

Ben Knight  
07-5-5

**Honda Comment for ZEV Direction  
CARB Board Meeting  
May 24, 2007**

**Honda has committed major resources and attention to the ZEV program, and recognizes a number of successes:**

- Demonstrated real world air quality benefits from near-zero emission PZEVs. (Total emission reductions are even greater than anticipated from 10% ZEV)
- Advancement of AT-PZEV hybrid technology with two AT-PZEV hybrids in the market.
- Advancement of AT-PZEV dedicated Natural Gas Vehicle technology, with 'ZEV-level' emissions impact, now being marketed to consumers with the availability of home refueling.
- Advancement of ZEV Fuel Cell Vehicle technology with early deployments in real world applications. A second generation vehicle under development will demonstrate significant improvements in vehicle & component weight, size (packaging), range, & efficiency.
- Honda is spending significant resources for technology development of batteries, ultra-capacitors, fuel cells, and electric drive.

**ZEV framework should remain flexible so manufacturers can invest in the technologies and paths they believe have greatest promise in the several ZEV categories:**

- *Bronze credit should be proportional to environmental impact (performance), Silver credits reflecting environmental performance plus incentives reflecting cost, and Gold credits reflecting resources invested to advance the technology (cost).*

**Honda is pursuing the Fuel Cell Vehicle path for pure ZEVs (Alternative Path). ZEV rule changes are needed to assure continued investment and progress in Fuel Cell Vehicle technology. It is critical to maintain a FCV path and credit structure that continues to encourage the significant investment and real progress in FCV technology that some OEMs believe is most promising and want to pursue (avoid a structure that promotes all manufacturers to take lower cost compliance options).**

- *Maintain a FCV path that encourages companies like Honda to pursue a high cost path which they believe has greatest potential long term.*
- *In structuring the FCV path and credits, need to reflect the resources invested (cost), to maintain this promising path and future investments.*
- *Ramping up volumes too quickly at this stage can stall progress and misuse resources.*

**Honda: Additional Comment:**

**PZEVs:**

Large numbers of near-zero emission PZEVs are providing greater air quality benefits than expected from a 10% ZEV program. This has been recently validated by real world emissions evaluation in a 5 year program at UC Riverside's Center for Environmental Research & Technology. PZEVs produce extremely low emissions in real world use, below their certification standards. (The demonstrated emission reduction performance is equivalent to at least 0.5 ZEV credits versus the 0.2 earned now!)

**AT-PZEVs:**

The Fuel Cell Vehicle optional path that Honda is taking requires a doubling of AT-PZEV volumes, which has been very challenging and resource intensive considering market demand is limited. We have developed three AT-PZEV models to date.

The framework for AT-PZEVs should remain flexible, with incentives but not mandates for PHEVs or H<sub>2</sub>ICEs. PHEV battery technology needs to progress for their viability – we need batteries lasting at least 10 years/150,000 miles; this is further off than some believe.

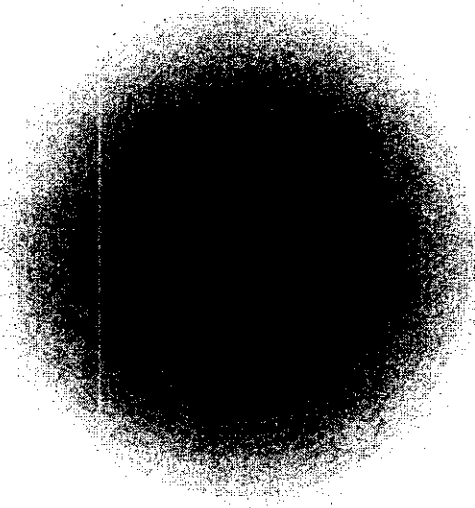
**ZEVs:**

Revisions to the mandate should carefully preserve the continuing development and investment in FCV progress. There is a very real risk that undervaluing FCVs could drive manufacturers to migrate to low cost options. Overly aggressive volume requirements in this alternative path can be equally as harmful. Honda is putting FCVs in the hands of real people, and the infrastructure is coming along in parallel; we are involved in that effort with a number of energy companies.

