What will accelerate the EV diffusion?

Masato INOUE
Nissan Global Design Center

MASATO INOUE

1955 Born in Yokohama Japan
1979 Graduated Industrial Design dept. of Chiba university
1979 Joined to NISSAN Motors ,Ltd Design center
Interior designer in luxury car studio
1983-84 Art Center College of Design (Nissan sponsored study)
1984 Exterior designer
1989 Senior Creative designer
1991 Creative Chief designer/manager

2001 Chief designer in charge of Explor

2007 Product Chief designer in charge o

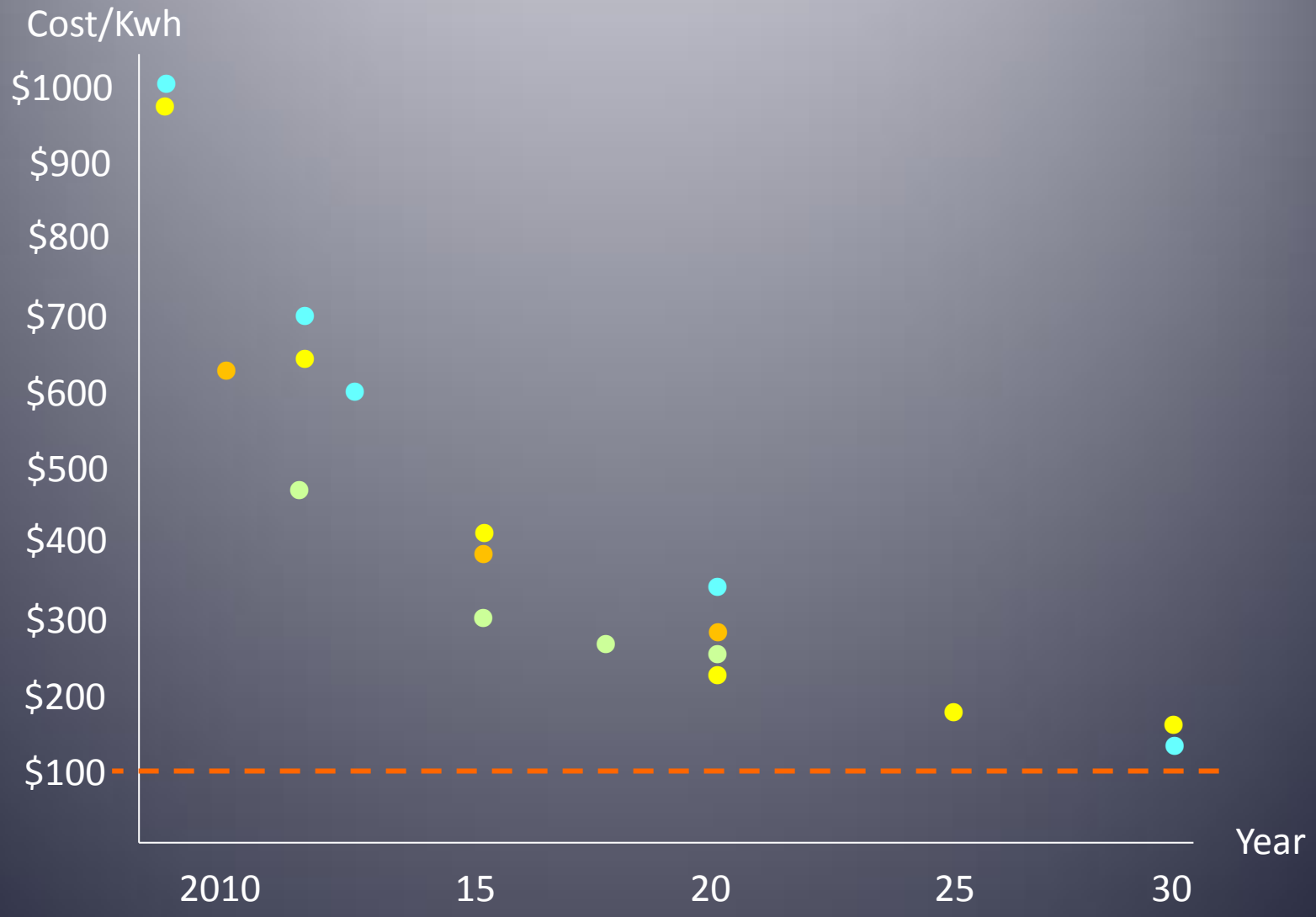
2011-Present Owner of Nissan LEAF / So far 2.5year/70000Km of experience in real life.
2012-Present Senior stuff manager in charge of EV advanced design/Designer education

Economists forecasted that ,,,

If 1Kwh of battery cost goes to less than 100 dollar, disruption between EV and ICE vehicle is “game over”. That’s right.

