Building Range Confidence & DC Fast Charge Infrastructure

University of Michigan  Powertrain Strategies for the 21st Century Conference
July 25, 2013

Brendan Jones
Director, EV Infrastructure Strategy
Nissan North America
Market Update

LEAF
- 31,000+ US Sales
- 67,000+ Global Sales
- Consumer Pull for More Infrastructure

US DCFC Infrastructure
- 600+ by March 31, 2014
- 284 as of July 1, 2013
New Features for 2013 Nissan LEAF

- S grade addition
- Leather interior (SL)
- 6.6 kW onboard charger (SV & SL)
- Hybrid heater system (SV & SL)
- B-mode (SV & SL)
- Display Audio (S)
- Charge light & lock including I-key release
- 17” Alloy wheel (SL)
- 16” Steel wheel (S)

- BOSE option (SV & SL)
- AVM option (SV & SL)
- Leather wrapped steering wheel
- Hill start assist
- Black interior
- 2 New exterior colors:
  - KBC – Metallic Slate
  - QAK – Glacier White

$6000 reduction in entry price
Nissan LEAF

More LEAFs sold in CYTD 2013 than in all of 2012

Sales are up 200%+ compared to a year ago!
Building Range Confidence & Infrastructure

**Primary Approach:** Build out target 21 DMAs* by deploying infrastructure in population centers to support extending in-town range.

**Infrastructure**

- **DC Fast Charger Dealer Program**
  - Creates community anchor for charging infrastructure
  - Answers purchase question on “where do I charge my car?”
  - Creates sales tool and links community infrastructure

- **Deployment via Key Stakeholder Engagement**
  - Builds confidence through community awareness
  - Local and State Government
  - Utilities
  - Clean Cities Organizations
  - Research & Environmental Organizations

- **Workplace Charging Program**
  - Supports employer incentives for sustainable mobility
  - Supports business fleet needs
  - Employee benefit used to attract and retain top talent, increase productivity and workplace harmony
  - Promotes energy efficiency and environmental benefits

**Dealership**

**Community**

**Workplace**

**Three Key Pillars**

* 4 additional DMAs identified for infra development.
The CHAdeMO standard is aligned with Nissan’s approach to support cost-effective solutions without compromise for all stakeholders.

- **Safe**
  CHAdeMO takes measures for making charging as safe as possible and protecting the user against any potential hazard while charging.

- **Pragmatic**
  Uses existing industry-preferred vehicle communication standards (CAN).

- **Natural Differentiator**
  Limited parking competition for L2 in strong markets prevents BEVs from charging – fast charging provides needed solution.

- **Low Cost**
  Prices for proven and reliable fast chargers are falling (commoditization).

- **Future-Proof**
  Smart-grid capable on multiple scales (e.g., V2H and V2G).
Multi-standards chargers

European charger manufacturers have started to offer dual- and triple-arm chargers in 2013

90~95% of the cost is likely commonalised, leaving 5-10% of overall cost unique to each standard

European charger manufacturers are already producing multi-arm chargers

As the number of EVs per charger increases, the turn over ratio of each charger will go up...

...therefore it speeds up the recovery of investment in the infrastructure

Source: 2nd World EV Summit, Lillestrøm, Norway 2013
EV Infrastructure Considerations

- Electrical Capacity
- Rate Structures
- Temperature
- Altitude
- Voltage
- Utility Upgrade?
- Demand Charges?
- 208V or 480V?
- Hot / Cold Extremes?
- > 3000 feet?

Bottom Line: Each site requires different solutions.
# Infrastructure Opportunities

<table>
<thead>
<tr>
<th>Focus</th>
<th>Primary</th>
<th>Secondary</th>
<th>Tertiary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance</td>
<td>Short</td>
<td>35 Miles+ Suburban</td>
<td>60 Miles+ Connector</td>
</tr>
<tr>
<td>Charging Type</td>
<td>Home</td>
<td>Destination Charging / Workplace / Multi-unit</td>
<td>Pathway Charging</td>
</tr>
<tr>
<td>Charger Type</td>
<td>Normal</td>
<td>Normal DCFC</td>
<td>DCFC</td>
</tr>
<tr>
<td>Charging Site</td>
<td>Home / Community</td>
<td>Super Market, Mall, Restaurant, Park, Gym, Parking Lot or Gas Station</td>
<td>Major Road, Highway Service Area, Gas Station</td>
</tr>
</tbody>
</table>
Some Challenges

- Site host identification
  - Engaged and willing to take time to understand the issues
  - High potential for asset utilization – improved load factor

- Installation costs
  - Available electrical capacity
  - Distance from load center
  - Footprint for ADA and zoning

- Operation costs
  - Varied utility rate structures
  - Connectivity; data management & transport; interoperability

- No value consideration for societal benefits
- Regulatory structure varied across US for utility participation
- Sustainable business models still in early stages
Approach to Market

- Create customer convenience
- Maximize site host value

- Strong LEAF Sales with Strong DCFC Infrastructure...but not enough
- Strong LEAF Sales with DCFC Gap
- Infrastructure and signage to build range confidence in other markets
Department of Transportation
Blue Sign Program

Interstate Signage

EXCEPT FOR ELECTRIC VEHICLE CHARGING

Premise Signage Each Location

Directional Signage
Quick Charger Study Data

Utilization

Average Charge Event Duration: **21 minutes**

Average Charge Events per Day: **4.75**

Charge Event Leader: **11 per day**

Cost

Average Cost Per Site: **$49,679** (Unit & Install)

Study Background
- 5 Markets: LA, San Fran, San Diego, Sacramento, Seattle
- 14 dealers
Summary

- DC Fast Charging is key component of effective EV Infrastructure
- Custom approach required for each community
- Costs can be minimalized through proper planning and implementation
- Interest in utilization patterns across regions still high
- Signage best EV awareness and educational tool in the box