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ZEV Board Meeting

May 24, 2007  
San Diego, CA



# Honda's ZEV Program & Comment

ZEV Program Vehicles

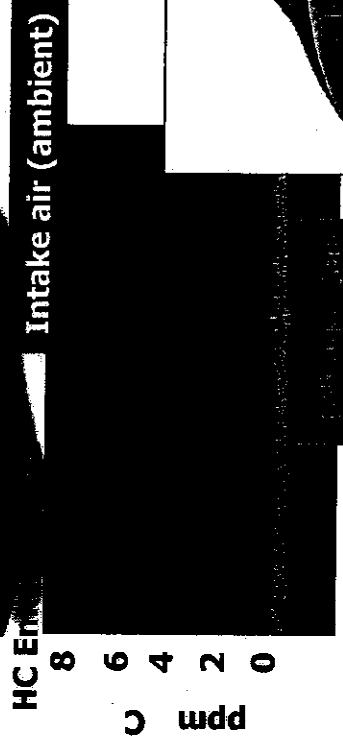
Air Quality

Technology Advancement

Critical to get structure and credits right

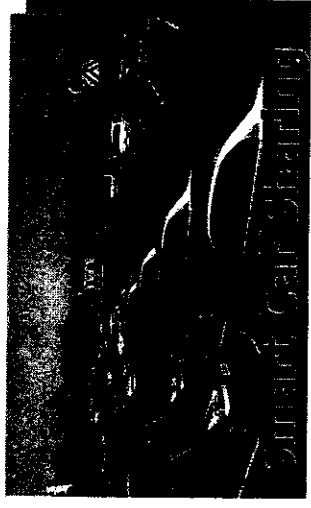
# Honda's ZEV Program

## Near Zero Emission ICES (Gasoline and Natural Gas)



Driving Time  
SAE Papers # 2000-01-1142 and 2000-01-1140

## Home Refueled Natural Gas Vehicle

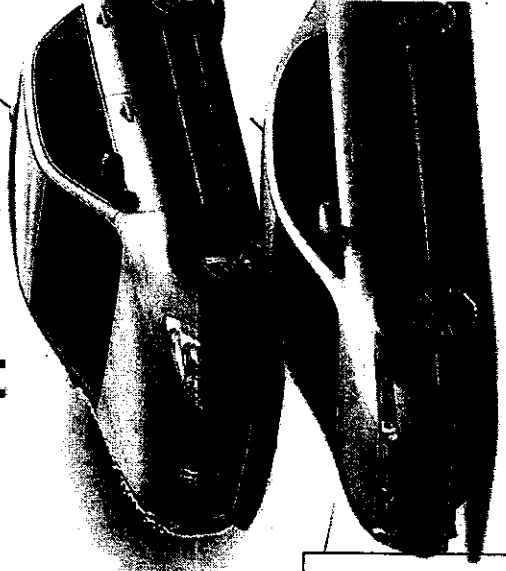


## Linked to Transit



## Battery Electric Vehicle

## Hybrid Electric Vehicle Applications



NiMH, Li-Ion,  
Ultra-Capacitor,  
& Fuel Cell R&D

## Advancement of Fuel Cell Electric Vehicle Development



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ZEV Success:

PZEVs:

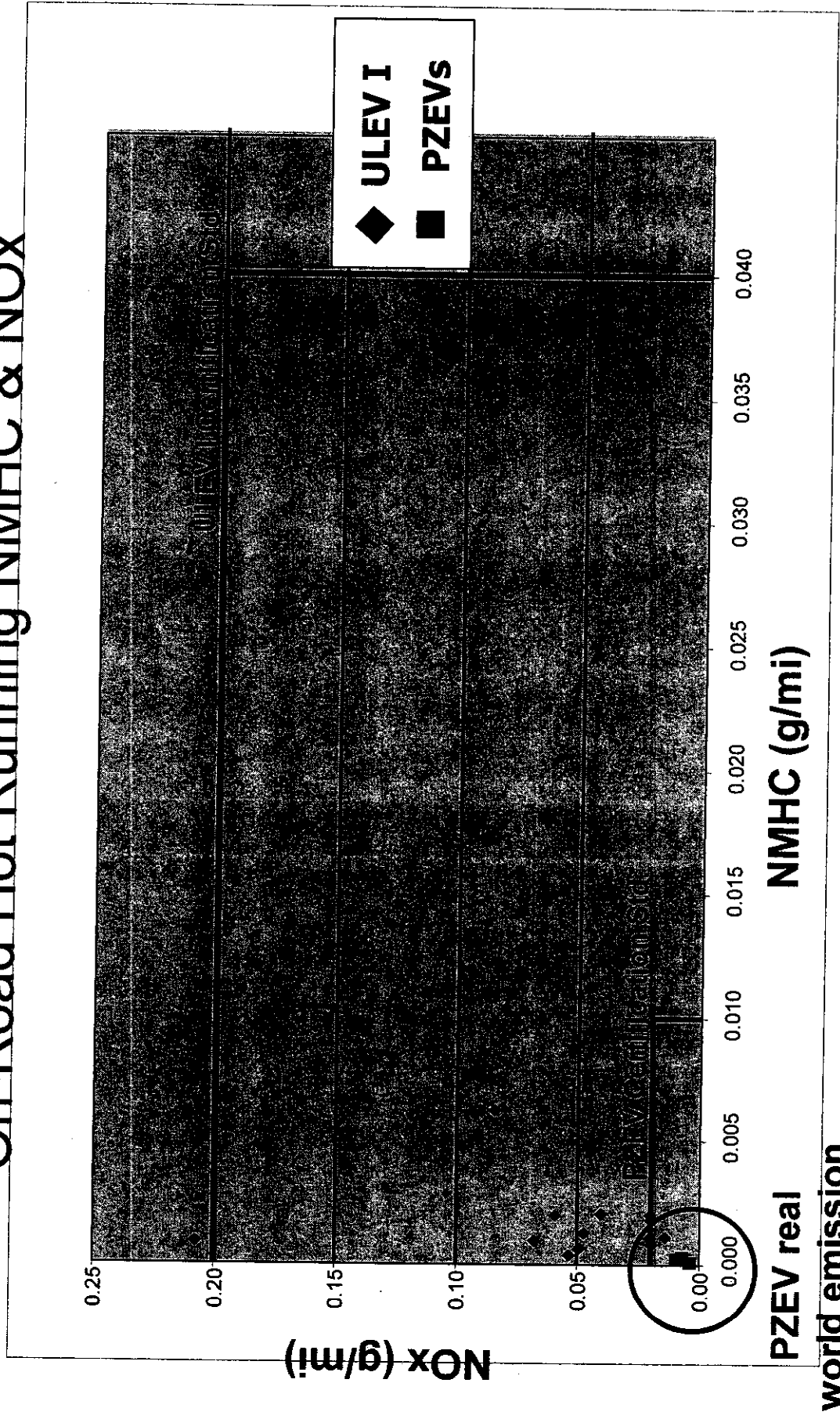
## Verified Real World Air Quality Impact

*“To date, the most important technical finding is that emissions from gasoline powered light duty vehicles that meet the most stringent emission standards for California are operating well below their certification levels. This is true for both laboratory measurements and in real world, on-road conditions.”*

