Nissan History of EV Technology
Nissan released its first electric vehicle in 1947. Beginning in the 1960s the company became more active in developing such vehicles and has since released and sold numerous electric-powered automobiles.

We at Nissan are applying our many years of expertise with lithium-ion batteries and high-voltage electric-system technology in the development of our fuel-cell vehicles.

Nissan has developed unique knowledge in the EV space with over 15 concepts and production models introduced over the last 65 years.
Nissan’s Global North American Commitment to EV
Mass production for mass marketing

500,000 battery and assembly capacities
5 battery plants
3 confirmed assembly plants

Sunderland, UK
Flins, France
Smyrna, USA
Zama, Japan
Oppama, Japan
Nissan’s Commitment to Zero-emission leadership

- Nissan LEAF
- evNV2000
- TBD
- Infiniti
- TBD
- Fluence
- Zoe
- Twizy

[Logos of Nissan, Infiniti, and Renault]
Nissan Sustainable Mobility Plan

SUSTAINABLE MOBILITY PLANT
Smyrna, Tennessee

- **Facility:** 1.3 million square feet for battery operation
- **Property:** 67 acres for battery operation
- **Production start:** Late 2012 for battery and Nissan LEAF
- **Component:** Lithium-ion battery
- **Model Produced:** Nissan LEAF
- **Capacity:** 200,000 batteries annually
  - 150,000 Nissan LEAFs annually
- **Investment:** $1.7 billion for Nissan LEAF assembly construction and retooling
- **Employees:** Up to 1,300 employees at maximum capacity for both battery and Nissan LEAF vehicle production
Zero-emission leadership

Comprehensive approach toward zero-emission mobility
BOCHUM, Germany – Global passenger-car sales:

- Will show a steady rise in coming years to total 92.5 million units by 2025 according to the CAR Center Economic Research of the University.
- This will represent a 57 pc from 2010 levels.
- Led by China and other new markets:
  - China forecast to soar 163 pc to 29.6 million by 2025.
  - India sales are expected to jump 181 pc to 6.7 million units.
- Alternative Power train vehicles will need to significantly increase their global market share or the demand for oil will outstrip supply and production capability.
## 2025 EPA Standards and Fuel Savings

<table>
<thead>
<tr>
<th>2025 MPG</th>
<th>VMTe</th>
<th>Price of Gasoline</th>
<th>PV of Fuel Savings</th>
<th>Price of Gasoline</th>
<th>PV of Fuel Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>37.6</td>
<td>14,595 (1st Yr.) - 13,301 (5th Yr.)</td>
<td>$3.50</td>
<td>$3,451</td>
<td>$6.00</td>
<td>$5,917</td>
</tr>
<tr>
<td>40.8</td>
<td>14,794 (1st Yr.) - 13,481 (5th Yr.)</td>
<td>$3.50</td>
<td>$3,885</td>
<td>$6.00</td>
<td>$6,660</td>
</tr>
<tr>
<td>44.8</td>
<td>15,041 (1st Yr.) - 13,707 (5th Yr.)</td>
<td>$3.50</td>
<td>$4,363</td>
<td>$6.00</td>
<td>$7,479</td>
</tr>
<tr>
<td>49.6</td>
<td>15,339 (1st Yr.) - 13,978 (5th Yr.)</td>
<td>$3.50</td>
<td>$4,865</td>
<td>$6.00</td>
<td>$8,339</td>
</tr>
</tbody>
</table>

**Nissan LEAF is 75+ MPG**
The Customer
Consumer Profile

- High Income ($140,000+)
- Technologically Savvy
- Well-educated
- Enjoy Role As Early Adopter
- 82% new to Nissan Brand
- 75% considered only Nissan vehicles
- 38% of Nissan LEAF customers traded a Toyota
- Prius is the number #1 traded in model
Nearly all Nissan LEAF owners drive less than 60 miles a day – the average is more around 30 miles a day

- Average charging time is less than 3 hours
- The average drive trip is about 7 miles...
- People are using the vehicle as their PRIMARY car
- 85% to 90% of Charging takes place at home
Why 100 Mile Range?

