

PA PUC Alternative Fuel Vehicles Forum



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Zero Emission

The World's Highest Volume EV

- Global sales : over 28,000
- Over 36 million miles driven globally



12,000 units



3,000 units



13,000 units

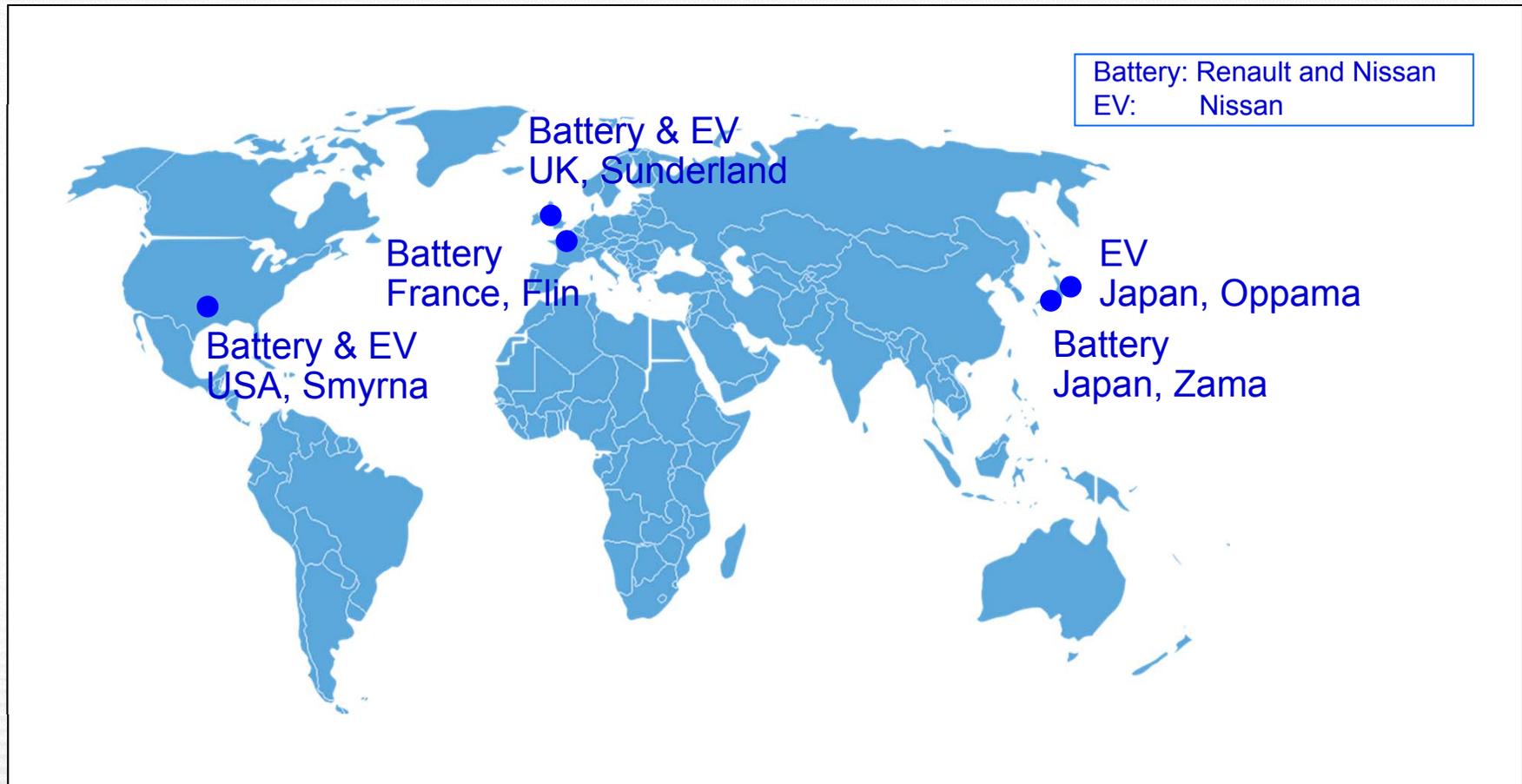


-- Winning more than 30 awards --



Global Investment (EV and Battery)

- Expand EV and Battery manufacturing globally



Getting to Mass Market Volumes



Localize production at facilities to serve key global markets

- Smyrna, TN: production begins in 2012
- 200,000 battery capacity
- 150,000 vehicle capacity



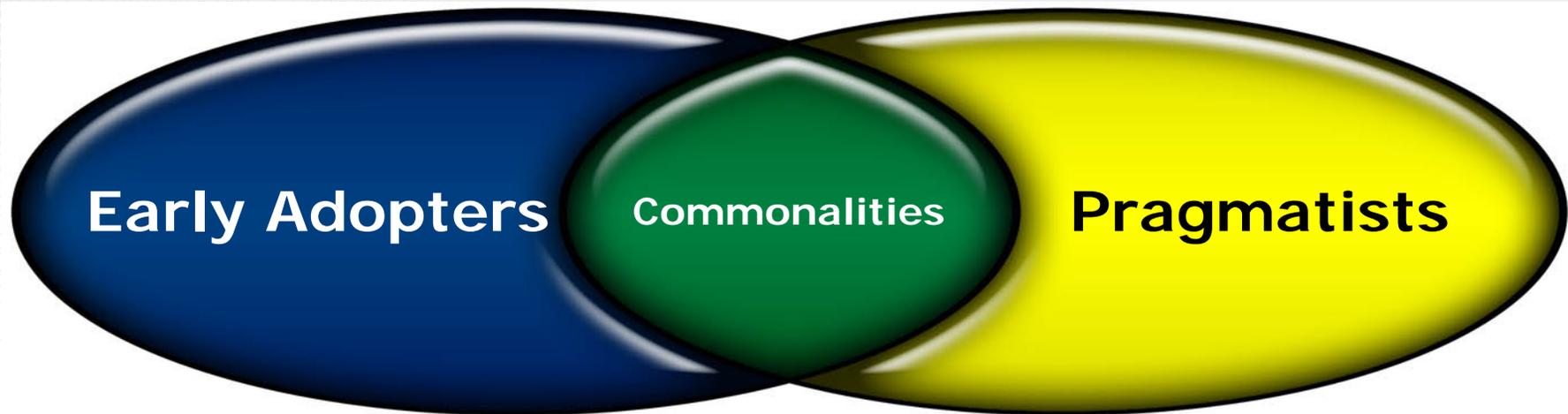
Nissan LEAF – Product Highlights

- Zero-emission
- 100-mile battery
- 5-door mid size hatchback



Size	5-door mid size hatchback
Capacity	5 Adults
Range	100 miles (US LA4)
Top Speed	90 mph
Battery	Laminated Li-ion
Capacity/Power	24 kWh/over 90kW
Motor	High-response synchronous AC Motor (80kW/280Nm)
IT System	Integrated communication system

Pragmatists think differently from Early Adopters



- *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)*

“... I MAKE CHOICES THAT HELP THE WORLD ...”

