U.S. Department of Energy FreedomCAR & Vehicle Technologies Program

Advanced Vehicle Testing Activity – *Hybrid Electric Vehicle and Idle Reduction Technology Activities*

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Presentation Outline

- AVTA Goal
- AVTA Testing Partners
- Hybrid Electric Vehicle Testing (Performance)
- Hybrid Electric Vehicle Policy Support
- Hybrid Electric Vehicle Provisions in pending Energy Bill
- State and Local Idle Reduction Activities
- State and Local Idle Reduction Regulations
- DOE Idle Reduction Demonstration Project

AVTA Goal

- Benchmark and validate the performance of light-, medium-, and heavy-duty vehicles that feature one or more advanced technologies, including:
  - ICE's burning advanced fuels, such as 100% hydrogen and hydrogen/CNG-blended fuels
  - Hybrid electric, pure electric, and hydraulic drive systems
  - Advanced batteries and engines
  - Advanced climate control, power electronic, and other ancillary systems

AVTA Testing Partners

- Qualified Vehicle Testers (50 – 50 cost share)
  - Electric Transportation Applications (lead)
  - Arizona Public Service (APS)
  - Bank One
  - Ford Motor Company
  - Luke AFB
  - New York Power Authority
  - Red Cross
  - Southern California Edison
  - Salt River Project
  - Cites of Palm Springs, Palm Valley, Phoenix, Vacaville, and San Diego

Hybrid Electric Vehicle Testing

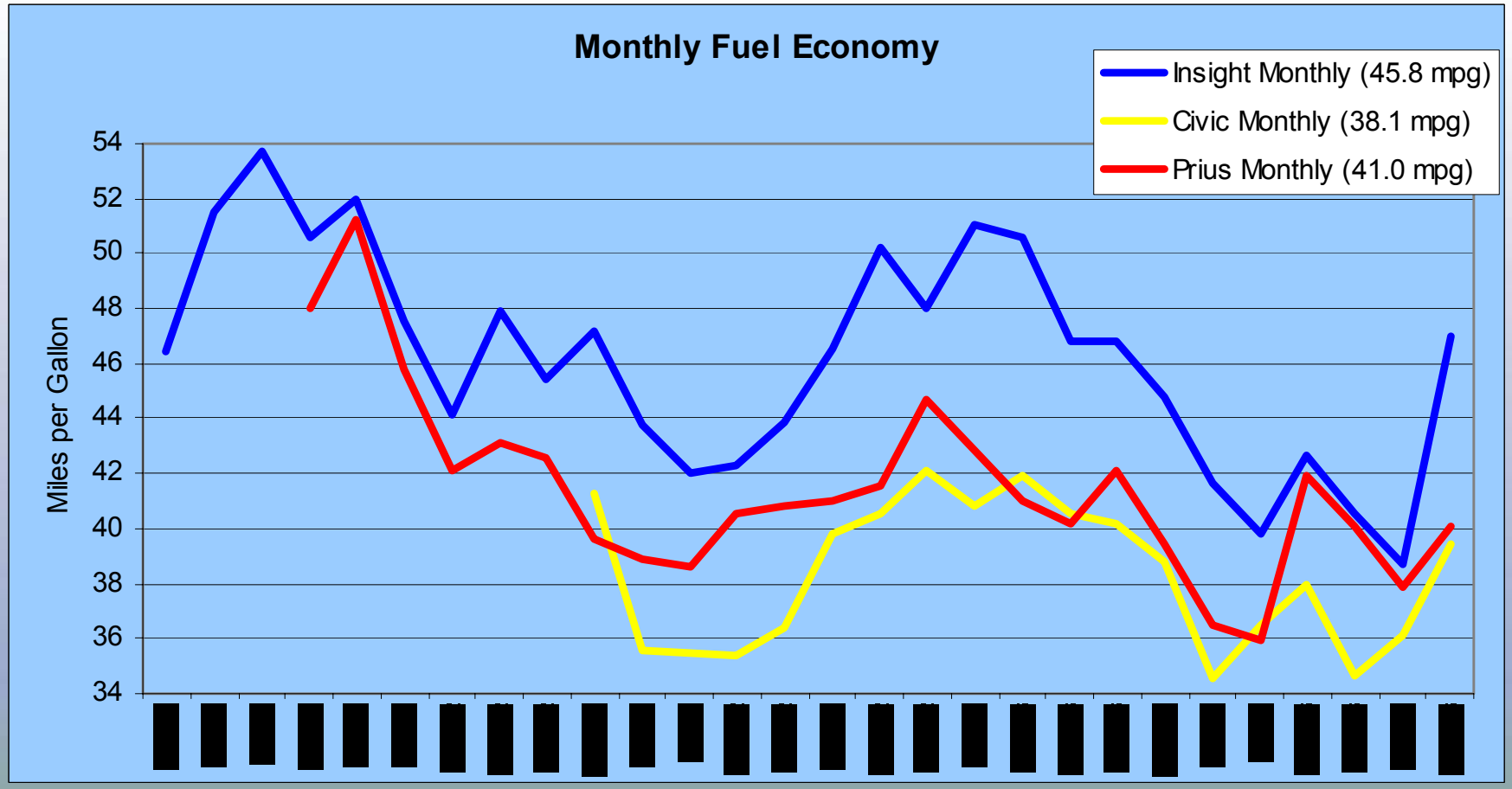
- Honda Insight
- Honda Civic
- MY ’02 & ’03 Toyota Prius
- MY ’04 Toyota Prius
- Fleet and accelerated reliability testing (900,000+ miles)
  - Bank One, Red Cross, Arizona Public Service, ETA
  - Fuel use, maintenance, repairs, driver experience
- Baseline Performance testing (dynamometers and closed test tracks)
  - Fuel economy, acceleration, max speed, braking, & handling

