

IEA Hydrogen Roadmap Work Shop

Progress on FCEV Development

Honda Alt. Fuel Vehicle History

HONDA

The Power of Dreams

1980s 1995 2000 2002 2004 2006 2008 2015

Fundamental
research

FCX- V1, V2 V3 V4

FCX

**FCX
CLARITY**

**Next
Gen.**

Hydrogen-powered FCEV
(Hydrogen absorbing alloys)

Hydrogen-powered FCEV (High-pressure
tank of hydrogen)

FCX Clarity

FCX-V0

FCEV

(Fuel Cell Electric Vehicle)



Methanol reforming
FCEV

Public road test

Lease sale

**Applied
Technologies**

Electric vehicle

FIT-EV

EV-Plus

CNG vehicle

Civic GX

Hybrid vehicle

INSIGHT

CIVIC Hybrid

INSIGHT / CR-Z Accord Hybrid

Motor

High-pressure
tank

Energy
management

The Ultimate Clean Vehicle

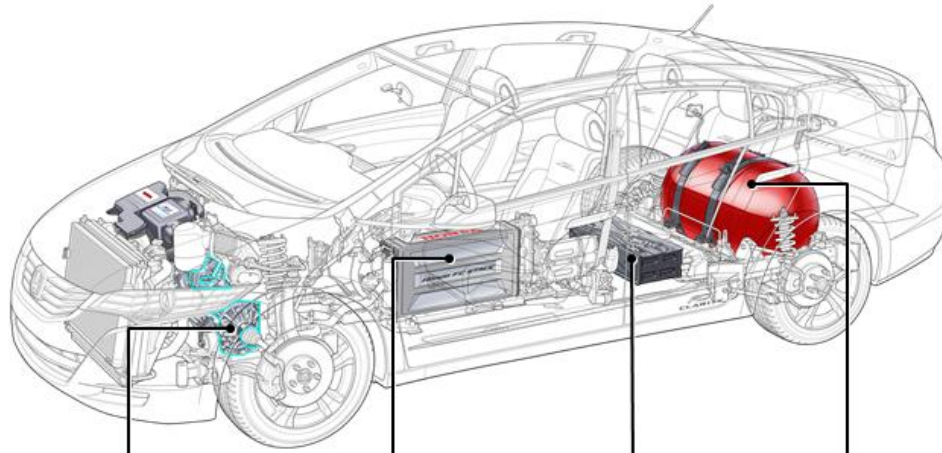
FCX
CLARITY



FCX Clarity outline

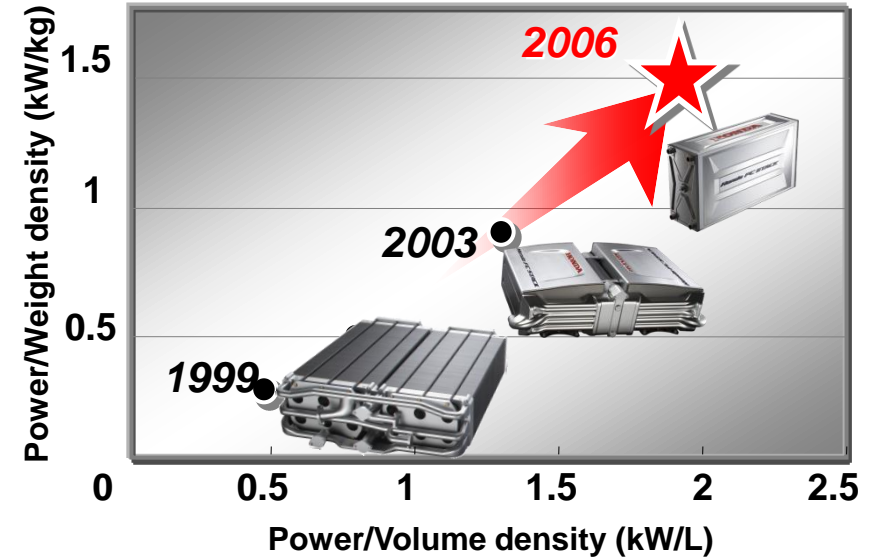
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**FCX
CLARITY**



Coaxial Electric Drive Motor and Gearbox V Flow Fuel Cell Stack (Center tunnel layout) Lithium-Ion Battery High-Pressure Hydrogen Tank