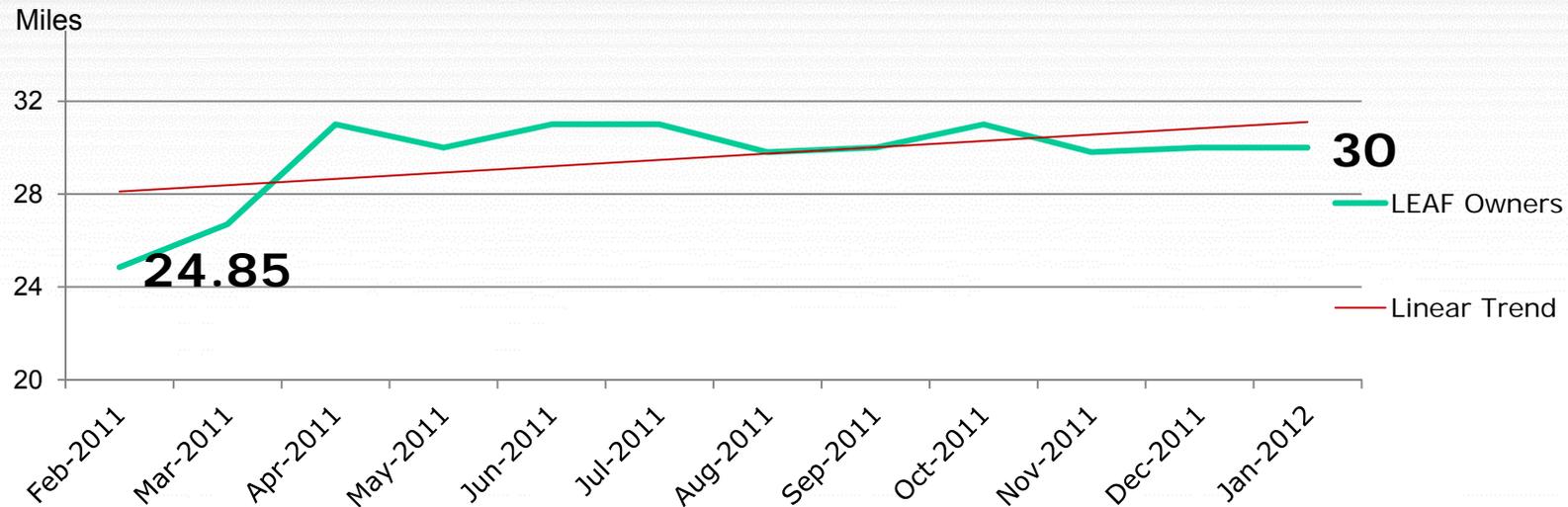


“... PARTICIPATE – AS LONG AS IT'S EASY, AFFORDABLE, AND CONVENIENT ...”



LEAF Owners Driving Distance

LEAF Owners: Avg Daily Driving Distance



Travel Profile of the United States

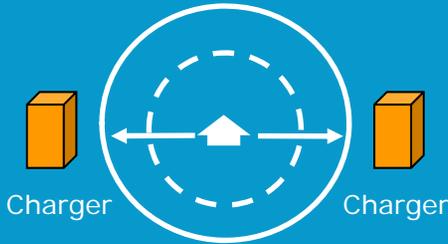
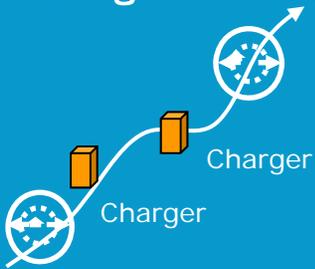
Based on the latest data gathered from the Federal Highway Administration's (FHWA) 2009 National Household Travel Survey (NHTS).

Daily Travel Per Person			
	1995	2001	2009
Person Trips	4.3	3.74	3.79
Person Miles	38.67	36.89	36.12
Vehicle Trips	3.57	3.35	3.02
Vehicle Miles	32.14	32.73	28.97

Nationally, daily driving distance is decreasing over time.

Oceanus Automotive © 2012.

Charging Network

	Home Charging	Charging Network	
		Destination Charging	Pathway Charging
EV Usage	Short Distance 	Mid Distance 	Long Distance 
Charger Type	Normal	Normal or Quick (depends on stay time)	Quick
Charging Site	Home Office	Super Market, Mall Restaurant or Parking Lot	Major Road Highway Service Area

EV Market Readiness

- **Incentives for consumers**

- Financial (tax credit, free permitting, free charging, subsidized charger installation)
- Non-financial (HOV lane access, preferential parking, etc.)
- Time of use rates from utilities
- Address issue of demand charges

- **Streamlined EVSE permit process**

- Fast, easy permit application process (online permitting)
- Expedient installation approvals or installer self certification

- **Charging Infrastructure**

- Home
- Workplace
- Public

- **Education and Public Outreach**

- Educate the public on environmental, social, and financial benefits of electric drive vehicles