Hybrid Electric Vehicle Testing

- Fleet and accelerated reliability testing
  - 6 Honda Insights (302,000 miles) ~45.8 mpg
  - 4 Honda Civics (248,000 miles) ~38.1 mpg
  - 6 Model year 02 & 03 Toyota Prius (344,000 miles) ~41.0 mpg

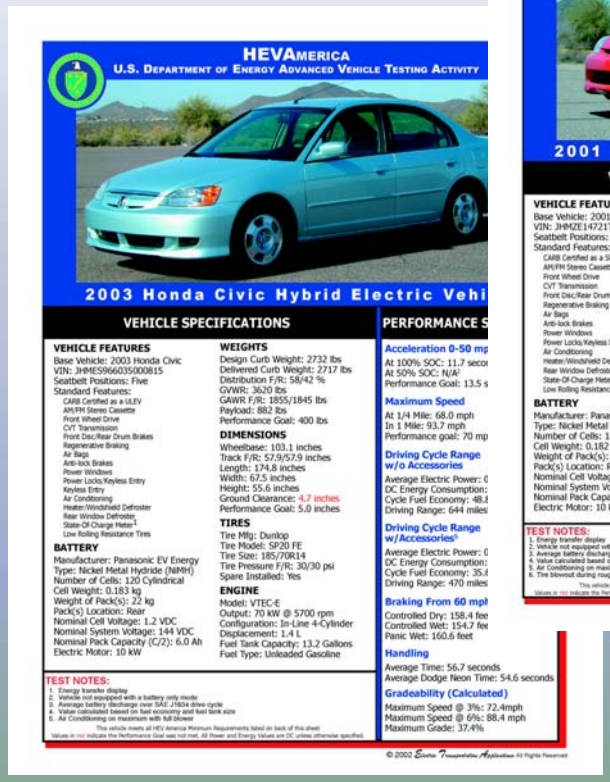
Hybrid Electric Vehicle Testing

- **Fleet and accelerated reliability testing**



Hybrid Electric Vehicle Testing

- **Baseline Performance testing**



HEVAmerica
U.S. Department of Energy Advanced Vehicle Testing Activity

2003 Honda Civic Hybrid Electric Vehi

VEHICLE SPECIFICATIONS

VEHICLE FEATURES
Base Vehicle: 2003 Honda Civic
VIN: JHMES96603S000815
Seatbelt Positions: Five
Standard Features:
CARB Certified as a ULEV
AM/FM Stereo Cassette
Front Wheel Drive
CVT Transmission
Front Disc/Rear Drum Brakes
Regenerative Braking
Air Bags
Anti-lock Brakes
Power Windows
Power Locks/Keyless Entry
Air Conditioning
Heater/Windshield Defroster
Rear Window Defroster
State-Of-Charge Meter[1]
Low Rolling Resistance Tires