But when?

EV Battery Cost Forecast ($/Kwh)



Data is extracted from various forecast to see tendency.

By the way ,,,Evolution of Electric guitar

Acoustic guitar

Bigger sound yet Howling/Distorted

Innovation
≠Substitution
＝Charming

(～1930s)

(1936)

(1951)

Real substitution
With Natural & Bigger Sound (1969)

Big diffusion(‘60-’80)

What will Accelerate EV diffusion?

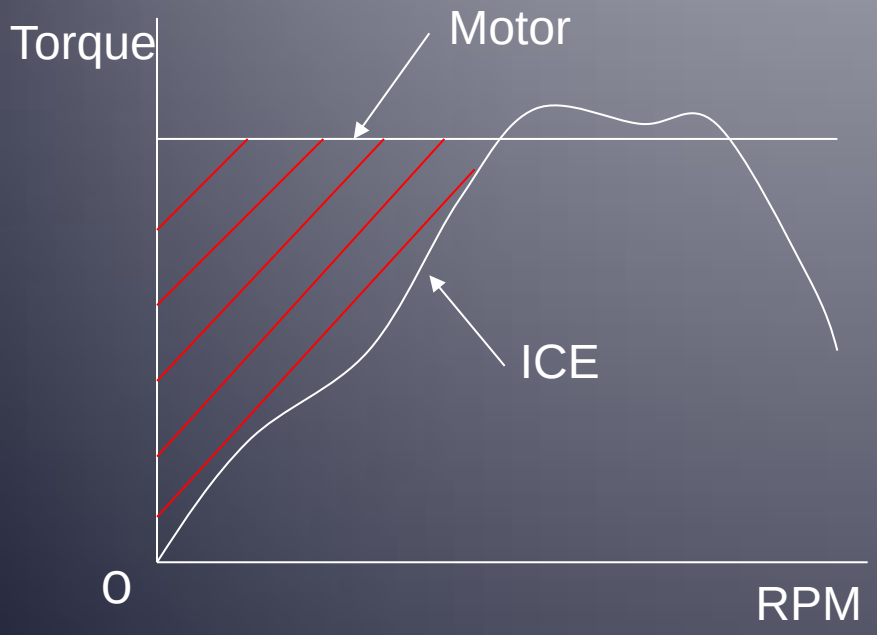
What will accelerate EV diffusion?

1) To brake your fixed idea that EV can't run long way.


■私の通勤経路
My daily commute
Nissan Design Center
Atsugi-city
NDC
50km
30km
Odawara-Atsugi Free way
Odawara
宮ノ下
Hakone house
芦ノ湖
Home
Hakone
20km
Mountain road
© 2009 ZENRIN
Data © 2009 MIRC/JHA
Image © 2009 TerraMetrics
Image © 2009 DigitalGlobe
ストリーミング 100%
©2007 Google
ポインタ 35° 19'21.69" N 139° 12'32.89" E 高度 65 m
上空 48.71 km