Nissan

Roadblock: Installation Cost

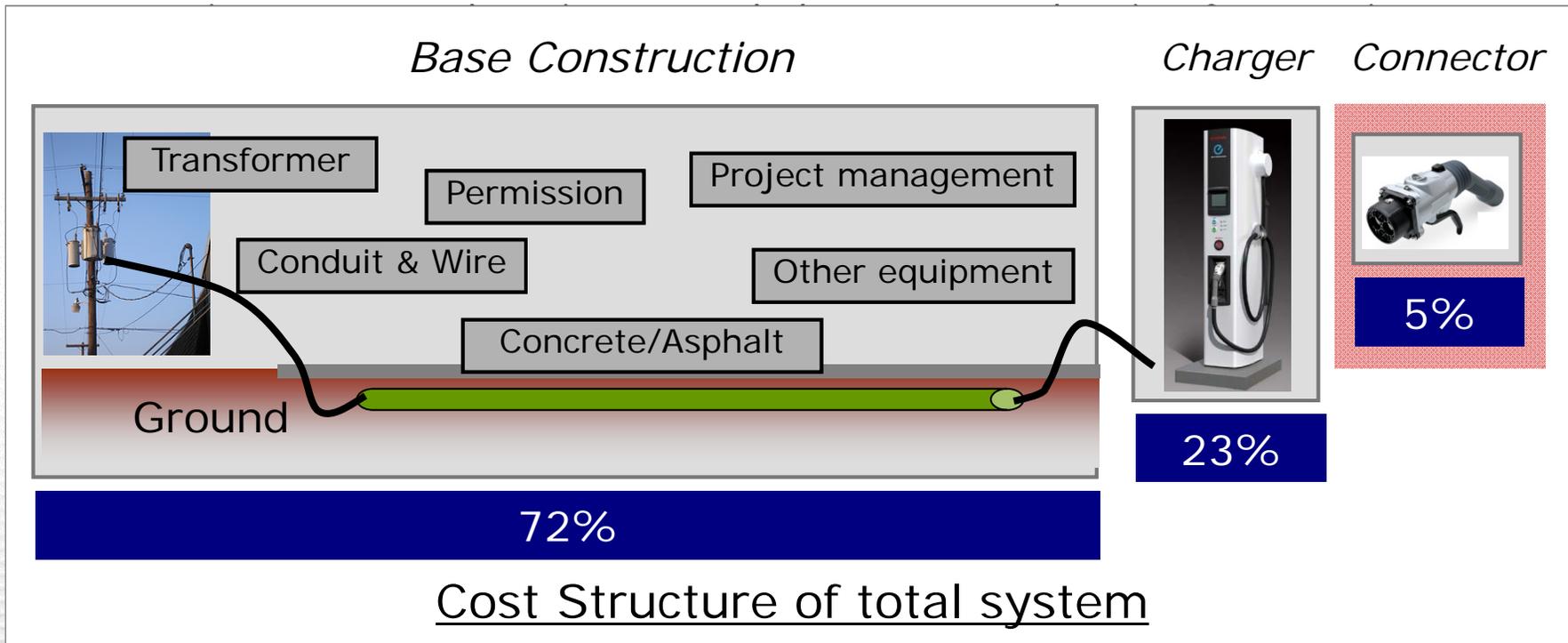
- High installation cost in the US.
- There seems some space for reducing cost.

Transformer related;

- High utility interconnect fees
- Requirements on cost for an additional transformer for QC

Permission related;

- Installation costs increase for equipment weighing more than 400 lbs



Roadblock: Operation Cost (Demand Charge)

- High electricity rates cause hesitation for installing quick charging stations.

Rough estimation of monthly electricity rate for one station

Utility	Summer On-Peak Rates
PG & E (San Francisco Area)	\$570 /Month + \$0.13 /kWh
SDG & E (San Diego Area)	\$1,401 /Month + \$0.09 /kWh

* Demand charge calculated based on 50kW QC.