BATTERY
Manufacturer: Panasonic EV Energy
Type: Nickel Metal Hydride (NiMH)
Number of Cells: 120 Cylindrical
Cell Weight: 0.183 kg
Weight of Pack(s): 22 kg
Pack(s) Location: Rear
Nominal Cell Voltage: 1.2 VDC
Nominal System Voltage: 144 VDC
Nominal Pack Capacity (C/2): 6.0 Ah
Electric Motor: 10 kW

WEIGHTS
Design Curb Weight: 2732 lbs
Delivered Curb Weight: 2717 lbs
Distribution F/R: 58/42 %
GVWR: 3620 lbs
GAWR F/R: 1855/1845 lbs
Payload: 882 lbs
Performance Goal: 400 lbs

DIMENSIONS
Wheelbase: 103.1 inches
Track F/R: 57.9/57.9 inches
Length: 174.8 inches
Width: 67.5 inches
Height: 55.6 inches
Ground Clearance: 4.7 inches
Performance Goal: 5.0 inches

TIRES
Tire Mfg: Dunlop
Tire Model: SP20 FE
Tire Size: 185/70R14
Tire Pressure F/R: 30/30 psi
Spare Installed: Yes

ENGINE
Model: VTEC-E
Output: 70 kW @ 5700 rpm
Configuration: In-Line 4-Cylinder
Displacement: 1.4 L
Fuel Tank Capacity: 13.2 Gallons
Fuel Type: Unleaded Gasoline

PERFORMANCE S

Acceleration 0-50 mp
At 100% SOC: 11.7 secon
At 50% SOC: N/A[2]
Performance Goal: 13.5 s

Maximum Speed
At 1/4 Mile: 68.0 mph
In 1 Mile: 93.7 mph
Performance goal: 70 mp

Driving Cycle Range w/o Accessories
Average Electric Power: 0
DC Energy Consumption:
Cycle Fuel Economy: 48.
Driving Range: 644 miles

Driving Cycle Range w/Accessories[5]
Average Electric Power: 0
DC Energy Consumption:
Cycle Fuel Economy: 35.
Driving Range: 470 miles

Braking From 60 mph
Controlled Dry: 158.4 fee
Controlled Wet: 154.7 fe
Panic Wet: 160.6 feet

Handling
Average Time: 56.7 seconds
Average Dodge Neon Time: 54.6 seconds

Gradeability (Calculated)
Maximum Speed @ 3%: 72.4mph
Maximum Speed @ 6%: 88.4 mph
Maximum Grade: 37.4%

TEST NOTES:
1. Energy transfer display
2. Vehicle not equipped with a battery only mode
3. Average battery discharge over SAE J1634 drive cycle
4. Value calculated based on fuel economy and fuel tank size
5. Air Conditioning on maximum with full blower

This vehicle meets all HEV America Minimum Requirements listed on back of this sheet
Values in red indicate the Performance Goal was not met. All Power and Energy Values are DC unless otherwise specified.

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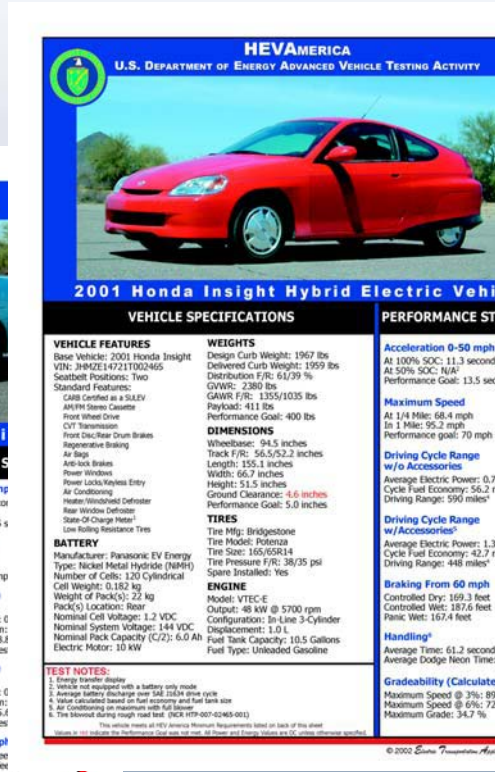

