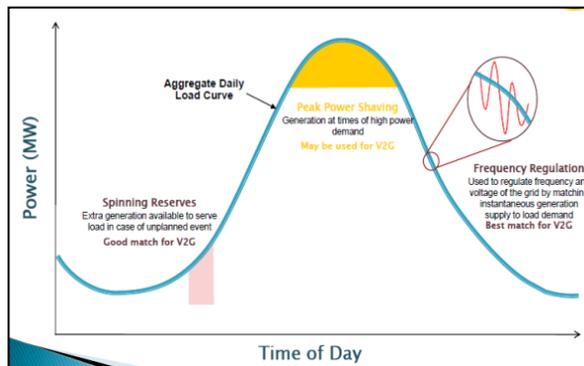
- Use excess solar PV generation



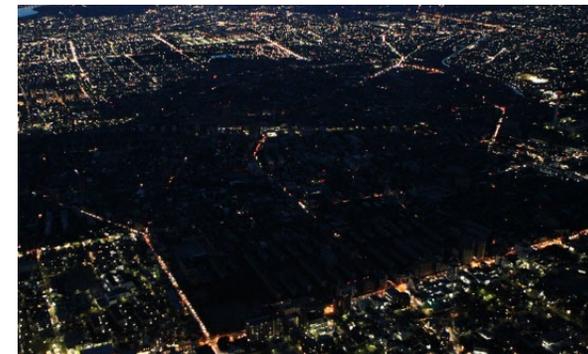
- Optimize electricity use with TOU rates



- Incentive for grid services



- Emergency backup power during blackout



# Vehicle to Home (V2H)



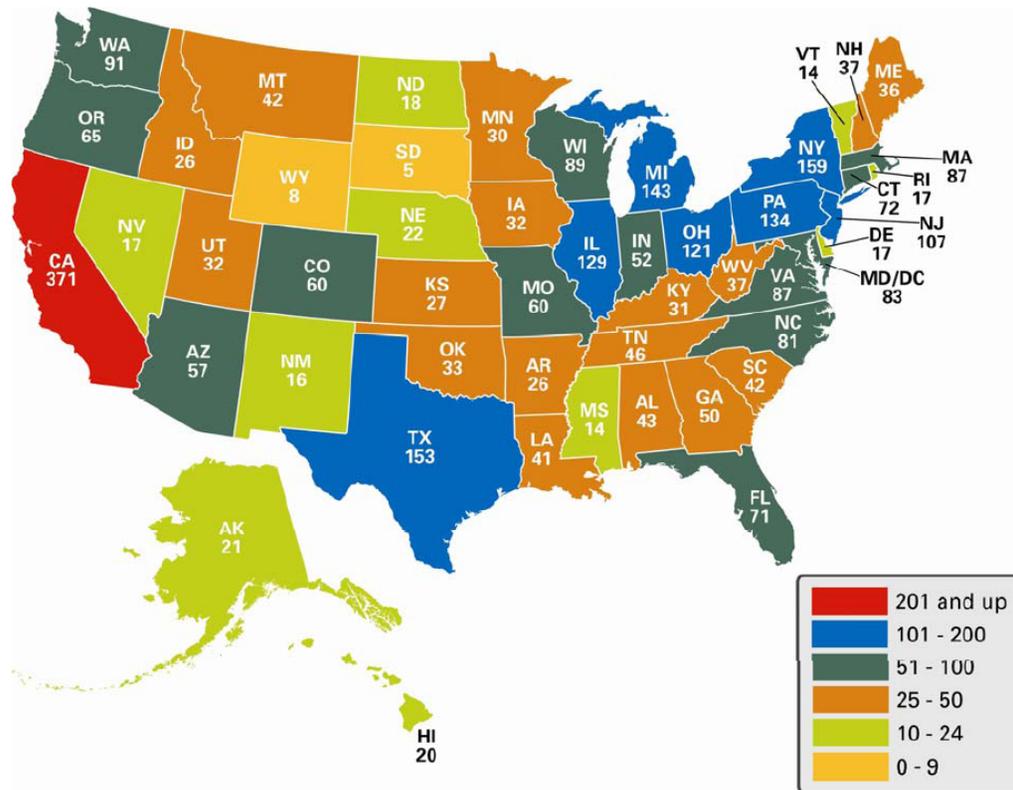
# LEAF to Home

- “LEAF to Home” System launch in Japan summer 2012
  - (1 year after 3/11 Tsunami) with Nichicon EV Power Station
- Currently available in Japan only
- Huge government incentive for charging stations
  - \$1billion (USD) available through Feb 2015
  - V2H devices qualify
  - Nichicon unit retails approx. \$4,800; \$2,400 after rebate