On average 90% of the U.S. population drives less than 100 miles a day

Typical consumer driving patterns:
• Weekday
  – Less than 50 miles - 73%
  – 5-10 miles – 27%
• Weekend
  – Less than 50 miles – 66%
  – 20-29 miles – 24%
The Product
© Nissan LEAF – Product Highlights

- Zero emission
- 100-mile range
- Superior battery technology
- Built for sustainable mobility
- Stimulating acceleration
- Quietness
- Connected intelligent transportation (IT) system
- Affordable

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Size</strong></td>
<td>5-door mid size hatchback</td>
</tr>
<tr>
<td><strong>Capacity</strong></td>
<td>5 Adults</td>
</tr>
<tr>
<td><strong>Range</strong></td>
<td>100 miles (US LA4)</td>
</tr>
<tr>
<td><strong>Top Speed</strong></td>
<td>90 mph</td>
</tr>
<tr>
<td><strong>Battery</strong></td>
<td>Laminated Li-ion</td>
</tr>
<tr>
<td><strong>Capacity/Power</strong></td>
<td>24 kWh/over 90kW</td>
</tr>
<tr>
<td><strong>Motor</strong></td>
<td>High-response synchronous AC Motor (80kW/280Nm)</td>
</tr>
<tr>
<td><strong>IT System</strong></td>
<td>Integrated communication system</td>
</tr>
</tbody>
</table>
© Superior Battery Technology

- Places **batteries in the safest location**
- Provides **optimum weight distribution** for ideal/predictable handling
- Allows for 5 passenger seating by not intruding into cabin space
Advanced Vehicle IT System

Use of technology for Range Management

**Meter:** Distance to empty

**Navigation:** Reachable area

**Charging Timer**
- Next Scheduled Battery Charging: 
  - Timer 1: ON Wednesday
- START Time: 01:00 AM
- END Time: 06:00 AM
- Charging Limit: 100%

**Climate Control Timer**
- Next Scheduled A/C-Heater Timer:
  - Timer 1: ON Wednesday
- Departure: 01:00 AM
- Priority: A/C-Heater Timer
- Assigned Days:
- Current Time: 10:47 AM Tue.
LEAF is equipped with Telematics control unit that transmits and receives data that will allow for unprecedented conveniences.

- Charging/Climate Control
- Charge Status
- Plug-in reminder
- Access by internet and web-enabled phone

Remote vehicle access

Data Center

Automatic charging spot

NEW charging spots
Nissan LEAF Marketing
Utilize LEAF as Brand Halo

- Differentiate EV’s as a segment from Hybrids including Volt.
- Educate about battery and electric motor technology.

- Legitimize EV technology:
  - Focus messaging on EV’s being “real cars”.
  - Communicate momentum towards charger network growth.
  - Alleviate range anxiety.

- Communicate environmental benefits of EV vs. ICE – target early adaptors.

- Communicate new buying process (LEAF Customer Journey)

- Begin messaging migration from Early Adopters to Pragmatic Majority.
  - Utilize targeted media to transition messaging in Launch Markets to Pragmatists (cost of ownership, driving experience, etc.)
Nissan LEAF - Accolades

IIHS “Top Safety Pick” & NHTSA 5-Star Rating

Ward’s “Ten Best Engines of 2011”

“2011 World Car of the Year”

“World’s 50 Most Innovative Companies”
Award Winning Commercials

Polar Bear

Lance

The Power of Zero

Gas Powered Everything
Social Media Stats and Press

Nissan LEAF Outsells Chevy Volt

facebook
122,193

twitter
@NissanLEAF
17,389
“Drive Electric Tour” began October 1, 2010 offering first-in-market consumer test drives. Tour extended to “Phase 2” for FY11. Interactive displays and test drives with Product Specialists providing information about Nissan LEAF, technology and features. Over 77,000 Total Consumer Experiences.
To Meet FY12 Sales, We Must Sell To Pragmatists

- Prioritizes environment and oil independence.
- Willing to adopt new technology, pay a premium and be inconvenienced.
- Prefers to purchase (perceived less wasteful).
- Want Green options
- Wants oil independence
- Believes EV has lowest impact
- Unwilling to compromise low cost and high convenience.
- Slow to adopt new technologies. Compares EV’s to ICE and HEV vehicles.
- Prefers to lease (less risk)
The Competition
Competitive Landscape – Ford Focus EV