EV's basic advantage in daily driving

- **Acceleration ---No stress**
- **Quietness with no Vibration --Less Fatigue**

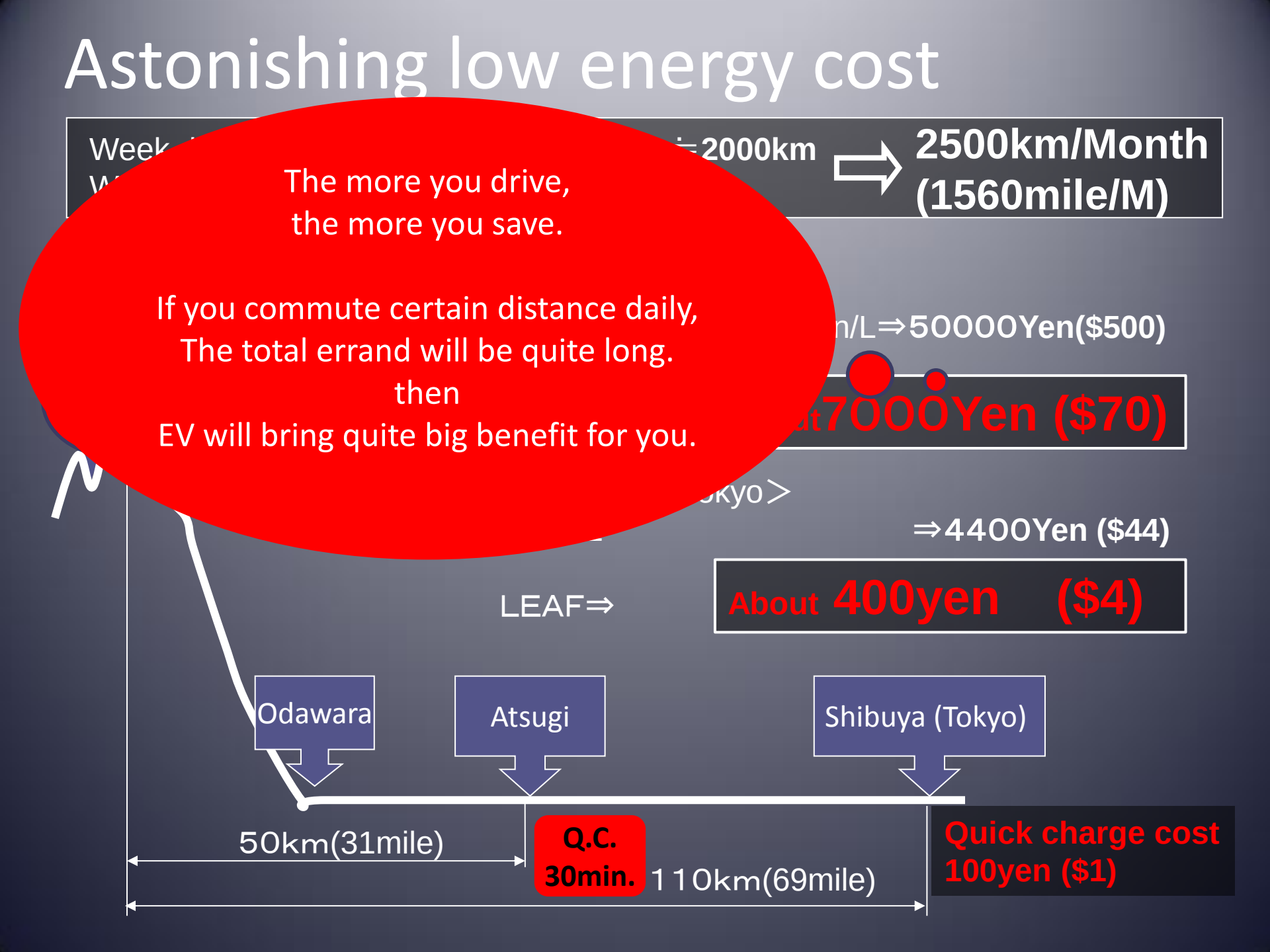


Torque carve difference

You can here sound of Bell Crickets in autumn, while driving, even window is closed.


Compact Hood
Distinctive look
Low wind noise
NISSAN
EV's compact hood ⇒ EV specific wind noise solution
Also good for Aerodynamics

Astonishing low energy cost



Like my case, if EV is used properly for longer daily commute, it makes big benefit.