Appendix

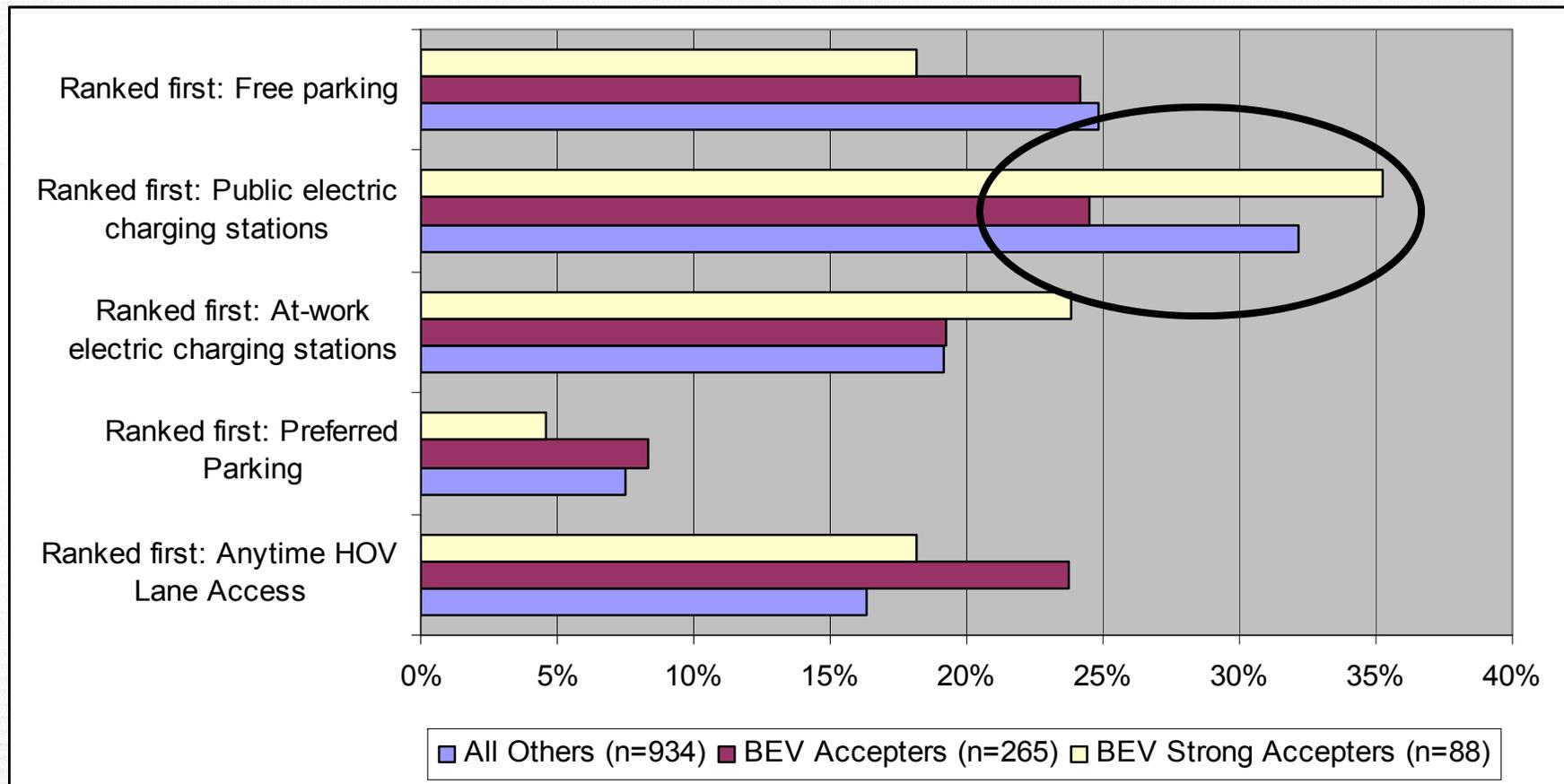
EVs & FCEV Introduction

- Introduce 4 EVs including Nissan LEAF
- Prepare introduction of mass-production FCEV



EV drivers prefer public electric charging stations to alternatives.

Free parking also high on the list.



Roadblock: Operation Cost

- Power required for EV charge have only a limited impact to the grid, even if all available QC stations used at the same time.

Utility	Number of QC Stations	Peak power impact		
		Max EV load** (MW) ①	Average output capacity (MW) ②	Impact ①/②
PG & E (San Francisco Area)	80	4	10,800	0.04 %
SDG & E (San Diego Area)	30	1.5	1,900	0.08 %

** In case all QC stations(50kw) operated at the same timing

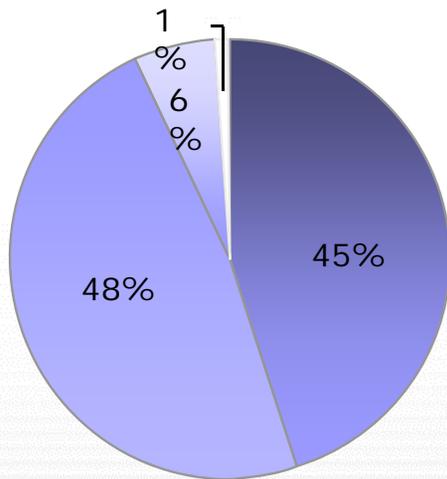
Nissan LEAF Satisfaction

- Overall satisfaction: 99% of owners are satisfied
- Autonomy range: 85% of owners responded positively



Overall

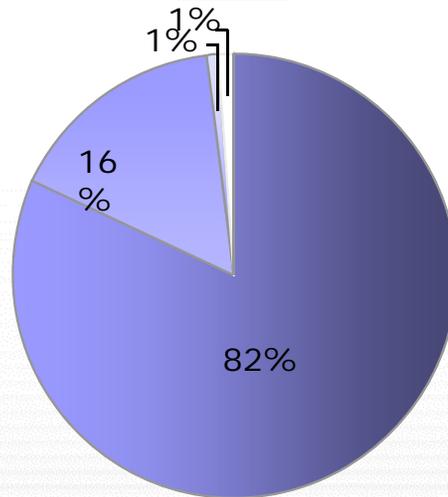
Satisfaction:
99%



- Completely Satisfied
- Very Satisfied
- Satisfied
- Not Very Satisfied
- Not at all Satisfied

Power & Performance

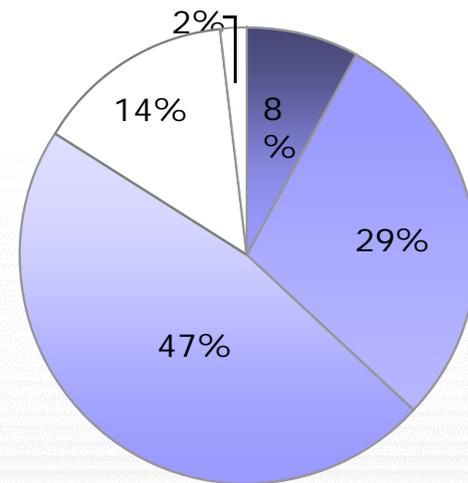
Satisfaction:
98%



- very Satisfied
- somewhat Satisfied
- neither satisfied nor Dissatisfied
- somewhat Dissatisfied
- very Dissatisfied

Autonomy Range

Satisfaction:
86%



- completely satisfied
- very satisfied
- somewhat satisfied
- Not very satisfied
- Not at all satisfied