# Power Outages in the US for 2011

Number of reported power outages by state



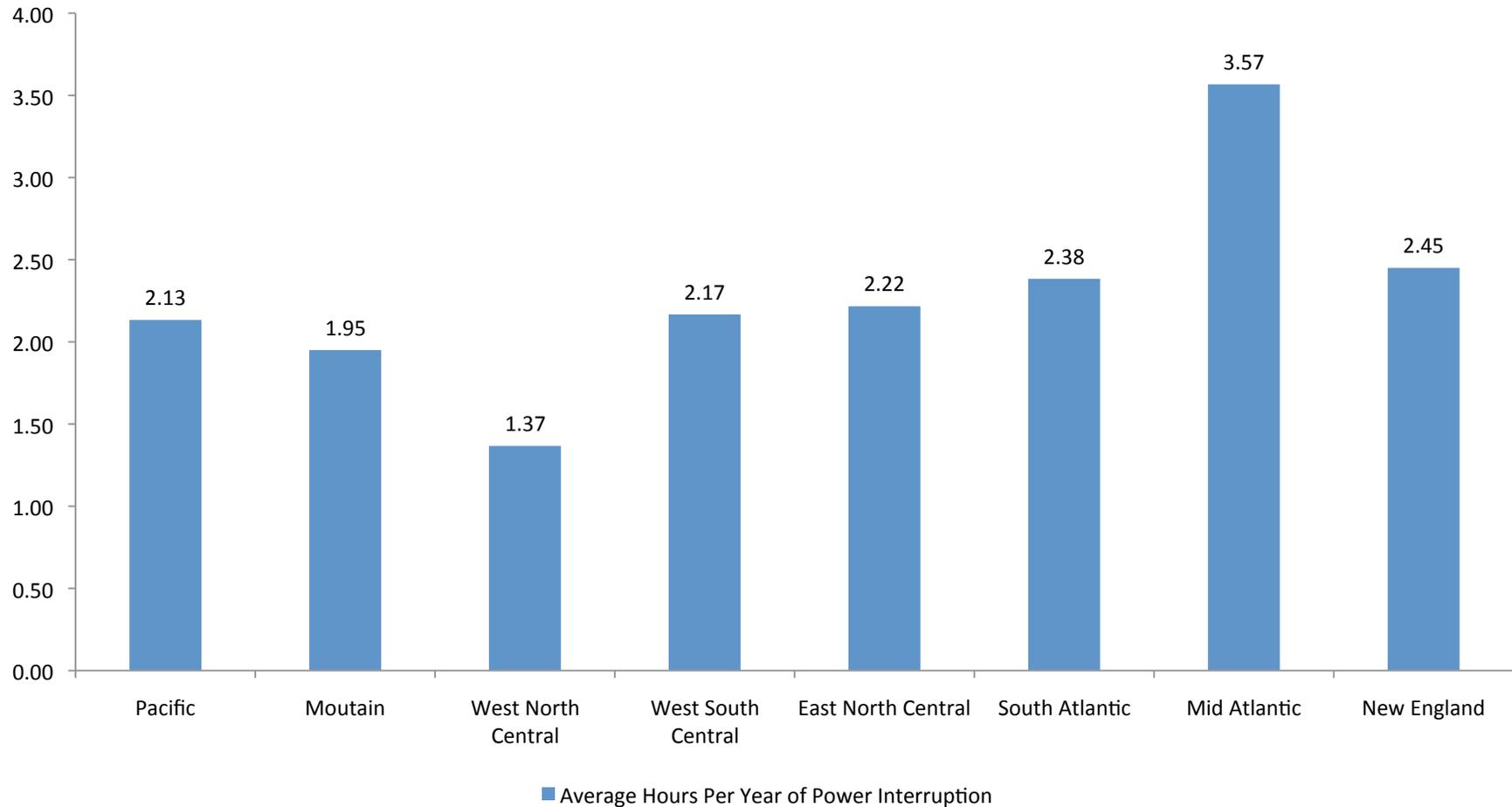
- Average duration of outage = 222 minutes (3.5 hours)
- Average number of people effected per outage = 20,109
- Most common cause = weather / falling trees