2)EV LIFE CIRCLE & Ellipse

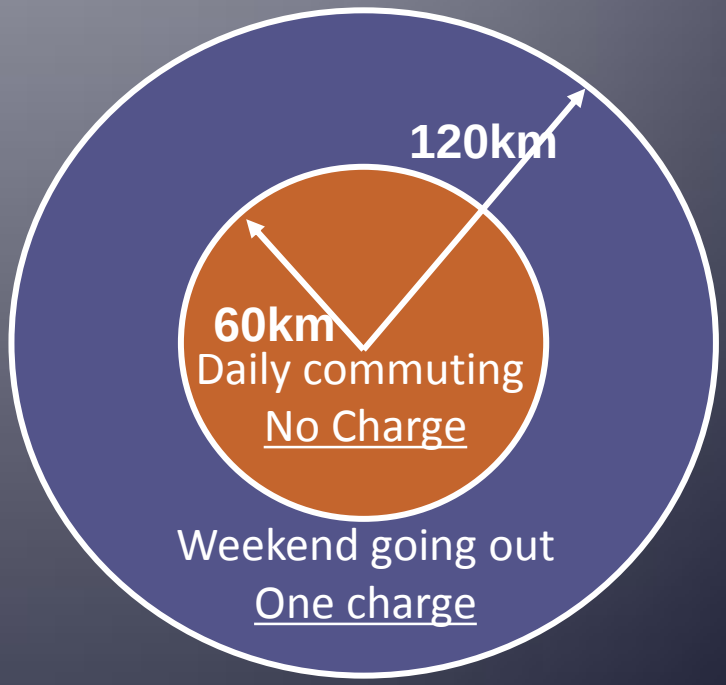
If we think about common life patterns are daily commute on weekday, and going somewhere for leisure so on, on weekend, EV LIFE CIRCLE can be define like below.

- Real Life Range-20Km(Margin) / 2= Daily commuting (No need of charge)
- Real Life Range-20Km(Margin) = Weekend going out (w/Healthy QC circumstance)