Honda FC Stack Evolution



■ Specification

Size	4,845x1,845x1,470 mm	Maximum motor output	100 kW (136ps)
Vehicle weight	1630 kg	Maximum motor torque	256 Nm (26.1kg·m)
Maximum speed	100 mph	Energy storage	Li-ion battery 288 (V)
Driving range	240 mile	Hydrogen tank capacity/pressure	171 L/ 35Mpa
Fuel-cell stack power	100 kW	Hydrogen charging time	3 - 4min

FCX Clarity in use

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USA deliveries: mainly individual customers (Southern California)



Japan deliveries: government agencies, corporations



FCEV CONCEPT

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2013 LA Auto Show

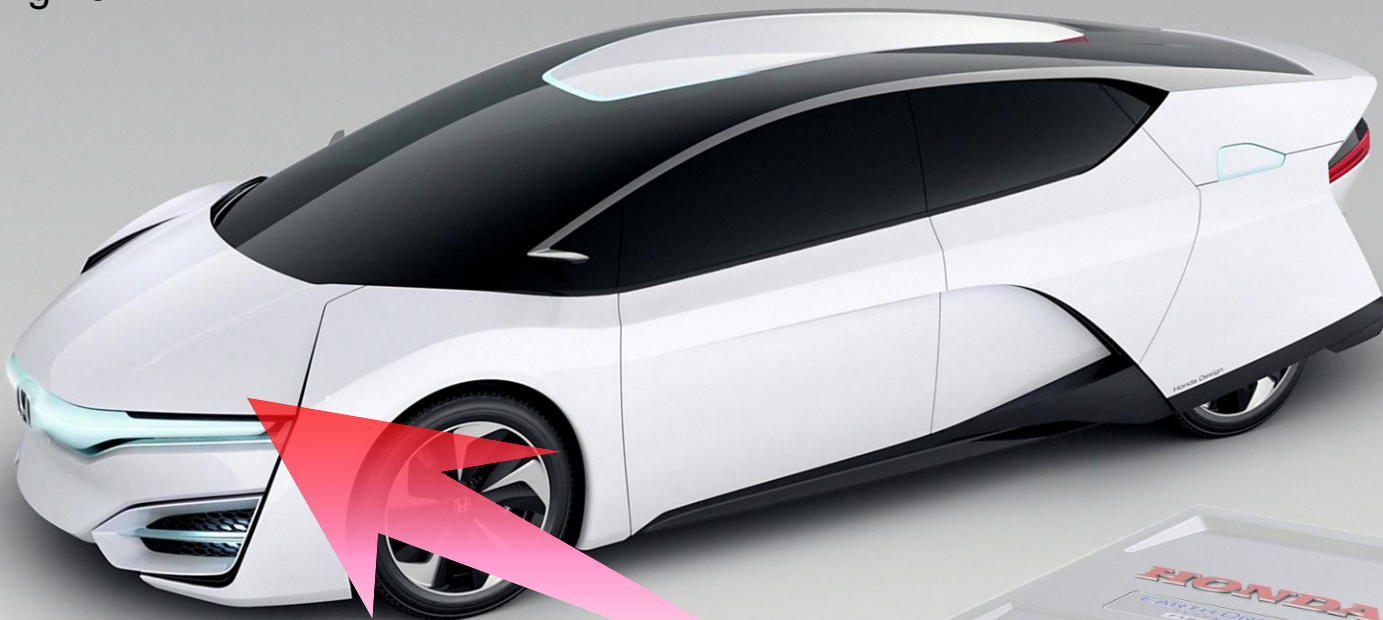


FCEV CONCEPT / New FC STACK

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FCEV CONCEPT

- Range : > 300miles
- H2 Tank Pressure : 70MPa
- Refuel Time : approx. 3minutes
- Seating : 5