Source: Eaton Blackout Tracker, United States Annual Report 2011

# U.S. Power Interruptions by Region

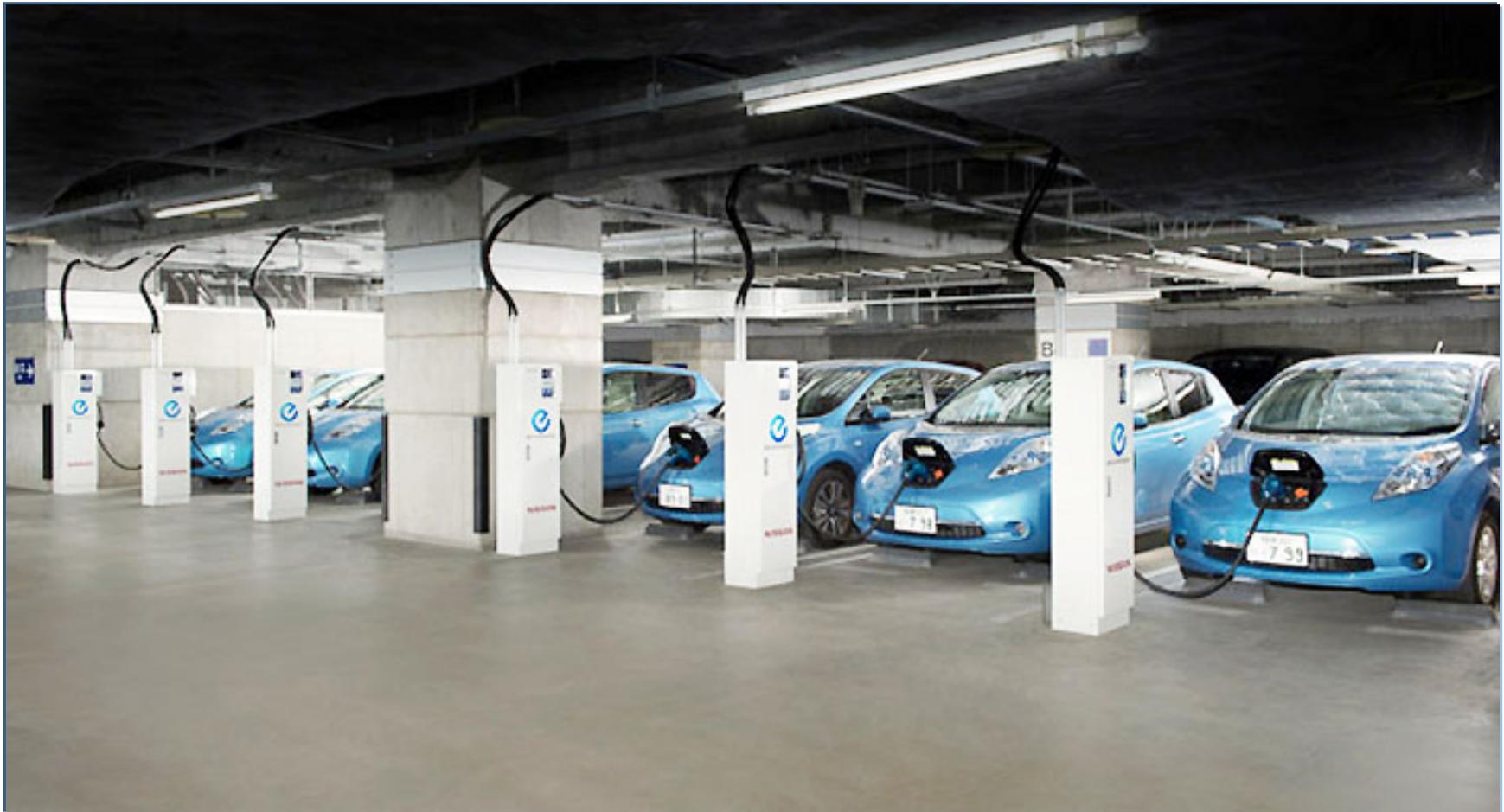
## Average Hours Per Year of Power Interruption