Nissan LEAF Early Customer Survey

LEAF Customers: Potential Needs

- QC optional coupler: more than 80% of customers chose



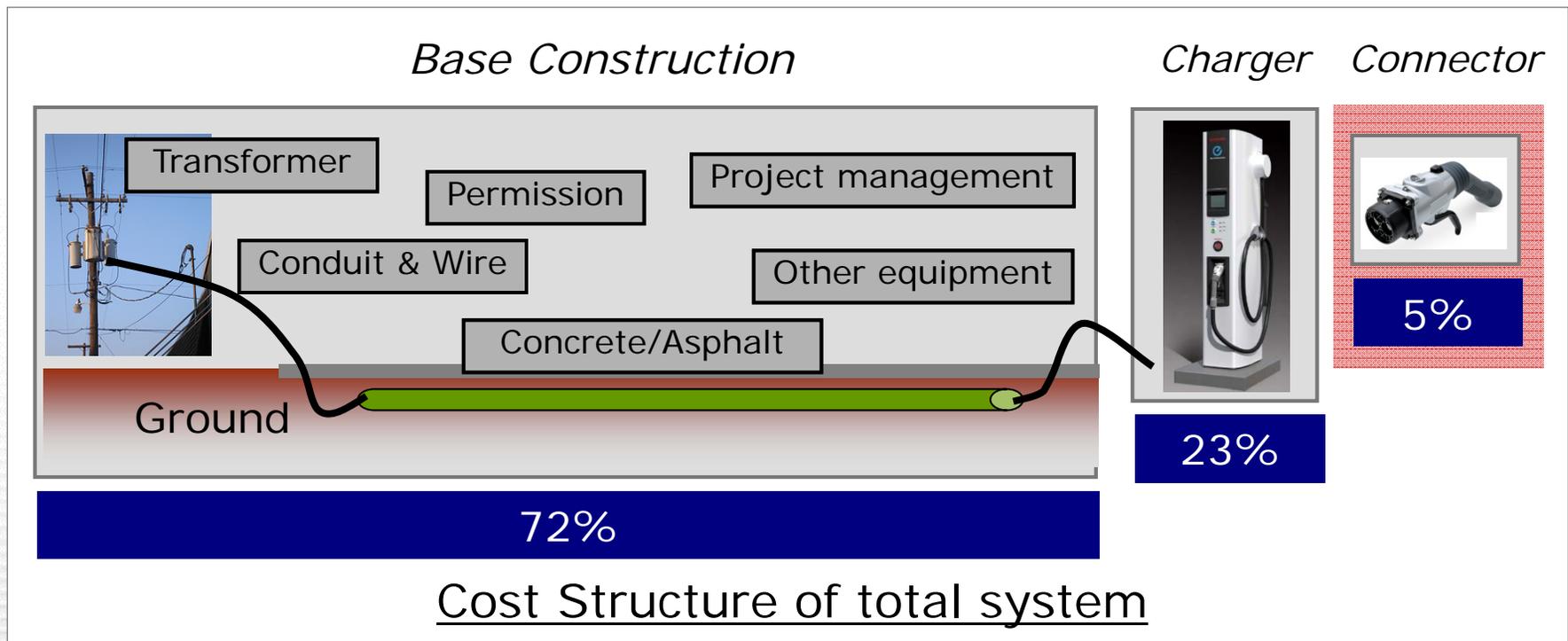
DC Quick Charger
at Public site



AC Normal Charger
at Home

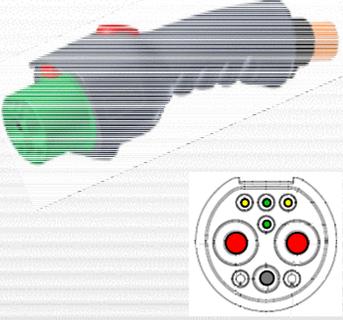
Priorities: towards EV expansion

- Deploy the infrastructure as quick as possible, and should not wait until the next technologies come.
- Make good use of on-going & past infrastructure investments.
- The priority is, instead of just focusing on connector type, to secure as much commonization as possible in major portion of the system.



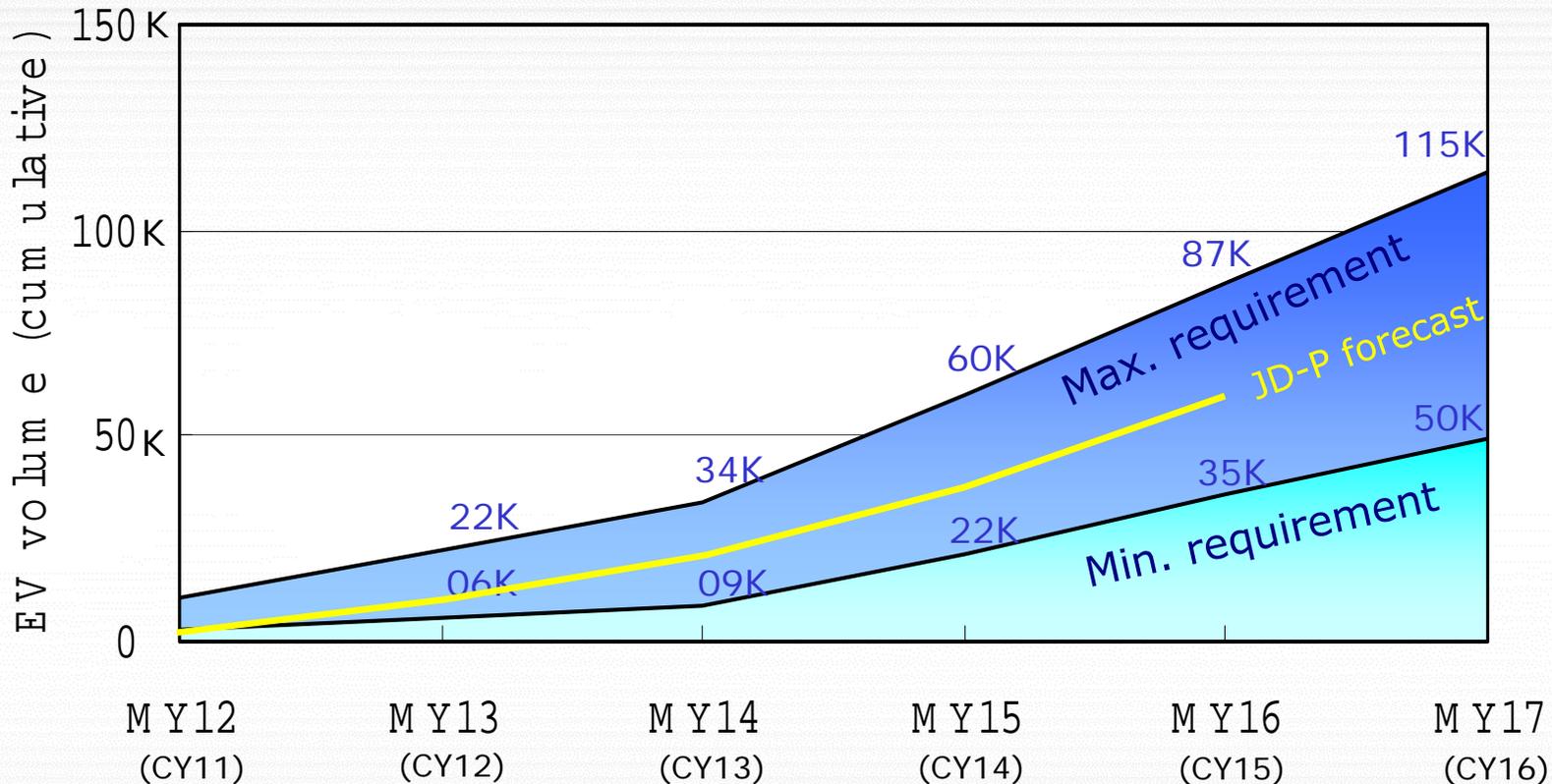
Status of Standardization for Quick Charger

- Several proposals exist at international level (IEC). China has issued its national standards. US and European standards are supposed to be finalized in a year or two.
- Nissan, applying CHAdeMO type, does not believe it is the only and best, but it is the only available technology at this time.
- Nissan predicts, from market experience, that it takes some time for the other technologies become ready, regardless of the status of the standardization.