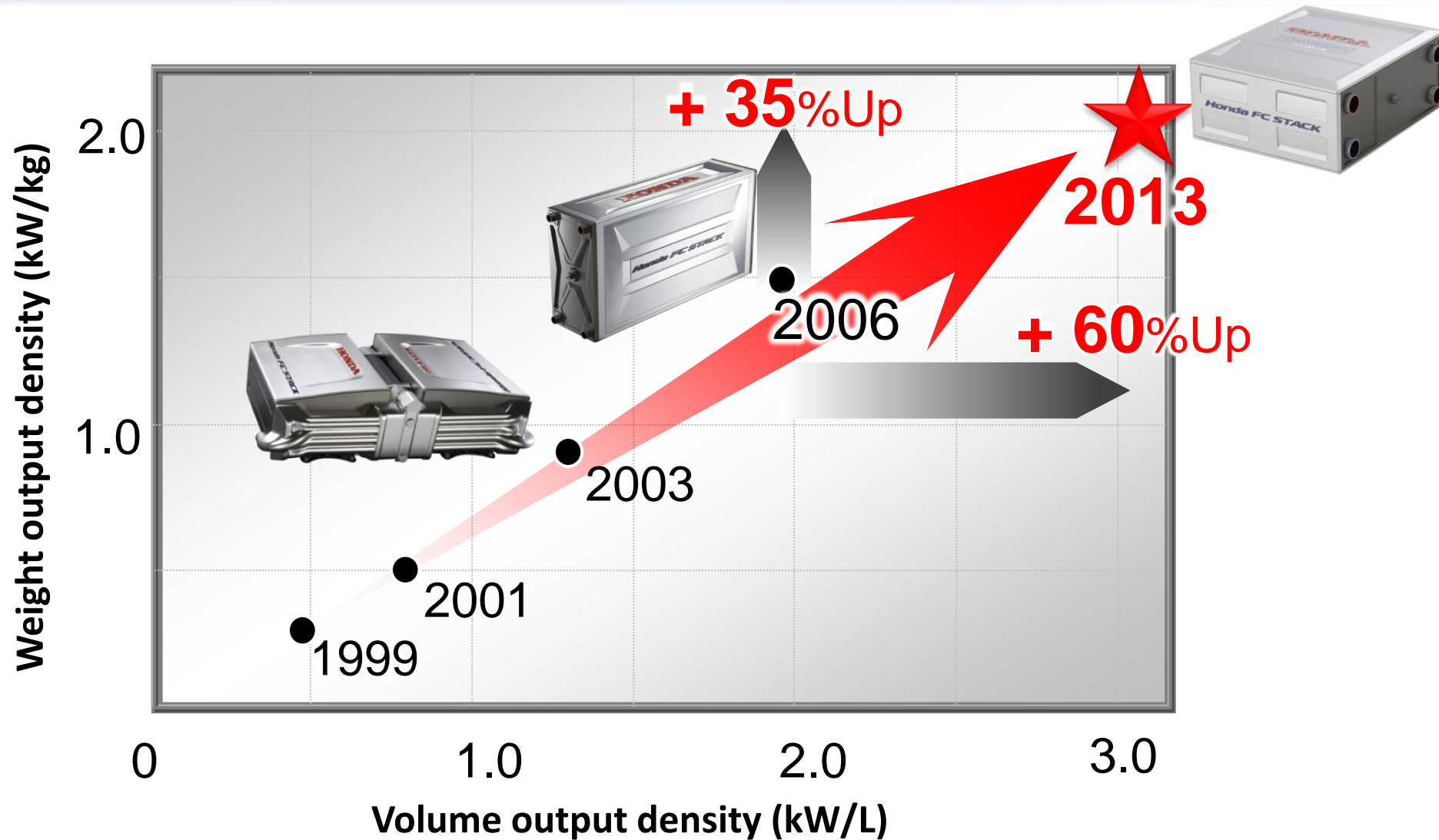
New Fuel Cell Stack

- Output : >100kW
- Power Density : > 3kW/L
- Location : in the engine room



FC Stack Downsizing

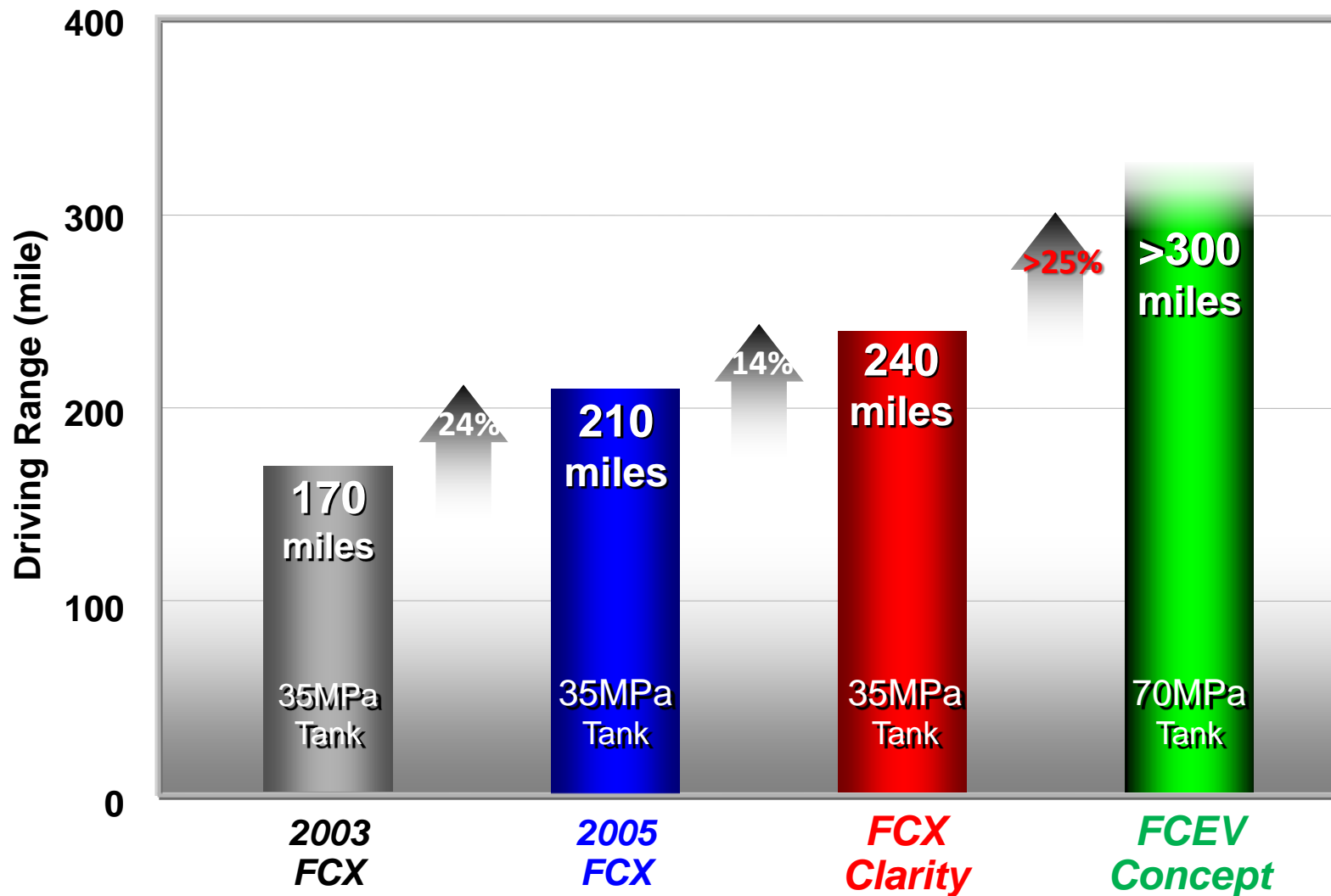
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New FC stack has achieved

- Power Density > 3kW/L
- 33% downsized vs. 2006 stack

Driving Range Extension



Driving range extended Gen. by Gen. >>> Competitive to ICE

Evolution toward FCEV Spreading

	Clarity	FCEV Concept
FC Stack Power Density	2 kW/L ↓	3 kW/L ↓
FC Stack Location	Center tunnel ↓	Under Hood ↓
Seating	4 ↓	5 ↓