HEVAmerica
U.S. Department of Energy Advanced Vehicle Testing Activity

2001 Honda Insight Hybrid Electric Vehi

VEHICLE SPECIFICATIONS

VEHICLE FEATURES
Base Vehicle: 2001 Honda Insight
VIN: JHMZE14721T002465
Seatbelt Positions: Two
Standard Features:
CARB Certified as a SULEV
AM/FM Stereo Cassette
Front Wheel Drive
CVT Transmission
Front Disc/Rear Drum Brakes
Regenerative Braking
Air Bags
Anti-lock Brakes
Power Windows
Power Locks/Keyless Entry
Air Conditioning
Heater/Windshield Defroster
Rear Window Defroster
State-Of-Charge Meter[1]
Low Rolling Resistance Tires

BATTERY
Manufacturer: Panasonic EV Energy
Type: Nickel Metal Hydride (NiMH)
Number of Cells: 120 Cylindrical
Cell Weight: 0.182 kg
Weight of Pack(s): 22 kg
Pack(s) Location: Rear
Nominal Cell Voltage: 1.2 VDC
Nominal System Voltage: 144 VDC
Nominal Pack Capacity (C/2): 6.0 Ah
Electric Motor: 10 kW

WEIGHTS
Design Curb Weight: 1967 lbs
Delivered Curb Weight: 1959 lbs
Distribution F/R: 61/39 %
GVWR: 2380 lbs
GAWR F/R: 1355/1035 lbs
Payload: 411 lbs
Performance Goal: 400 lbs

DIMENSIONS
Wheelbase: 94.5 inches
Track F/R: 56.5/52.2 inches
Length: 155.1 inches
Width: 66.7 inches
Height: 51.5 inches
Ground Clearance: 4.6 inches
Performance Goal: 5.0 inches

TIRES
Tire Mfg: Bridgestone
Tire Model: Potenza
Tire Size: 165/65R14
Tire Pressure F/R: 38/35 psi
Spare Installed: Yes

ENGINE
Model: VTEC-E
Output: 48 kW @ 5700 rpm
Configuration: In-Line 3-Cylinder
Displacement: 1.0 L
Fuel Tank Capacity: 10.5 Gallons
Fuel Type: Unleaded Gasoline

PERFORMANCE ST

Acceleration 0-50 mph
At 100% SOC: 11.3 second
At 50% SOC: N/A[2]
Performance Goal: 13.5 se

Maximum Speed
At 1/4 Mile: 68.4 mph
In 1 Mile: 95.2 mph
Performance goal: 70 mph

Driving Cycle Range w/o Accessories
Average Electric Power: 0.7
Cycle Fuel Economy: 56.2
Driving Range: 590 miles[4]

Driving Cycle Range w/Accessories[5]
Average Electric Power: 1.3
Cycle Fuel Economy: 42.7
Driving Range: 448 miles[4]

Braking From 60 mph
Controlled Dry: 169.3 feet
Controlled Wet: 187.6 feet
Panic Wet: 167.4 feet

Handling[6]
Average Time: 61.2 second
Average Dodge Neon Time:

Gradeability (Calculate
Maximum Speed @ 3%: 89
Maximum Speed @ 6%: 72
Maximum Grade: 34.7 %

TEST NOTES:
1. Energy transfer display
2. Vehicle not equipped with a battery only mode
3. Average battery discharge over SAE J1634 drive cycle
4. Value calculated based on fuel economy and fuel tank size
5. Air Conditioning on maximum with full blower
6. Tire blowout during rough road test. (NCR HTP-007-02465-001)