Common Life Pattern

+

LEAF's REAL LIFE RANGE of 140Km



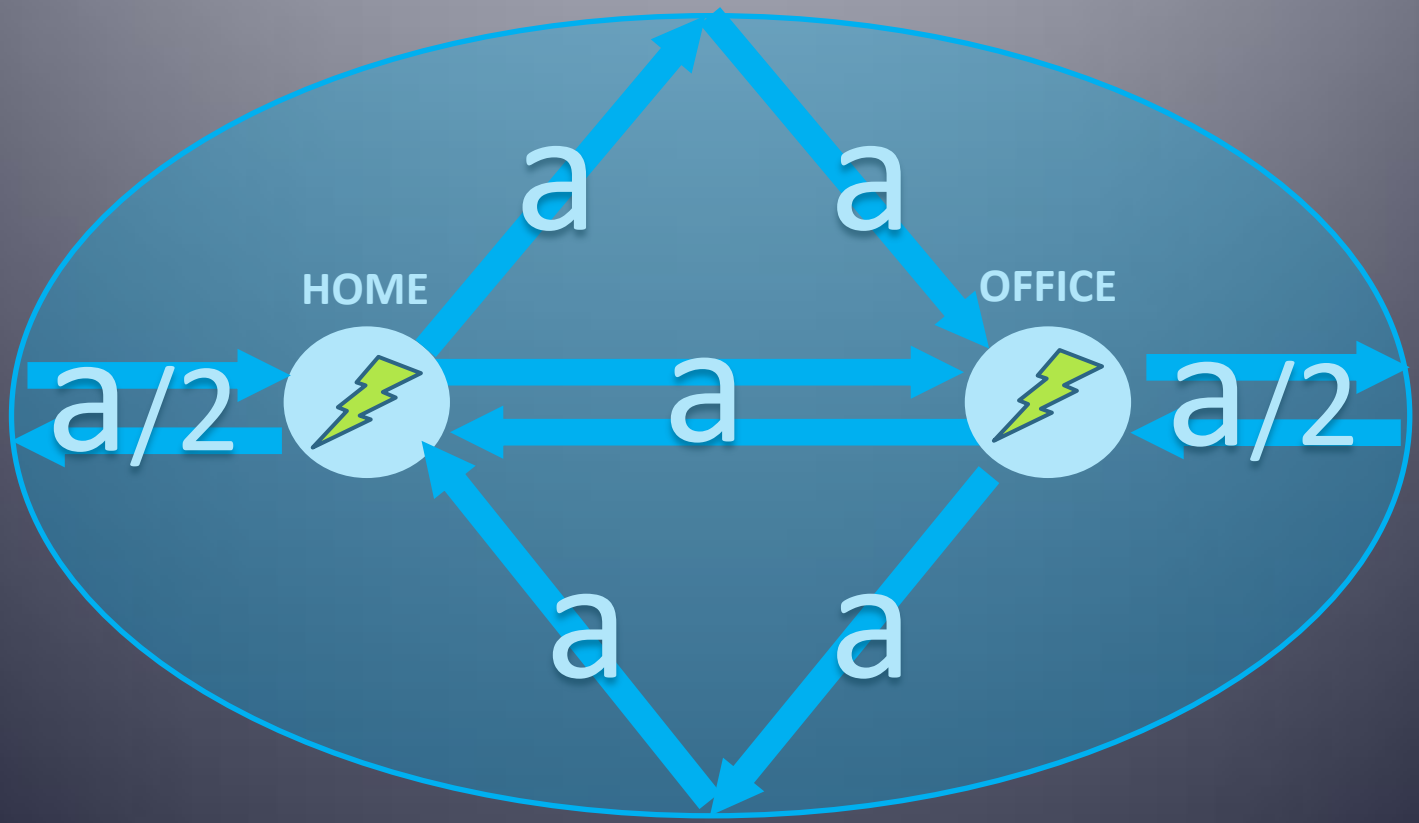

EV LIFE CIRCLE (Center= My home in Japan)
Tokyo area
120Km
Office
60Km
Home

EV LIFE ELLIPSE

The benefit of Normal Charger (Type2 -240V) at your office parking lot.

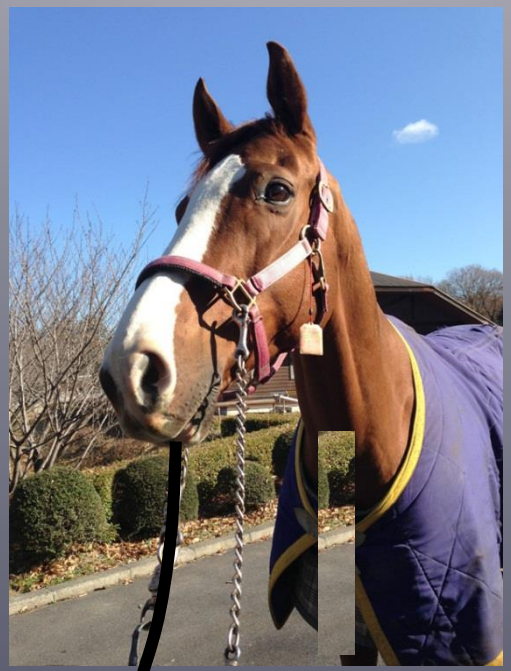
Extension of drivable area

2a=Range



EV LIFE ELLIPSE

The benefit of Normal Charger (Type2 -240V) at your office parking lot.



Since average office hours are 8 to 9 hours, normal charger works better than quick charger in several points.

*Easy –Only daily custom action
*Worry free for next person.
*100% top up charging
*Tender to battery
*Cheaper equipment cost (Compering to QC)
*Extension of drivable area

To plug always when parking like a horse!

3) Economy index of EV LIFE CIRCLE (US)

ELC=60/120km
Annual Errand=30000Km (18750mile)
Annual Electricity cost=$514
Price after incentive=$21300
<Same type ICE car>
Annual Fuel Cost= $3217
(19mpg as average,$3.26/gallon)
Price of the car ≒$15000

10years total cost of car and energy

LEAF: $26440
ICE : $47170

⇨ saved $20730

Economy index of EV LIFE CIRCLE---by 10 years

Car /Bat. size

EV: 7km/kwh 12cents/Kwh (Assumed all same efficiency as LEAF)
ICE: 19MPG $3.26/gallon

6.1 Kwh

R.Range60km

10000Km/Year Electricity:$171 /y EV Price: $10000
Gas: $1072/y ICE car Price: $10000

14 Kwh

R.Range100km

20000Km/Year Electricity:$342/y EV Price: $15000
Gas: $1802/y ICE car Price: $12000

24 Kwh

R. Range140km

30000Km/Year Electricity:$514 /y EV Price: $21300
Gas: $ 3217/y ICE car Price: $15000

85 Kwh

R.Range426km

50000Km/Year Electricity:$855 /y EV Price: $70000
Gas: $5360/y ICE car Price: $50000 (BMW-5)

Economy index of EV LIFE CIRCLE---by 10 years

Car Size \ ELC	20/40Km	40/80km	60/120km	100/200km
	**+$9010**			
	+$6010	**+$15020**		
	+$2710	+$11720	**+$20370**	
	-$10990	-$1980	+$7030	**+$25050**