Non FCEV
dedicated
chassis

Cost down

**FCEV
Spreading**

Tank Pressure	35MPa ↓	70MPa ↓
Range	240mile ↓	>300mile ↓
Refuel time	3min	3min

Same usability as ICE vehicle

Each evolution has meaning toward FCEV spreading

Roadmap to FCEV Commercialization

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Technology
Demonstration

2002 ~

Technology & Market
Demonstration

2008 ~

Early
Commercialization

2015

Expansion

2020

Full
Commercialization

2030 ~

'03M FCX



World's
1st FCEV

'05M FCX



Tech. improvement
Cold start up

FCX Clarity



Expanding of Leasing
• Performance
• Durability
• More Driving range

Next FCEV



Sales to general public
• Cost
• Production quality
• More driving range

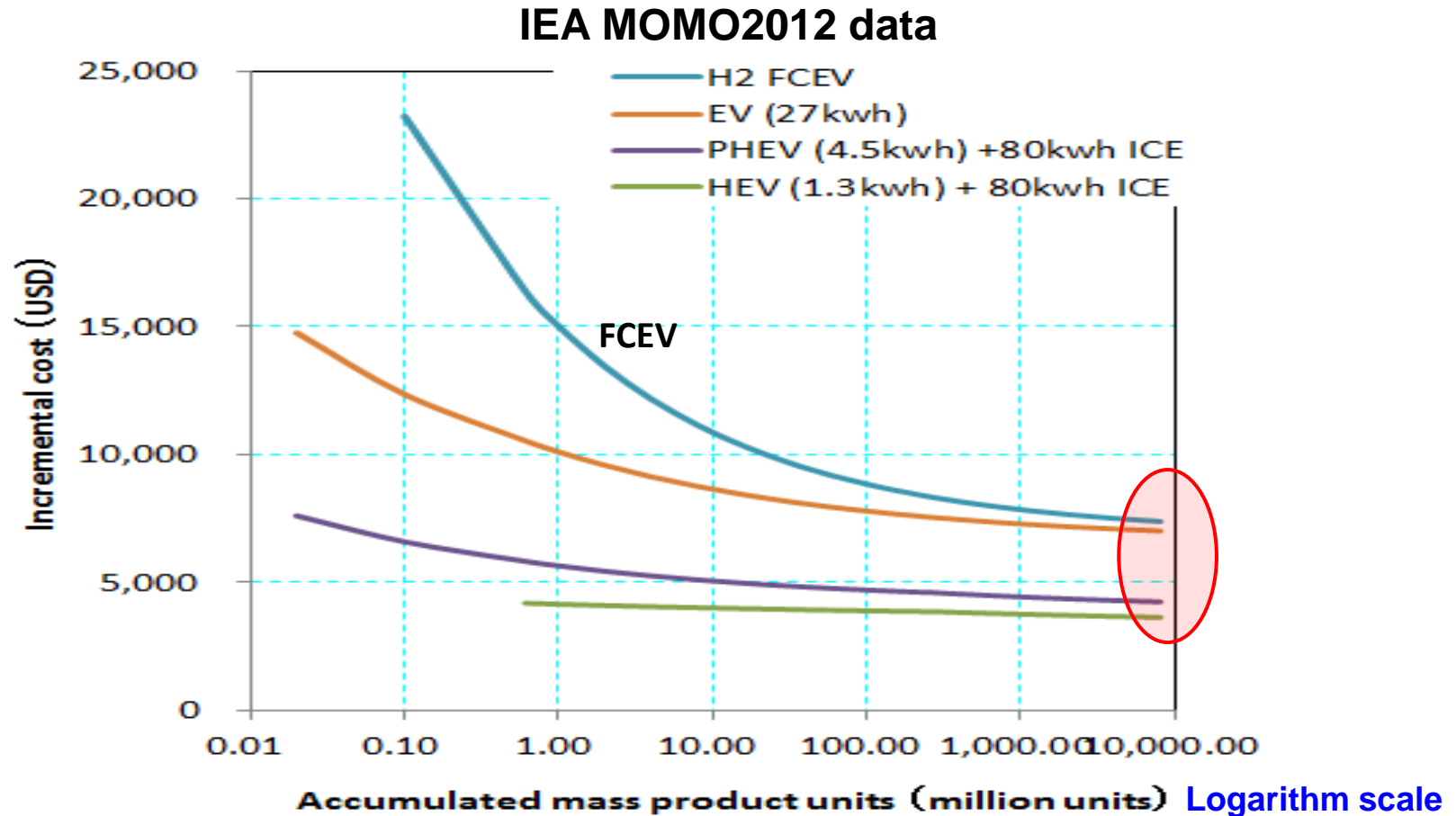


Sales expansion
