



# New York State Plug-In Hybrid Electric Vehicle Initiative

**By: Joseph R. Wagner**  
**Sr. Project Manager, Transportation Research**  
**New York State Energy R&D Authority (NYSERDA)**



# NYSERDA

- New York State Energy Research and Development Authority
- Public Benefit Corporation created in 1975, primarily funded by utility ratepayers
- Three Goals: *Energy Savings*  
*Environmental Benefits*  
*Economic Development*

# Past EV Experience



1999 – 2001  
500 Postal Service  
vehicles built

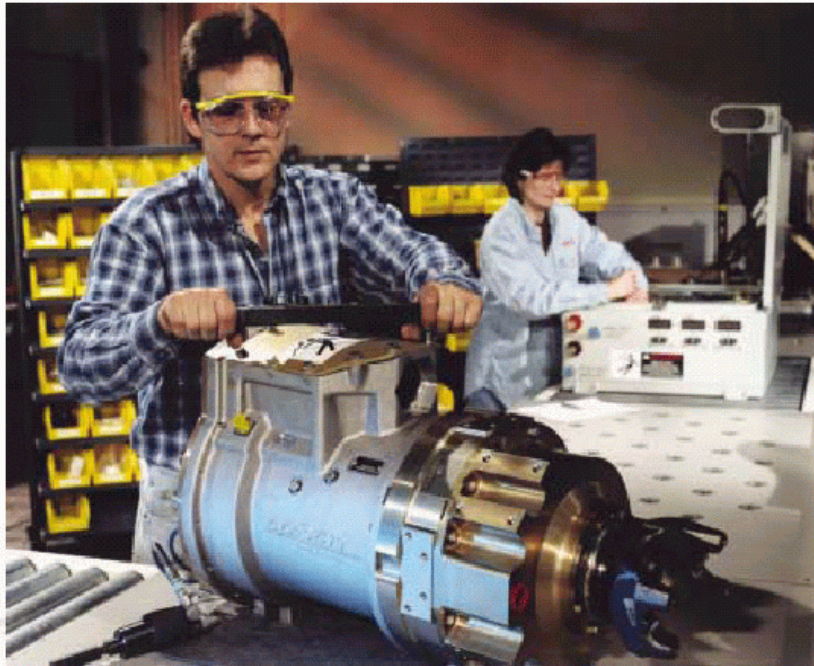
2001 – 2003  
100 Station Cars  
demonstrated





# Hybrid Transit Bus

R&D Program 1995-99



BAE Systems HybriDrive™

Orion VII Hybrid Bus

1999 – Ongoing  
Hybrid Bus Production  
(1,000+ orders to date)