4) A new concept for Micro EV LIFE CIRCLE

LandGlider

2009 Tokyo Motor Show

Tandem 2 seater
With
LEAN experience

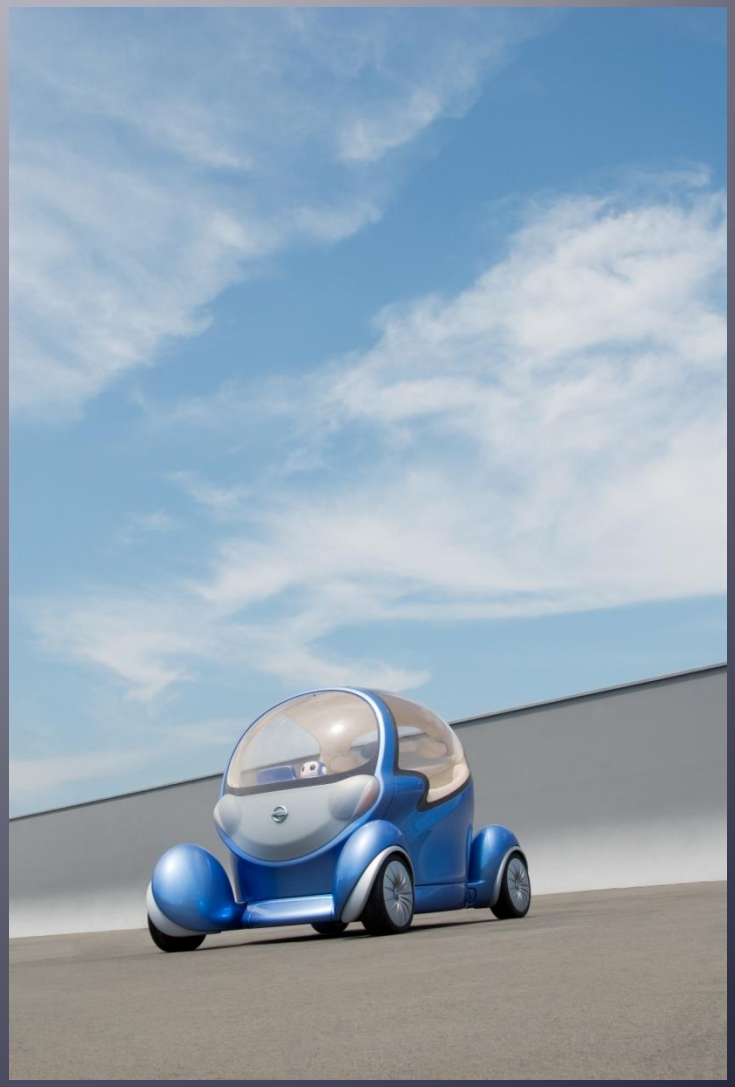
Width=1100mm

5) A new concept for Smaller EV LIFE CIRCLE

PIVO2

Exhibited at 2007 Tokyo motor show

< Robotics Interface>
From your car to your partner



Robotic Interface

There is a fact that happy driver's accident rate is very low , comparing to stressed one, found by
Prof. Clifford Nass of Stanford university.

Based on that, Robotic interface on PIVO2 was developed to make driver happy and positive always.

6)EV's advantage in Autonomous driving

EV's simplicity, just battery and motor, no need of transmission, makes EV very controllable comparing to ICE vehicle. This is EV's big advantage for Autonomous driving.

PIVO3

Exhibited at 2011 Tokyo Motor show

If you call,
Pivo3 will come.

If you call, Pivo3 will come. If you don’t call,Pivo3 charge electricity by itself.

How can technology makes city smarter?

Automated Valet Parking

Autonomous driving in private parking area

Cars On-demand

Stabilizing Electricity

Change! @ AVP

As huge size battery

At Parking lot

More freedom in private life

- **When you need a car, it is there for you anytime. When you don't need, it will fade away for charge.**