Source: UC Riverside CE-CERT 5-year  
Research Study Conclusions

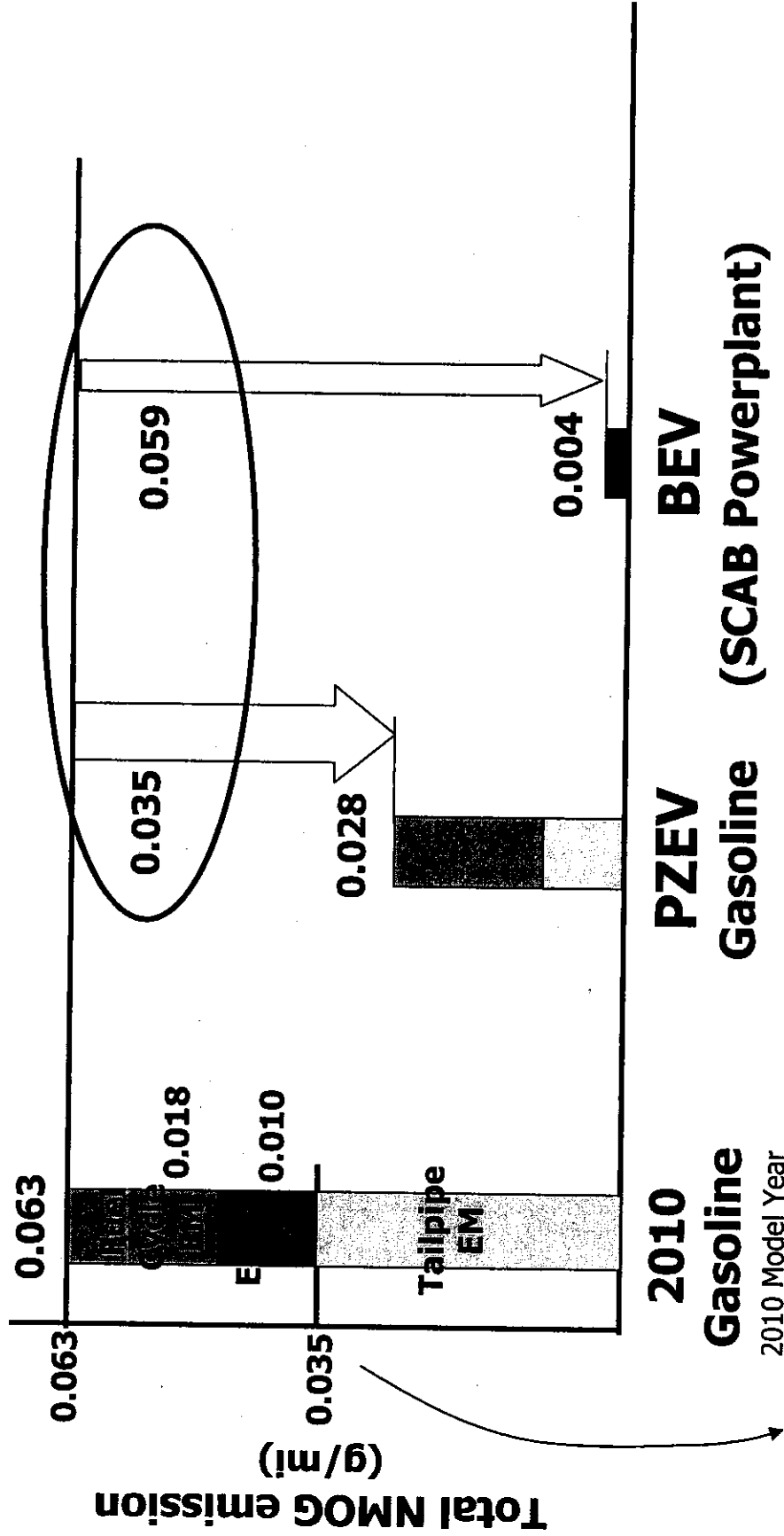
# Real World Emissions

## On-Road Hot Running NMHC & NOx



Source: UC Riverside CE-CERT SELEV Research

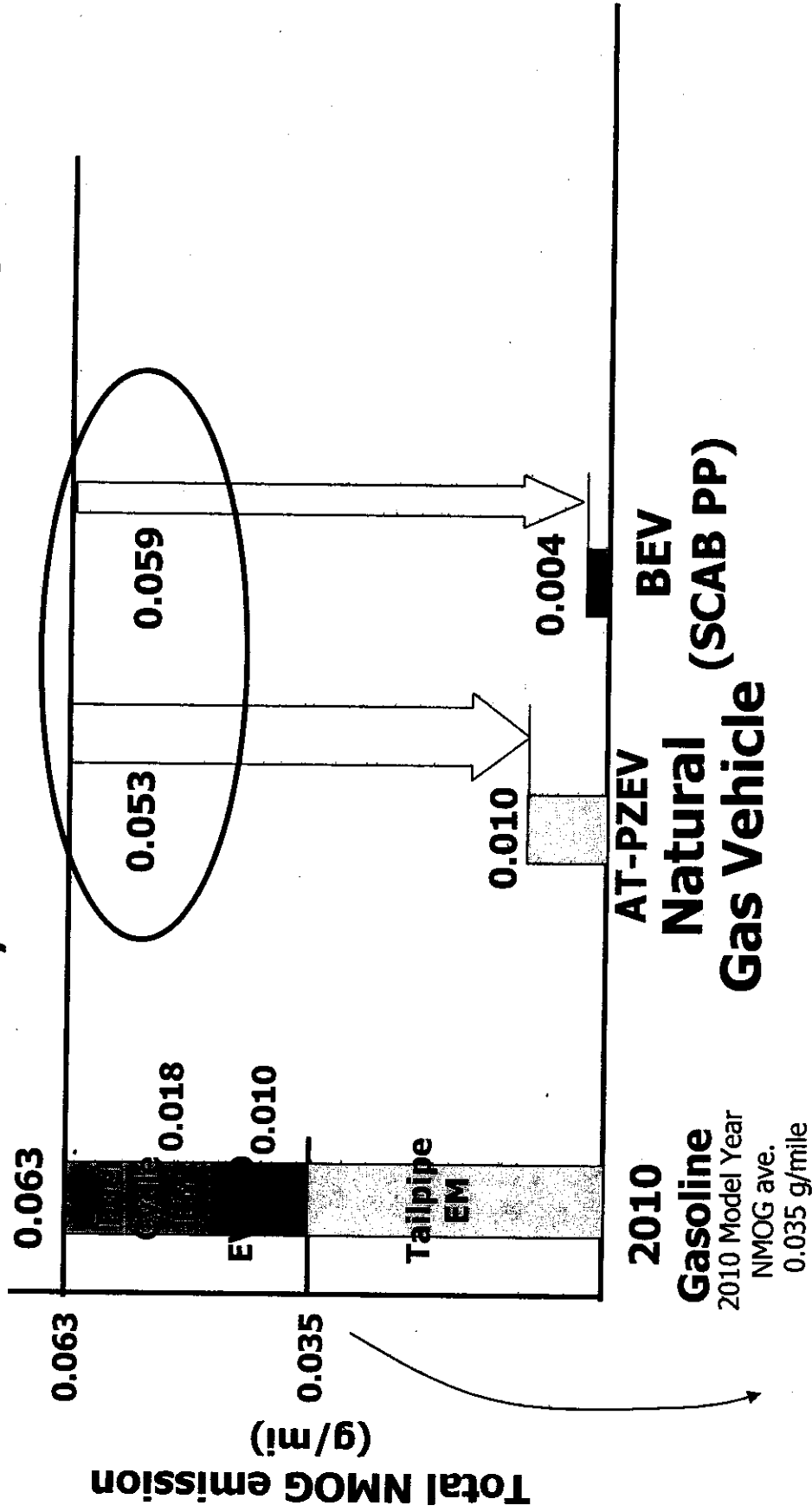
# NMOG Reduction from 2010 extremely low emission vehicle



**Current PZEV Credit: 0.2**  
**PZEV Credit if performance-based: 0.6+**

(based on PZEV standards; real world emissions are confirmed below standard)