(excludes data from extraordinary events i.e. fires, tornados, etc)



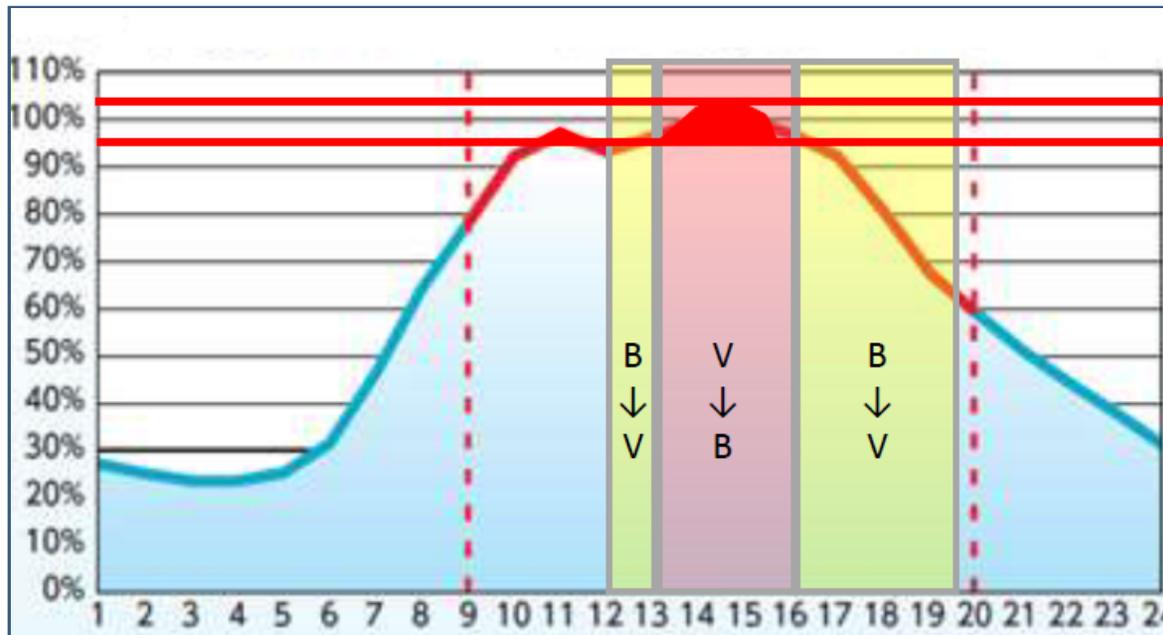
Source: Lawrence Berkeley National Laboratory Report, Oct. 2008