## Other NYSERDA Plug-In Hybrid Vehicle Projects

Odyne Corp./Thor Industries:  
24-Passenger Bus,  
20-mile Electric-Only Range



DaimlerChrysler Corp.:  
“Sprinter” Delivery Van,  
25-mile Electric-Only Range



NYSERDA's Prius PHEV  
at White House, 2/23/07



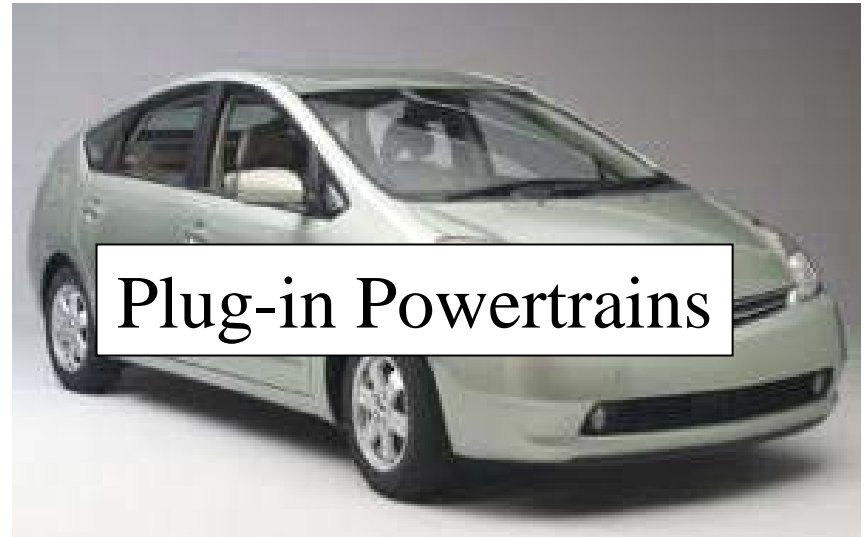
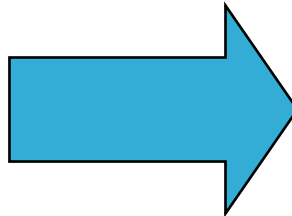
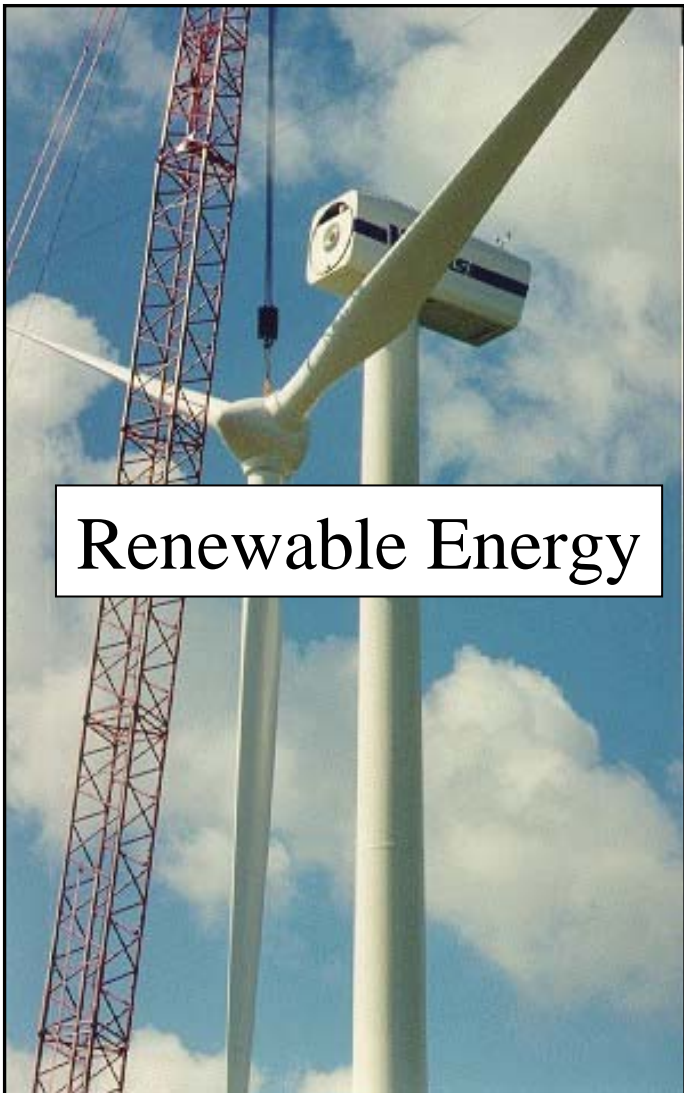


# Plug-In HEVs

## Advantages

- » Less petroleum use
- » Lower fuel cost
- » Potentially less air pollution & CO<sub>2</sub>
- » Can benefit grid (e.g., off-peak charging, V2G)
- » Unlike battery-electric:
  - No range restriction, smaller batteries
  - Charging is optional/interruptible
- » Infrastructure can be simpler
- » Path for renewables (e.g., Wind) to vehicles

# Plug-In HEVs: The Big Picture



**Also: NREL Preliminary Study...**  
*PHEV energy storage could boost growth of wind projects*





# Plug-In HEVs

## Disadvantages

- » **Batteries Add:**
  - Cost (could be >\$10K)**
  - Weight (100-300 lbs)**
  - Uncertainty (battery life)**
- » **Car companies reluctant**
- » **Conversions raise additional issues:**
  - Emissions certification**
  - Safety compliance**
  - Loss of Warranty**



# NYS Plug-in HEV Initiative

***“\$10 million plug-in hybrids program...  
the 600 hybrid vehicles in the State fleet  
will be retrofitted to be plug-in hybrids.”***