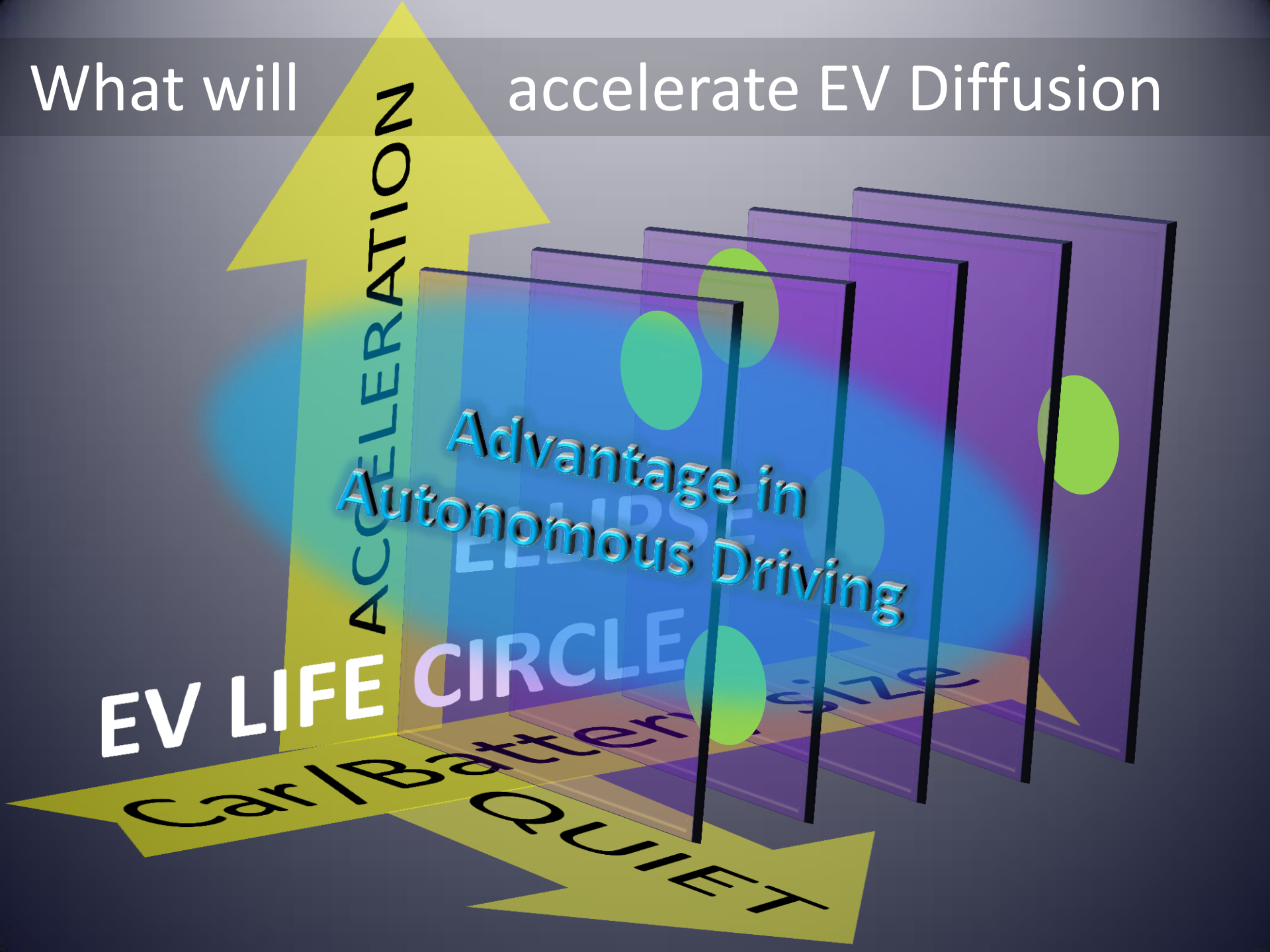
Contribution to society

- **When the car is at idle, it contribute to the society by stabilizing electricity.**

3.Summary-What will accelerate EV diffusion

- Acceleration and Quietness is EV's major strength.
- Plus low energy cost in daily commute is remarkable.
- EV LIFE CIRCLE is conception to balance common life pattern and range of the EV.
- EV LIFE ELLIPSE has big potential to expand drivable area, It's realized by ordinary NC(Type2) at daily destination.
- To balance the size of EV's body/battery and user's EV LIFE CIRCLE is essentially important for total economy.
- Together with main 3 strength and size factor which EV LIFE CIRCLE-ELLIPSE suggest, future EV design dimension will be determined.
- Such as Robotic Interface, EV's wide adoptability to Digital or Cloud world, cars become intimate and safer to person.
- Advantage in Autonomous driving as near future value.

What will accelerate EV Diffusion



End of Presentation
Thank you