- Launching in 17 States mid 2012 – Nationwide in 2013
- 5-10K units first year
- Est. 100 Mile range
- 23kWh lithium-ion battery
- 6kW onboard charger - ~3 hr charge time
- MyFord Touch system with EV unique content
- 1 trim available: $39,200
  - Leather package $995
- Eligible for $7,500 federal tax credit
Competitive Landscape – Honda Fit EV

- California and Oregon launch summer 2012, 6 east coast markets early 2013
  - 1,100 units over the next 3 yrs, but plan to react to consumer demand
- MSRP: $36,625 (estimated lease $399)
- Estimated 123 mile range LA4 / 76 mile combined EPA
- 20kWh lithium-ion battery
  - 6.6kW onboard charger: ~3hr charge time
- 3-mode drive system: Sport, Normal, Econ
- Interactive remote requiring no internet/cell connection (30 meter range)
Competitive Landscape - Coda

• Launching in California early 2012 – Production start Nov 2011
  o Coda estimates 50,000 vehicles sales by 2015 (10,000 1st year)
• MSRP: Reduced to $39,900
• Estimated 150 mile range LA4 / 120 combined EPA
• 36kWh lithium-ion battery
  o 6.6kW onboard charger: ~6hr charge time
• 10 year / 100,000 mile battery warranty
• Sedan Styling – full trunk
Competitive Landscape – BMW i3 Concept EV

- Launch 2012 700 vehicles (conversion), 2013 production vehicles
- MSRP: $35,000 USD (approx); No volume estimates available
- Driving Range is 93-100 miles (not confirmed by BMW)
- 125 kW motor (170hp); 250 Nm of torque (184 lb-ft)
- Only weighs 2756 lbs
- Has a range extender (REx) option (small gas generator)
• California launch in 2013
• MSRP, volume estimates and driving range not yet determined
• 85 kW electric motor
• Lithium Nanophosphate Battery: capacity TBC
Competitive Landscape – Hyundai Elantra Concept EV

- Concept based on current Elantra Platform
- No MSRP or est. volume at this time
- 80kW motor
- 27kWh lithium-polymer battery pack
- Estimated driving range of 124 miles
- 6.6kW onboard charger: ~5hr charge time (220V)
Nissan LEAF Customer Education

- Advanced Range Simulators
- Real World Driving Statistics
- Charge Times
- Fact vs. Fiction
Charging
Nissan LEAF Charge Ports

DC Fast Charge

Level 1 & 2
Charging Time And Mileage

<table>
<thead>
<tr>
<th>Charging Level</th>
<th>Mileage and Charging time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2hr</td>
</tr>
<tr>
<td>Level 2 (240 volts, 16amps)</td>
<td>+25m</td>
</tr>
<tr>
<td>Level 1 (120 volts, 12amps)</td>
<td>+10m</td>
</tr>
</tbody>
</table>

• DC Quick charging:
  • 25 to 30 miles in 10 minutes “Coffee Break”
  • 40 to 50 miles in 15 minutes “Snack & Sandwich”
  • 80 to 100 in 30 min “Range Extender”
# Level 2 Residential & Commercial

## Commodities

- **GE**
- **Schneider**
- **Leviton**
- **Legrand**
- **Eaton**
- **AV**
- **ECOTality**
- **Clipper Creek**
- **SPX**
- **Coulomb**

## Retailers

- **Lowes**
- **Best Buy**
- **Home Depot**

---

**EVSEs Have gone Mainstream**
Infrastructure

Estimated Number Of Public Charging Stations:
Level 2  1000
DC Fast Charge  30
DC Fast Charging

Ecotality Blink: $45,000

Aerovironment: $35,000 - $40,000

Nissan Standard DCQC: $12,990
Gas Station Of The Future
Appendix
**LITHIUM-ION BATTERY**  
**SMYRNA, TENNESSEE**