**Governor’s Press Release (August 1, 2006)**

## **Purpose**

**Jump-start Commercialization**

## **How**

**Product development, testing, certification  
Guaranteed sales**

# Hybrid-Electric Vehicles in NYS Fleet

Ford Escape 4WD



Toyota Prius



Honda Accord



Honda Civic





# NYS Hybrid Fleet

## Late Model (04+)

Excl. Accord & Silverado

<u>Agency</u>	<u>Escape</u>	<u>Prius</u>	<u>Civic</u>	<u>Total</u>
DEC	71	0	24	95
MTA	58	16	0	74
DMV	0	0	49	49
Lottery	19	26	0	45
DOT	12	0	20	32
<u>Other</u>	<u>38</u>	<u>21</u>	<u>61</u>	<u>120</u>
<b>Total</b>	<b>198</b>	<b>63</b>	<b>154</b>	<b>415</b>



# PHEV Technology Initiative

## Stage 1    *Validate the Technology*

**Resolve:**

***Specifications:*** Battery size, configuration, etc.

***Certification:*** Safety, Emissions

***Performance:*** mpg, winter operation, etc.

***Best fit:*** driving cycle, garaging, etc.

***Cost:*** vehicle, infrastructure, O&M, warranty, etc.

## Stage 2    *Convert State-Owned HEVs*





# Plug-in HEV Initiative

## Stage 1 (proposals due 9/18/06)

**Up to \$100K for sample vehicle (“first-article”)**

**No spec (Bidder-justified spec)**

**Bid includes base vehicle, PHEV conversion,  
field support, documentation**

**Emphasized rapid delivery of first-article**

## Stage 2 (proposals with due date TBD)

**Only for successful Stage 1 participants**

**Convert State HEVs using balance of \$10 million**



# **Plug-in HEV Initiative PON 1088, Stage 1 Proposals**

**16 Proposals, 3 Models:**

<b>Ford Escape</b>	<b>6 proposals</b>
<b>Toyota Prius</b>	<b>8 ”</b>
<b>Honda Civic</b>	<b>2 ”</b>

**9 Proposers/Teams**

**4 Proposers chosen to build 6 PHEVs**



# Plug-in HEV Initiative

## PON 1088, Stage 1 Awards

<u>Contractors / Subs</u>	<u>Prius</u>	<u>Escape</u>	<u>Civic</u>
<u>A123</u> / <u>Hymotion</u>	P	P	P
<u>Electrovaya</u>		P	
<u>EnergyCS</u> / <u>Valence</u>	R		
<u>Hybrids Plus</u> / <u>A123</u>		R	

---

Battery Supplier Underlined  
(all are lithium-ion type batteries)

P = New Battery in Parallel with Old  
R = Replace Original Battery



# **NYS Plug-in HEV Initiative Planned Tests & Analysis**

## **Vehicle Tests**

With DOE Adv. Vehicle Testing Activity (AVTA):

- **Performance (Chassis Dyno): mpg, Emissions**
- **Accelerated Durability: Fixed-course driving (4K miles)**
- **Fleet Demonstration: With NYS agencies**

## **Infrastructure**

With Electric Trans. Engineering Corp. (eTec):

- **Best-Fit options (base vehicle, usage, site, PHEV specs)**
- **Site-specific infrastructure study (cost, schedule)**



# **PHEVs: Preliminary Observations**

**First-article vehicles are truly firsts and require testing**

**Emissions regulatory status must be resolved**

**Gain in mpg can be high, but may be sensitive to emissions goals (may trade g/mile for mpg)**

**Serious Cost Concerns: Battery**

**Loss of warranty (conversions)**

**Designers may not have found optimum battery size (e.g., lowest \$ per gal saved); using “max available space”**

**“Electric-only range” is misleading; blended mode common**

**Plugging in may be difficult for many fleet operators**





# **Plug-In Hybrids**

## ***Beyond the Current Initiative***

### **Commercial Success May Depend on:**

- » **Public policy**
  - > **Clear, friendly regulatory environment**
  - > **Incentives, CO2 regulation**
- » **Economics (Battery cost/life, fuel prices)**
- » **Innovative Market Structure (e.g., V2G)**

### **Car Companies Beginning to Budge:**

**In last 9 months GM, Toyota, Nissan have announced preliminary PHEV plans**



# **PHEV Contacts in NYSERDA's Transportation R&D Program**

Richard Drake, Program Manager

518-862-1090, ext. 3258      [rld@nyserda.org](mailto:rld@nyserda.org)

Joe Wagner, Sr. Project Manager

518-862-1090, ext. 3228      [jrw@nyserda.org](mailto:jrw@nyserda.org)