• Affordable price

Image of hydrogen
infrastructure deployment

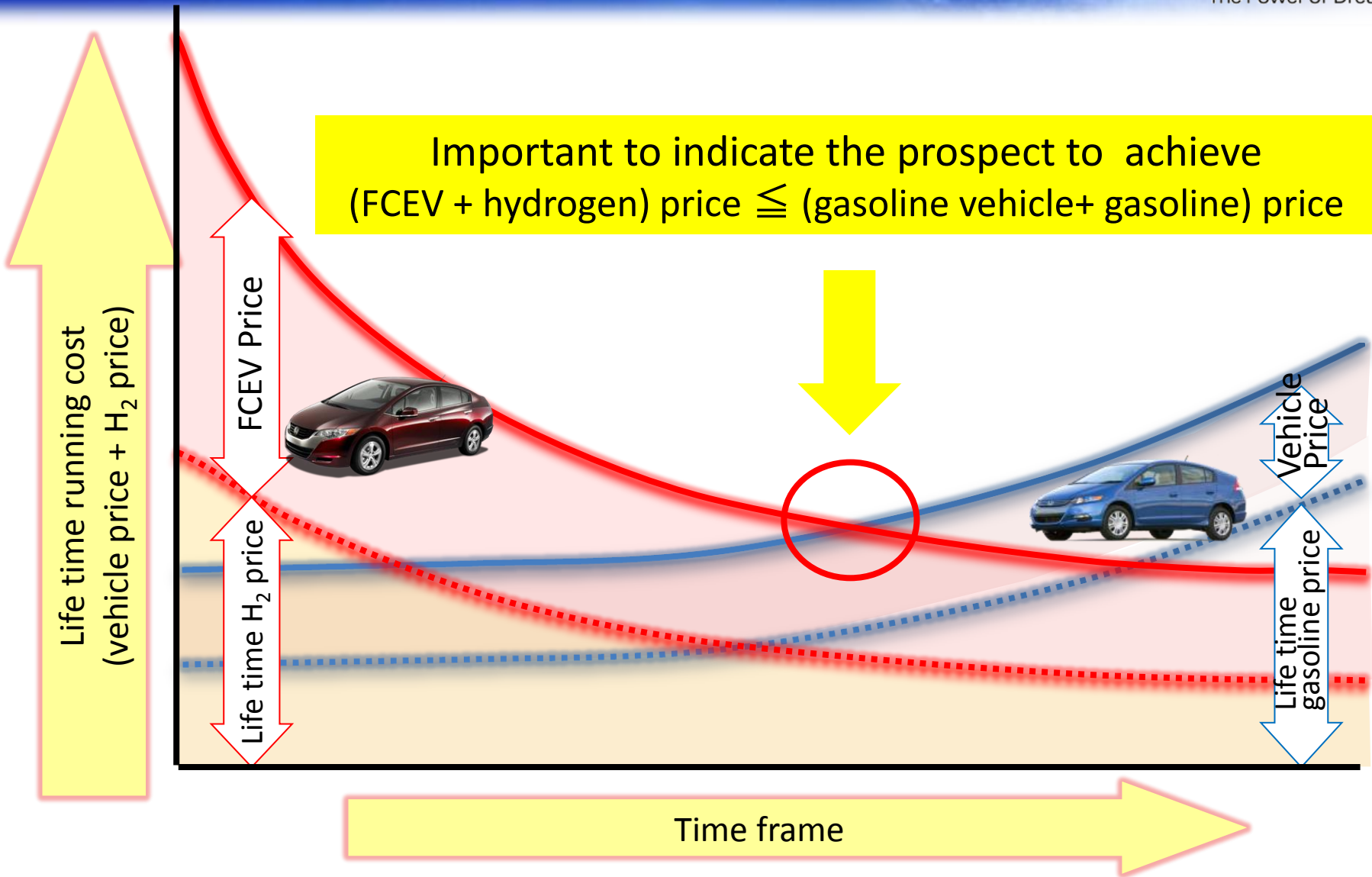
Cost reduction and improved quality need for mass production,
continuous efforts for hydrogen infrastructure deployment are necessary.

Cost Estimation by MOMO



According to MOMO2012 data, FCEV won't be cheaper than EV or Hybrid.

Finding Customers' Merit (Image)



Hydrogen cost is important as well as Vehicle cost

- ✓ **Honda has developed FCEVs step by step toward its commercialization.**
 - **FCX Clarity : Near-ICE performance, indicated FCEV possibility**
 - **Next Gen. FCEV : FC power train downsizing and extend driving range**

- ✓ **For commercialization, not only FCEV cost-down, but also price-down of hydrogen fuel is important.**