This vehicle meets all HEV America Minimum Requirements listed on back of this sheet
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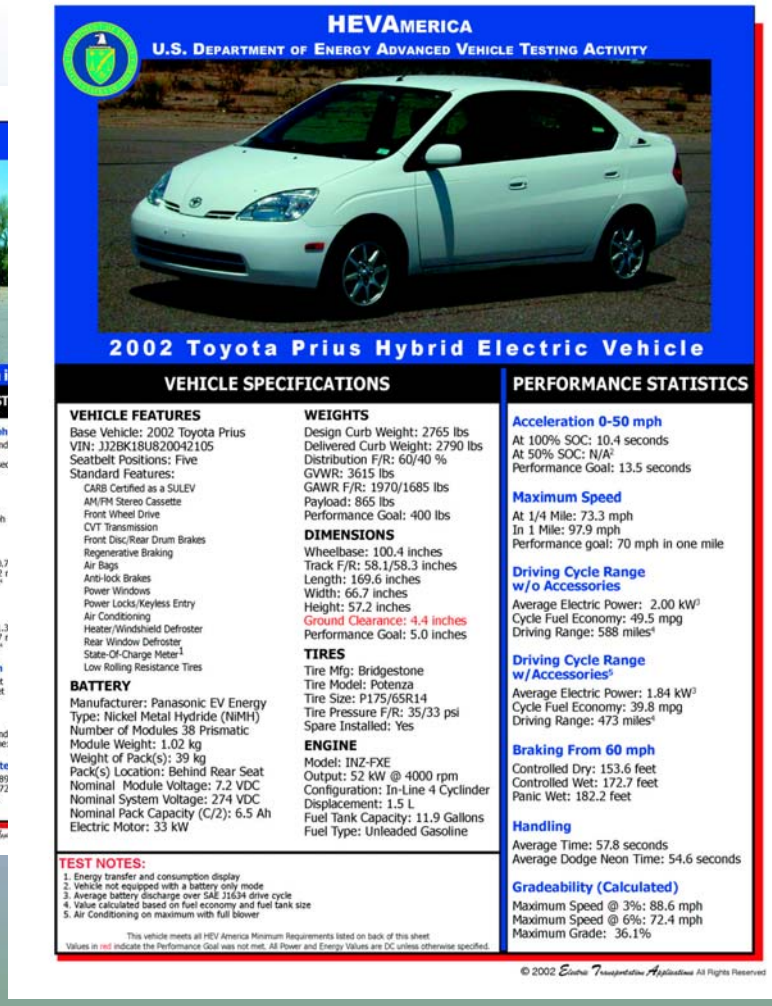

HEVAmerica
U.S. Department of Energy Advanced Vehicle Testing Activity

2002 Toyota Prius Hybrid Electric Vehicle

VEHICLE SPECIFICATIONS

VEHICLE FEATURES
Base Vehicle: 2002 Toyota Prius
VIN: JJ2BK18U820042105
Seatbelt Positions: Five
Standard Features:
CARB Certified as a SULEV
AM/FM Stereo Cassette
Front Wheel Drive
CVT Transmission
Front Disc/Rear Drum Brakes
Regenerative Braking
Air Bags
Anti-lock Brakes
Power Windows
Power Locks/Keyless Entry
Air Conditioning
Heater/Windshield Defroster
Rear Window Defroster
State-Of-Charge Meter[1]
Low Rolling Resistance Tires

BATTERY
Manufacturer: Panasonic EV Energy
Type: Nickel Metal Hydride (NiMH)
Number of Modules 38 Prismatic
Module Weight: 1.02 kg
Weight of Pack(s): 39 kg
Pack(s) Location: Behind Rear Seat
Nominal Module Voltage: 7.2 VDC
Nominal System Voltage: 274 VDC
Nominal Pack Capacity (C/2): 6.5 Ah
Electric Motor: 33 kW

WEIGHTS
Design Curb Weight: 2765 lbs
Delivered Curb Weight: 2790 lbs
Distribution F/R: 60/40 %
GVWR: 3615 lbs
GAWR F/R: 1970/1685 lbs
Payload: 865 lbs
Performance Goal: 400 lbs

DIMENSIONS
Wheelbase: 100.4 inches
Track F/R: 58.1/58.3 inches
Length: 169.6 inches
Width: 66.7 inches
Height: 57.2 inches
Ground Clearance: 4.4 inches
Performance Goal: 5.0 inches

TIRES
Tire Mfg: Bridgestone
Tire Model: Potenza
Tire Size: P175/65R14
Tire Pressure F/R: 35/33 psi
Spare Installed: Yes

ENGINE
Model: INZ-FXE
Output: 52 kW @ 4000 rpm
Configuration: In-Line 4 Cyclinder
Displacement: 1.5 L
Fuel Tank Capacity: 11.9 Gallons
Fuel Type: Unleaded Gasoline

PERFORMANCE STATISTICS

Acceleration 0-50 mph
At 100% SOC: 10.4 seconds
At 50% SOC: N/A[2]
Performance Goal: 13.5 seconds

Maximum Speed
At 1/4 Mile: 73.3 mph
In 1 Mile: 97.9 mph
Performance goal: 70 mph in one mile

Driving Cycle Range w/o Accessories
Average Electric Power: 2.00 kW[3]
Cycle Fuel Economy: 49.5 mpg
Driving Range: 588 miles[4]

Driving Cycle Range w/Accessories[5]
Average Electric Power: 1.84 kW[3]
Cycle Fuel Economy: 39.8 mpg
Driving Range: 473 miles[4]