# Plug-In Hybrids: Addendum



# **PHEVs: Factors Limiting “Electric-Only” Operation**

## **Small Size of Electric Motor:**

- » **Current HEVs optimized for “electric-boost”**
- » **Max electric-only speed:**
  - Escape 25 mph**
  - Prius 35 mph**
  - Civic 0 mph (engine starts at launch)**

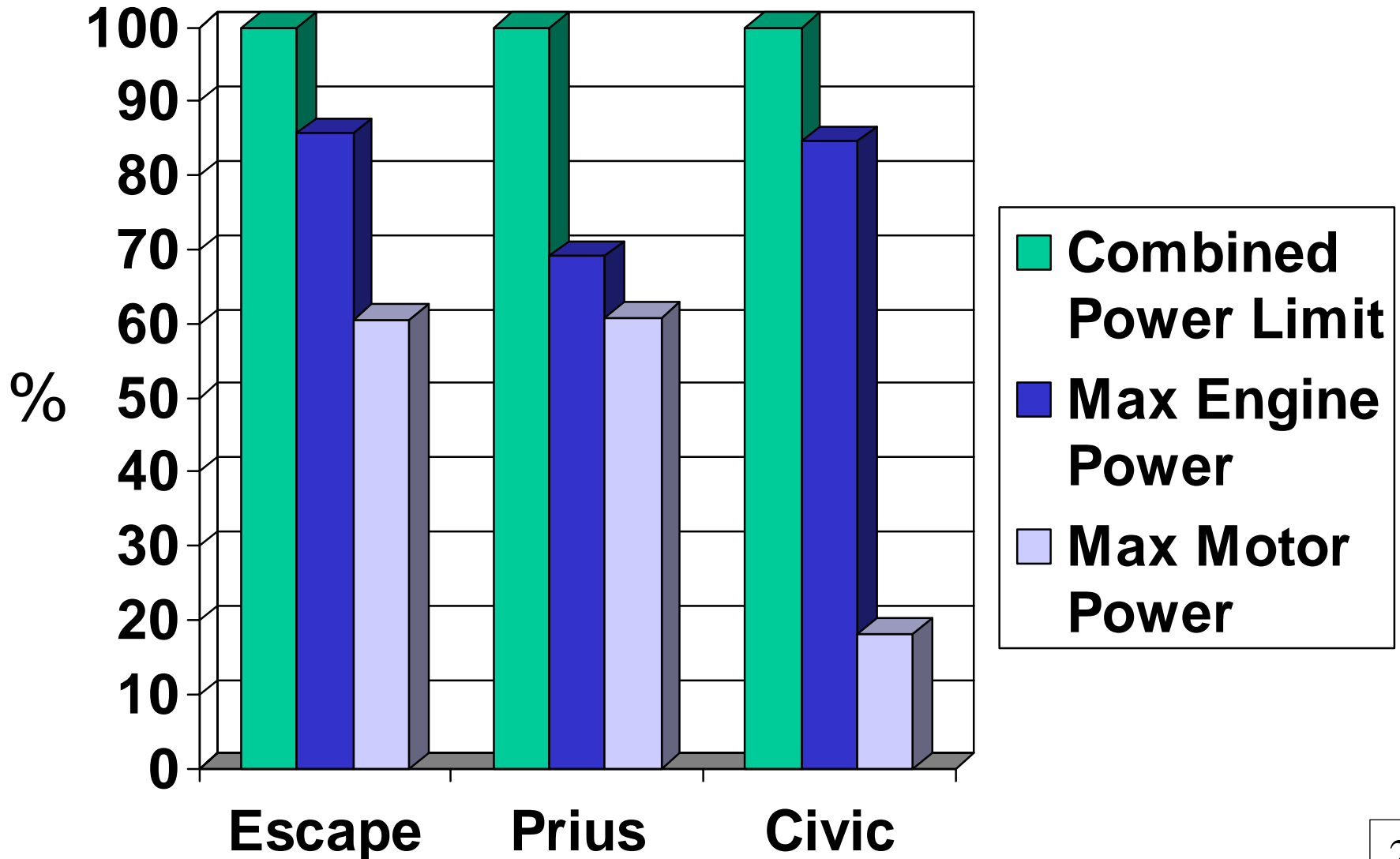
## **Need for Heat:**

- » **Keep engine/catalyst warm**
- » **Passenger space heat**

## **Condition of Battery Pack (SOC, too hot, too cold)**



# PHEVs: Electric Motor May Limit “Electric-Only” Operation







# Standard HEV Fuel Cost (@ \$2.50/Gal)