<table>
<thead>
<tr>
<th>Type:</th>
<th>Laminated lithium-ion battery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total capacity (kWh):</td>
<td>24</td>
</tr>
<tr>
<td>Power output (kW):</td>
<td>Over 90</td>
</tr>
<tr>
<td>Number of modules:</td>
<td>48</td>
</tr>
</tbody>
</table>
| Battery pack contents:        | - Positive electrodes  
                               | - Lithium manganate        
                               | - Negative electrodes  
                               | - Carbon                    
                               | - Cells                     
                               | - Modules                   
                               | - Assembly parts             |
| Charging times:               | - Quick charger DC50kW  
                               | (0 to 80%): apx. 30 min    
                               | - Home-use AC240V charging dock  
                               | (0-100%): less than 8 hrs  |
| Battery layout:               | Under seat & floor           |
| Battery life:                 | After 10 years, the battery is expected to 70-80 percent of its original storage capacity. |
## DC Quick Charge Installation

- DC Quick Charge
- Installation costs can vary greatly depending on:
  - May require separate electrical service
  - May require transformer upgrades or additional work

### Typical Installation Costs:

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permit</td>
<td>$1,000</td>
</tr>
<tr>
<td>Breaker / Panel Upgrades</td>
<td>$2,000</td>
</tr>
<tr>
<td>Installation &amp; Materials</td>
<td>$10,000 - $30,000</td>
</tr>
<tr>
<td>Commercial Grade EVSE</td>
<td>$10k-$12k</td>
</tr>
<tr>
<td>TOTAL</td>
<td>$23k - $45k</td>
</tr>
</tbody>
</table>
## Sample Of Large Infrastructure Projects

<table>
<thead>
<tr>
<th>Program</th>
<th>Total Amount</th>
<th>Markets</th>
<th>Level 2 Public</th>
<th>DC Fast</th>
</tr>
</thead>
<tbody>
<tr>
<td>EV Project (Ecotality) [DOE]</td>
<td>$230.0M</td>
<td>AZ, CA, OR, TN, TX, WA</td>
<td>5,600</td>
<td>200</td>
</tr>
<tr>
<td>ChargePoint America (Coulomb) [DOE]</td>
<td>$37.0M</td>
<td>CA, DC, FL, TX, MI, NY, WA</td>
<td>2,600</td>
<td>0</td>
</tr>
<tr>
<td>Bay Area AQMD</td>
<td>$5M</td>
<td>CA</td>
<td>0</td>
<td>30</td>
</tr>
<tr>
<td>California AB 118 [CEC]</td>
<td>$3.6M</td>
<td>CA</td>
<td>635</td>
<td>0</td>
</tr>
<tr>
<td>Hawaii (State Grant)</td>
<td>$3.0M</td>
<td>HI</td>
<td>450</td>
<td>0</td>
</tr>
<tr>
<td>City of Chicago</td>
<td>$1.9M</td>
<td>IL</td>
<td>207</td>
<td>73</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>+$280 M</strong></td>
<td><strong>26 States</strong></td>
<td><strong>12K+</strong></td>
<td><strong>500+</strong></td>
</tr>
</tbody>
</table>
## Charging Levels

<table>
<thead>
<tr>
<th>Type</th>
<th>Power Supply</th>
<th>Charger Power</th>
<th>Charging Level</th>
<th>Charger Location</th>
<th>Charging Time (24kwh Battery)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>120VAC Single Phase</td>
<td>12A 1.4kW</td>
<td>Level 1</td>
<td>On-board</td>
<td>18h</td>
</tr>
<tr>
<td></td>
<td>240VAC Single Phase</td>
<td>15A 3.3kW</td>
<td>Level 2</td>
<td></td>
<td>8h</td>
</tr>
<tr>
<td></td>
<td></td>
<td>30A 6.6kW</td>
<td></td>
<td></td>
<td>4h</td>
</tr>
<tr>
<td>Fast</td>
<td>480VDC 3-phase</td>
<td>50kW</td>
<td>Level 3</td>
<td>Off-board</td>
<td>30min</td>
</tr>
</tbody>
</table>
Goal
- Simple, one-stop shop for the consumer to have charging equipment installed at home

AeroVironment selected as Nissan’s preferred vendor for residential charging equipment
- Includes all US markets

AeroVironment provides
- The charging dock
- Manages permitting + installations
- Trains contractor network