# Emission Reduction from 2010 extremely low emission vehicle



**Current Nat. Gas Vehicle AT-ZEV Credit: 0.7**  
**Credit value if performance-based: 0.9+**

(based on PZEV standards; real world emissions are confirmed below standard)



# Honda Goals

## Honda Clean Technologies for California ZEV regulation

2006

2002

2000

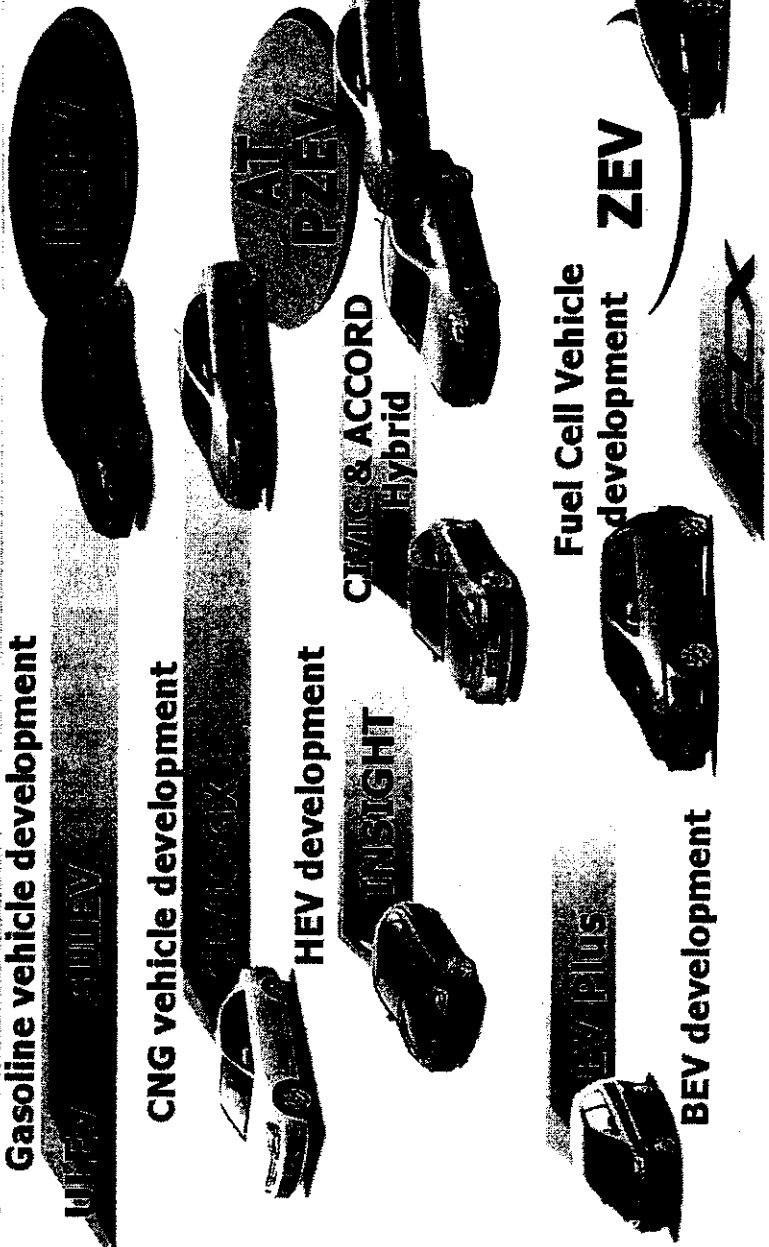
Gasoline vehicle development

CNG vehicle development

HEV development

Fuel Cell Vehicle  
development

BEV development



## Honda's ZEV Program Vehicles

## **Honda Comment: ZEV Direction**

### **PZEVs:**

Large numbers of near-zero emission PZEVs are providing greater air quality benefits than expected from a 10% ZEV program. This has been validated by real world emissions evaluations.