# Vehicle to Building (V2B)

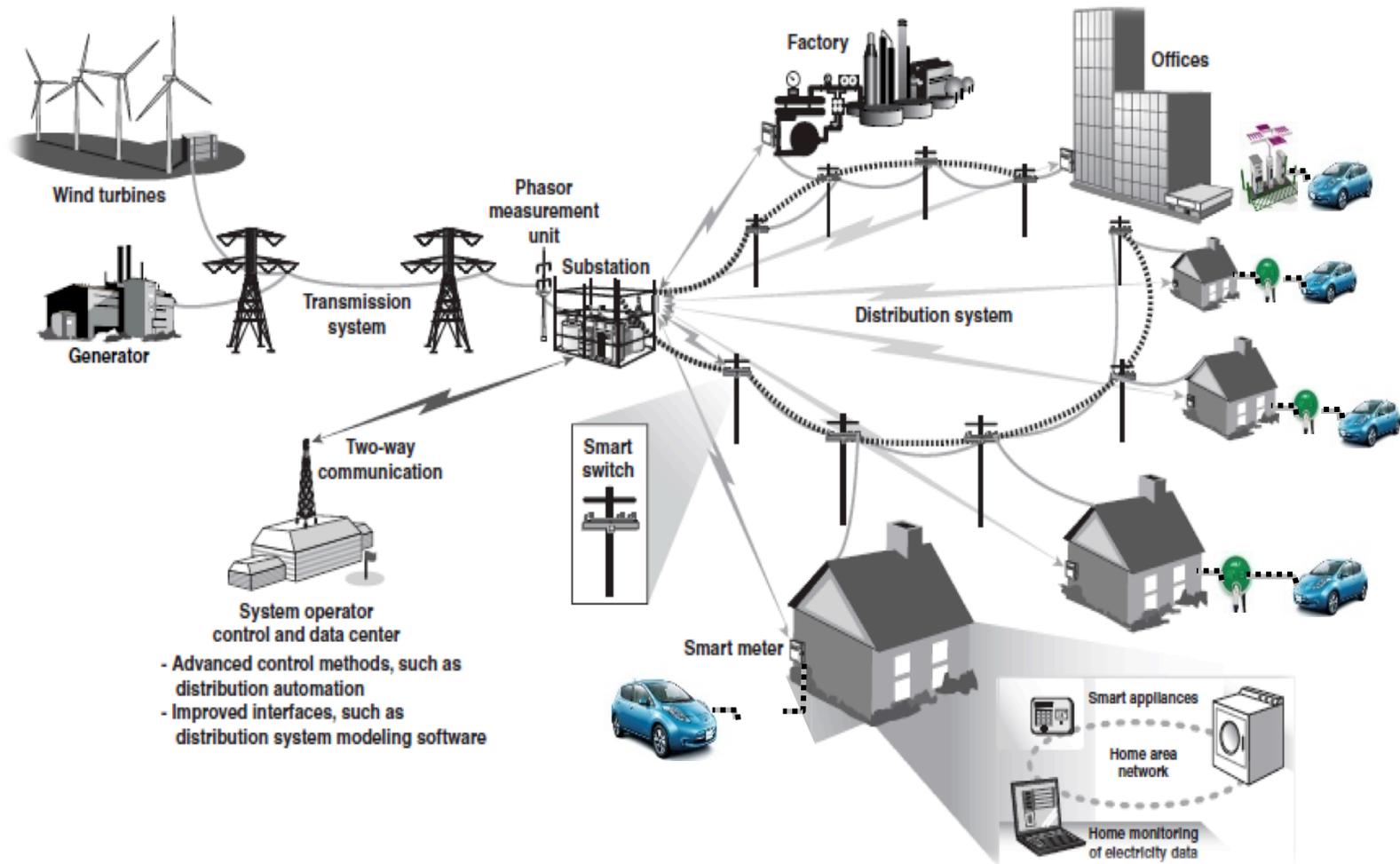


# Vehicle to Building (V2B)

- Demonstration in Atsugi, Japan at Nissan Advanced Technical Center
- Vehicle to Building (V2B)
  - Similar to V2H, but greater financial opportunity.
    - Demand charge reduction (peak shaving) vs. residential TOU rates