	Japan	US	Europe	China
Connector Type for DC QC	 CHAdeMO	 Combo		

CA Market Expansion and ZEV Mandate

■ EV cumulative volume in CA by major manufactures



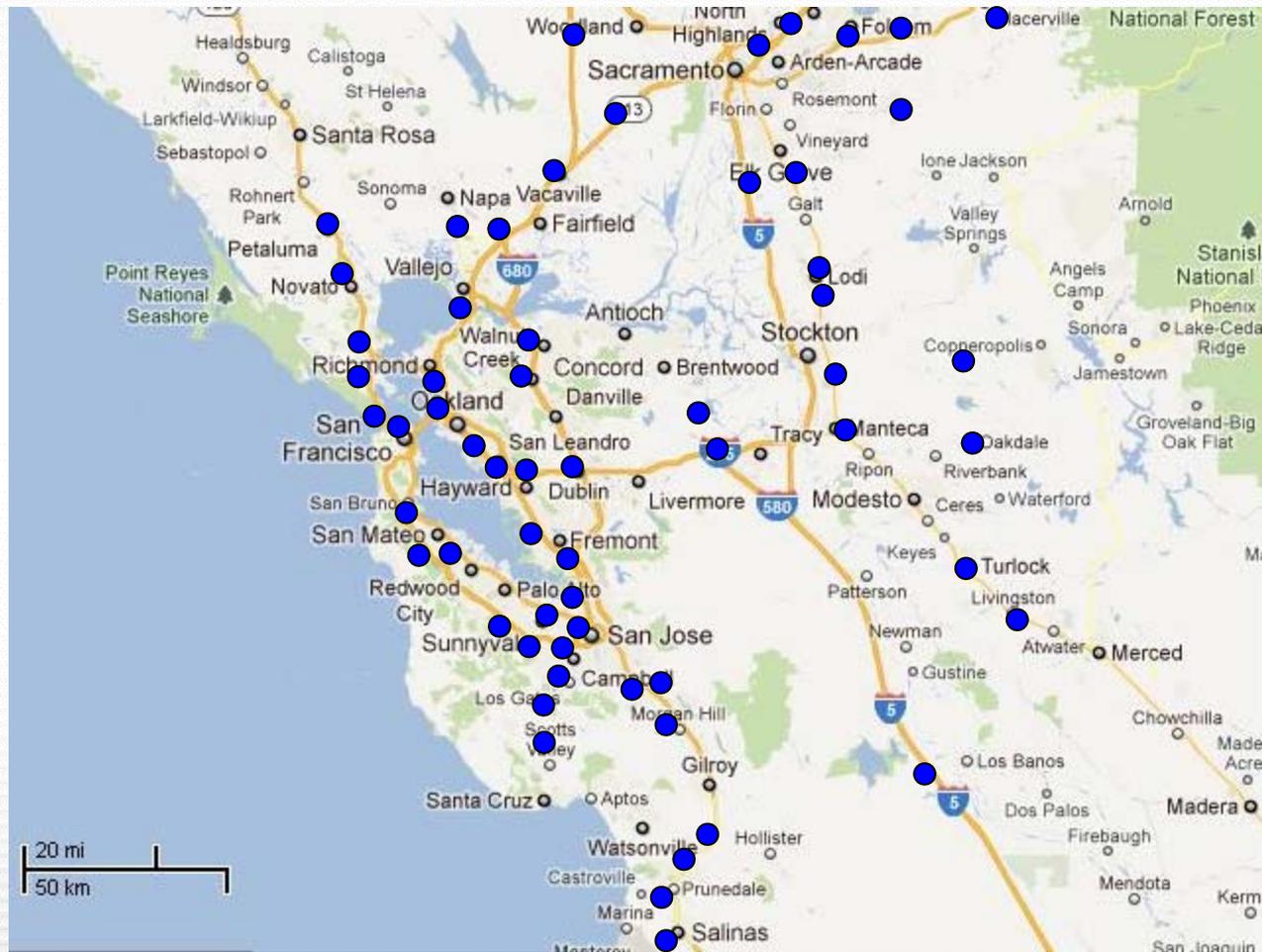
(NOTE) Governor's Executive Order

by 2020: The State's zero-emission vehicle infrastructure will be able to support up to **one million vehicles**

by 2025: **Over 1.5 million zero-emission vehicles** will be on California roads and their market share will be expanding

Study with UC-Davis: QC Locations (1)