### **AT-PZEVs:**

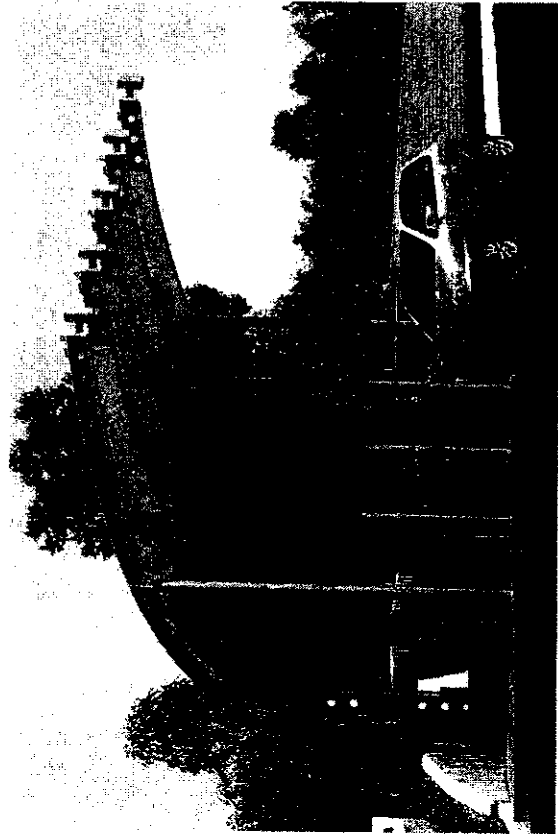
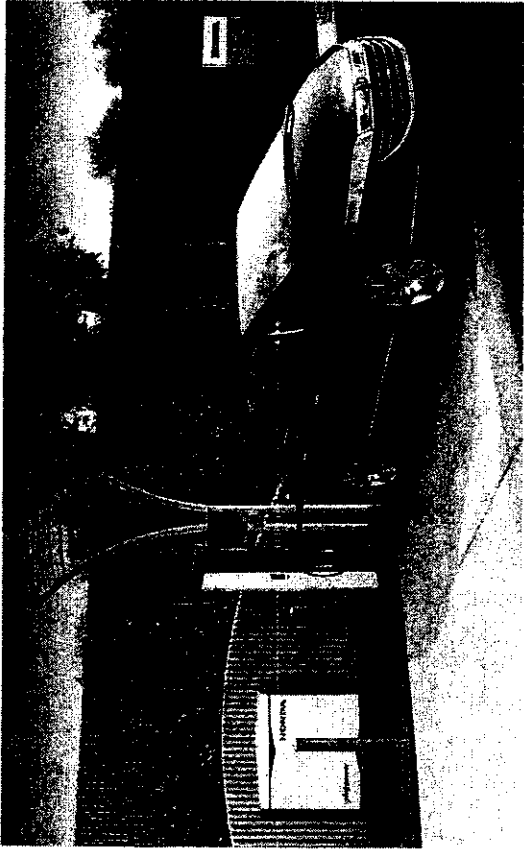
The Fuel Cell optional path Honda is taking requires a doubling of AT-PZEV volumes (which is very challenging and resource intensive considering market demand).

- *The framework for AT-PZEVs should remain flexible, with incentives but not mandates for PHEVs or H<sub>2</sub>ICEs. PHEV battery technology needs to progress for their viability – we need batteries lasting at least 10 years, 150K miles in real world use; this is further off than some believe.*

### **ZEVs:**

**ZEV changes are needed to assure continued investment and progress in Fuel Cell Vehicle technology.**

- Honda is pursuing the Fuel Cell option. It is critically important to ZEV success to enable manufacturers to invest in ZEV technology they believe is most promising. **The Board's greatest challenge is to maintain a FCV path and credit structure that continues to encourage this investment and real progress in FCVs that some OEMs believe is most promising and want to pursue.**
- **In structuring the FCV path and credits, need to reflect the resources invested (cost), to maintain this promising path and future investments.**
- **Ramping up volumes too quickly at this stage can stall progress and misuse resources.**



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The Power of Dreams