Braking From 60 mph
Controlled Dry: 153.6 feet
Controlled Wet: 172.7 feet
Panic Wet: 182.2 feet

Handling
Average Time: 57.8 seconds
Average Dodge Neon Time: 54.6 seconds

Gradeability (Calculated)
Maximum Speed @ 3%: 88.6 mph
Maximum Speed @ 6%: 72.4 mph
Maximum Grade: 36.1%

TEST NOTES:
1. Energy transfer and consumption display
2. Vehicle not equipped with a battery only mode
3. Average battery discharge over SAE J1634 drive cycle
4. Value calculated based on fuel economy and fuel tank size
5. Air Conditioning on maximum with full blower

This vehicle meets all HEV America Minimum Requirements listed on back of this sheet
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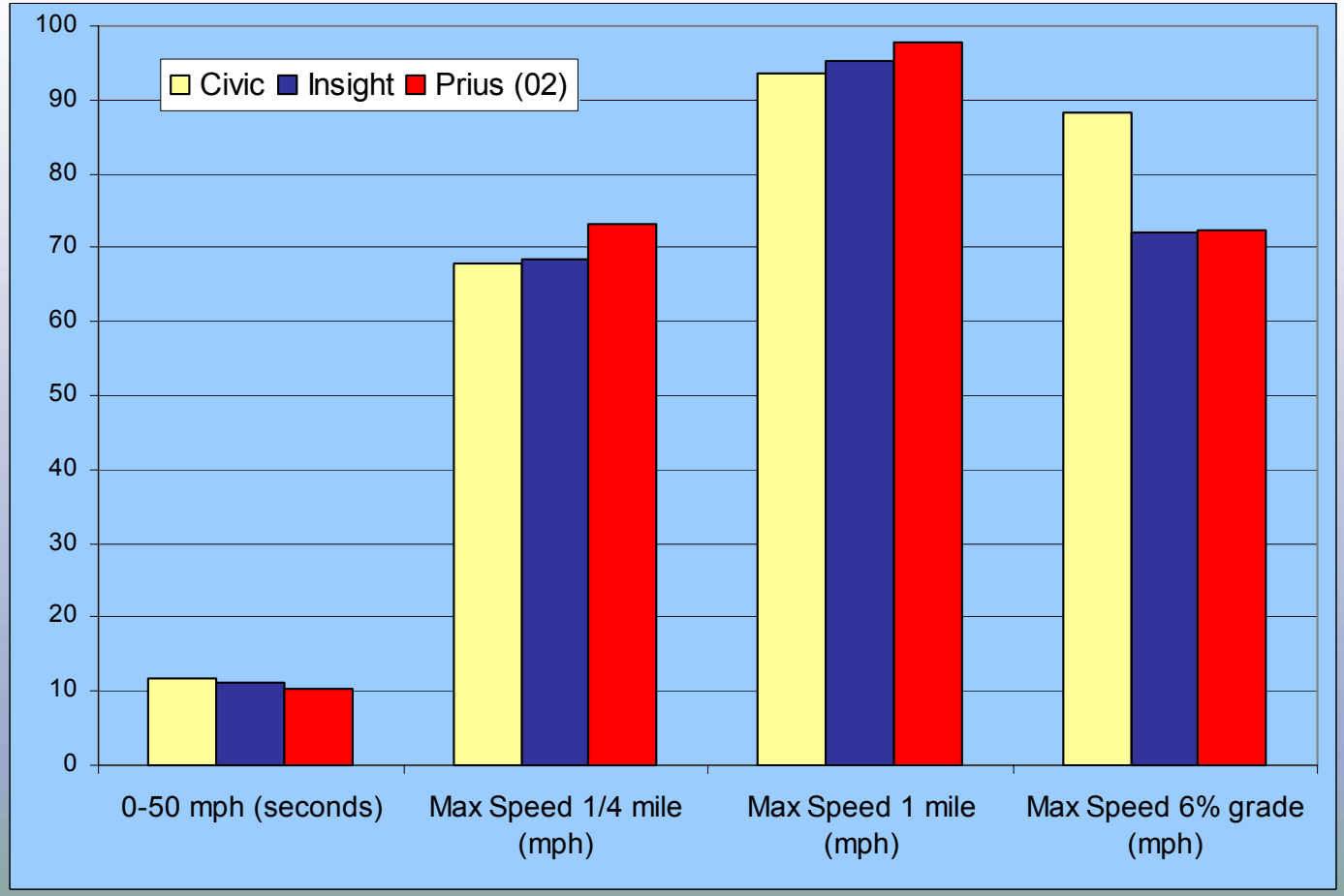
Hybrid Electric Vehicle Testing