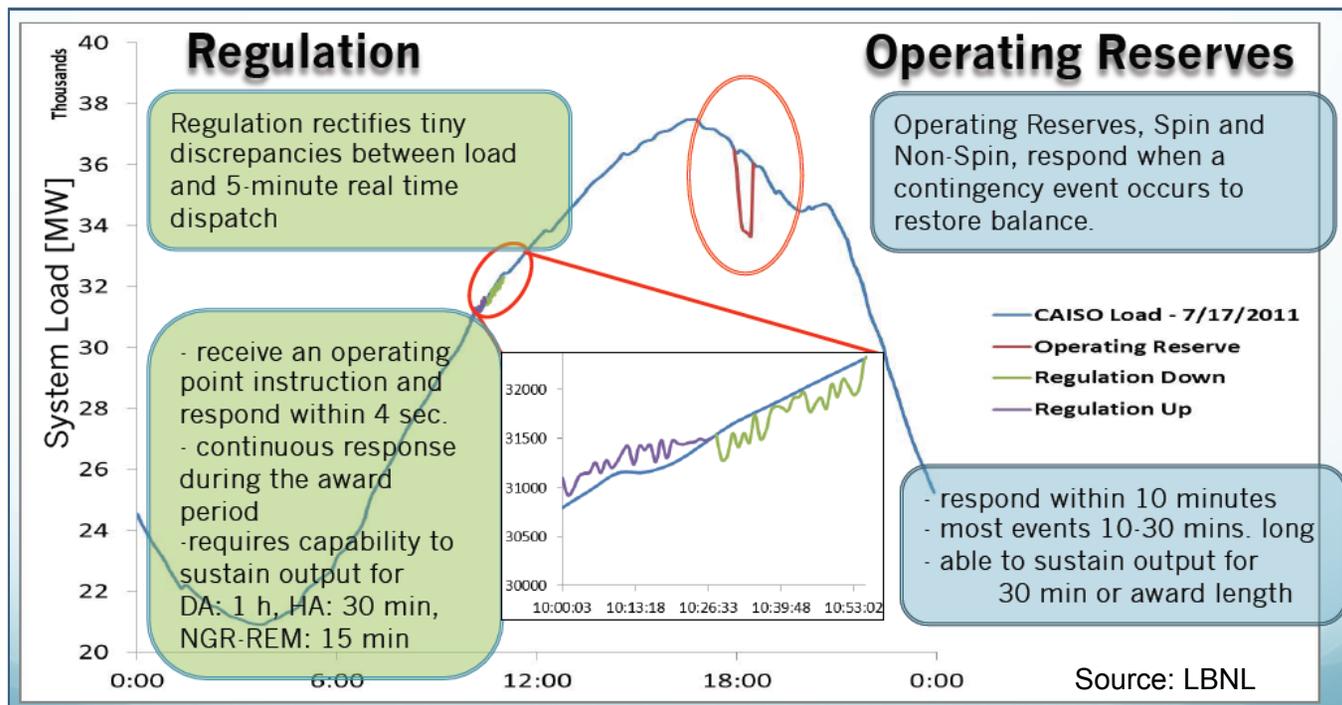
# Vehicle to Grid (V2G)



# V2G opportunity in US

## ■ Vehicle to Grid (V2G)

- Vehicle as power source (not Demand Side Management)
- Revenue generation opportunity (not cost-savings like V2H/V2B)
  - Ancillary Services (RTO/ISO payment for grid balancing)



# Technology Strategy

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- No EVs today have factory-installed bi-directional inverters
  - Nissan pursuing off-board Power Control System (PCS)
  - DC connection (CHAdeMO port)
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- Product / Prototype Development (examples)



Princeton Power Systems (15kW)



IKS (10kW)



Nichicon (6kW)

# Current US Projects

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## 1. Vehicle to Home

- Investigating US opportunities

## 2. Vehicle to Building

- Investigating US demonstration

## 3. Vehicle to Grid

- Nissan is supporting DOD V2G project
  - Los Angeles Air Force Base, CA
    - CEC/LBNL project
  - Fort Hood, TX
  - JB Andrews, MD

# Challenges

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## ■ PCS Development

- Currently limited number of PCS equipment manufacturers
  - No US V2H devices available
  - Lower cost

## ■ Regulatory

- Net metering and rules using EVs as energy storage
- ISO/RTO rules on EV participation as power generation

## ■ Business Model Development

- How to easily define value of energy storage for the vehicle owner

# Support Needed

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- Continued funding support for advanced technology demonstrations
  - EPIC and AB 118 funding is helping push technology forward
- Do not exclude V2H or V2B
  - Infrastructure incentives should apply to bi-directional PCS
  - Does not have to be grid-connected to provide value
  - Behind-the-meter storage and emergency back up power is valuable
- V2G
  - Ensure regulations enable EV participation