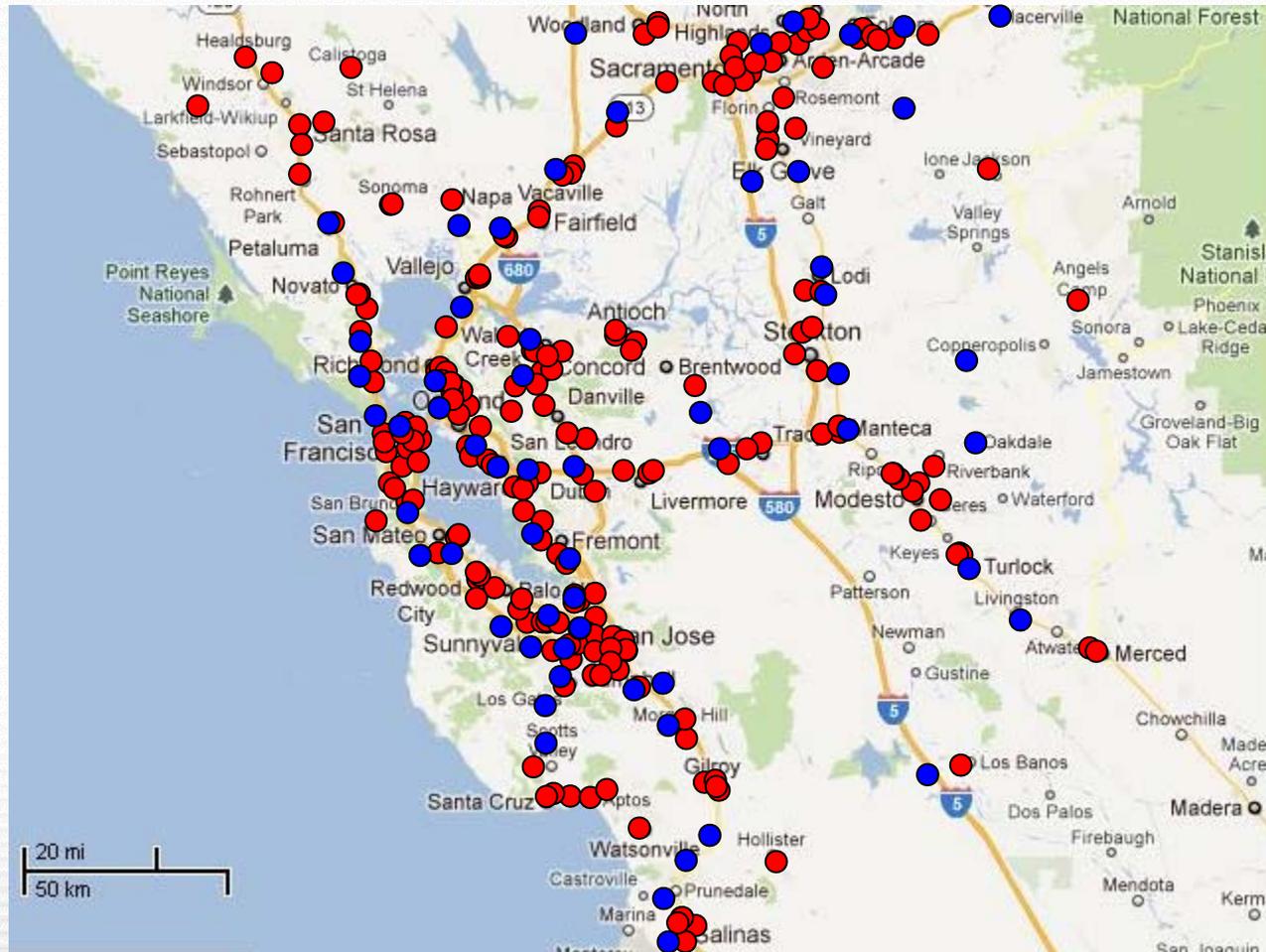
- This shows where the QCs would be necessary while driving



● QC Demand Locations

Study with UC-Davis: QC Locations (2)

- Major retail stores like Safeway, Target, and Costco are located on or adjacent to the QC demand locations.

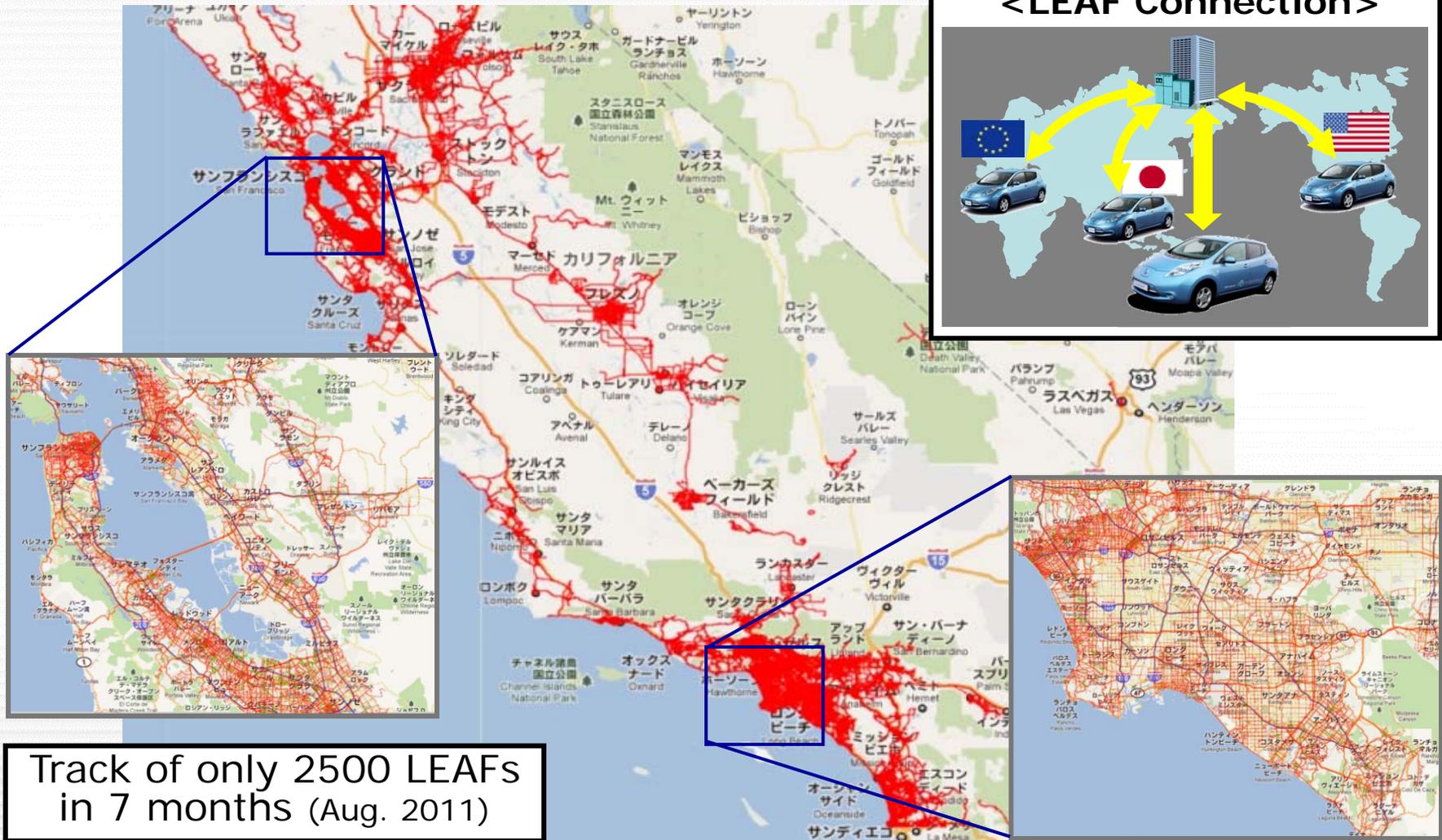
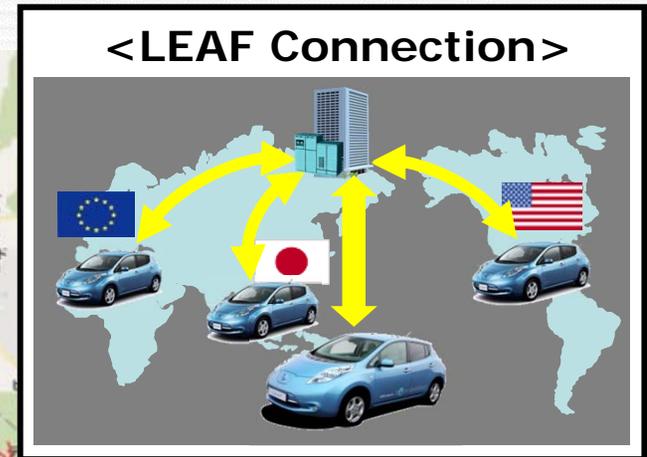


