Nissan LEAF

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

Zero Emission Society

- Zero-emission vehicle engineering & manufacturing
- Smart-grid research, Charging network
- New mobility proposal
- Battery secondary-use 4R business
- Power supply system “LEAF to Home”
- Collaborating with Governments/Cities
- Battery engineering & manufacturing
- CHAdeMO Nissan-made Quick Charger

NISSAN MOTOR COMPANY
WWW.nissan-global.com
Nissan Smart Charging

- 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
  - Incentive for grid services
  - Optimize electricity use with TOU rates
  - 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

- 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)

Average Hours Per Year of Power Interruption

- Pacific: 2.13
- Mountain: 1.95
- West North Central: 1.37
- West South Central: 2.17
- East North Central: 2.22
- South Atlantic: 2.38
- Mid Atlantic: 3.57
- New England: 2.45

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

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

Product / Prototype Development (examples)

- Princeton Power Systems (15kW)
- IKS (10kW)
- Nichicon (6kW)
Current US Projects

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

- **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

- 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