- **Baseline Performance testing results**



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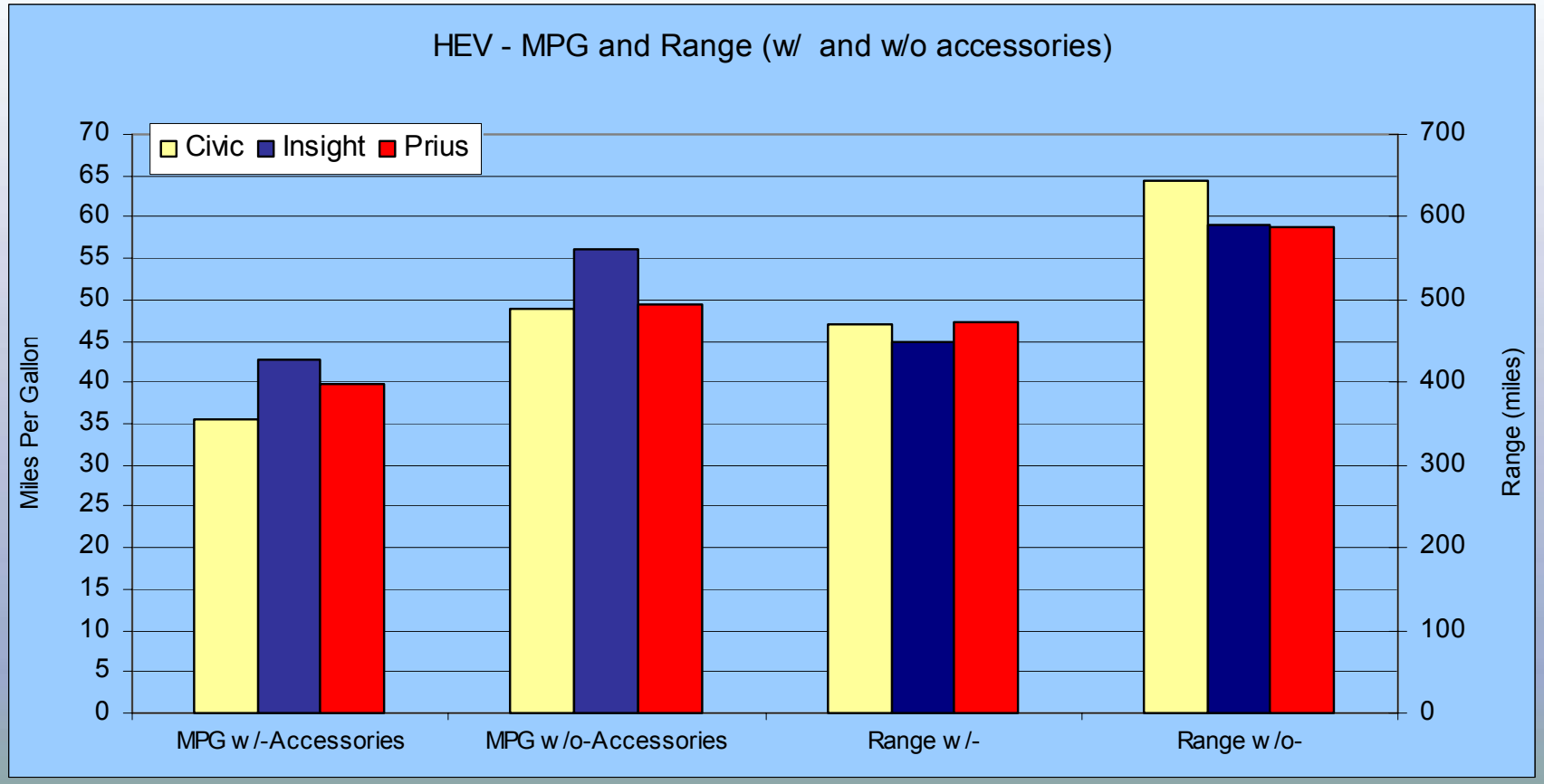
- **Baseline Performance testing results (SAE J1634)**