● QC Demand Locations

● Retail Stores in California (Safeway, Target, Costco)

The Connected Vehicle

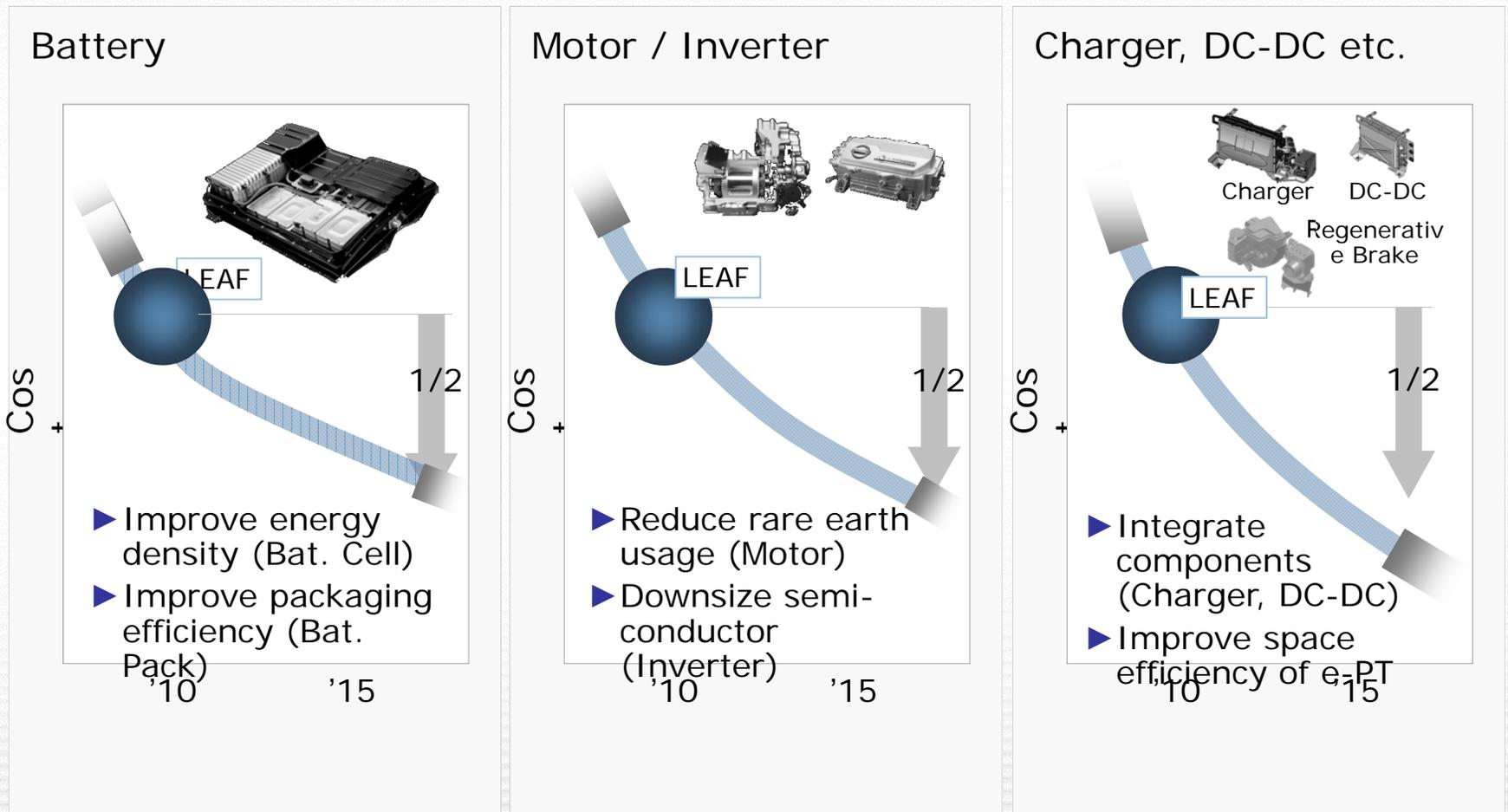
- 24-hour connection, extensive trace data (customer opt-in)



Track of only 2500 LEAFs in 7 months (Aug. 2011)

Cost Reduction

- Drastic cost reduction to expand application



Vehicle Technologies for Range Extension

- Continuous efforts for range extension

