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# AB118 Investment Plan 2010-2011; Electric Drive Workshop

September 9, 2009

One of the world's leading suppliers of high power lithium ion energy storage solutions:

- 1800 employees worldwide.



Leading the alternative energy transportation revolution:

- Largest DOE USABC awards to date.
- \$249.1M grant recipient under DOE Battery and Electric Drive Manufacturing Grant.
- Working with top European and American auto makers to develop green vehicles.

# Markets served and growth:



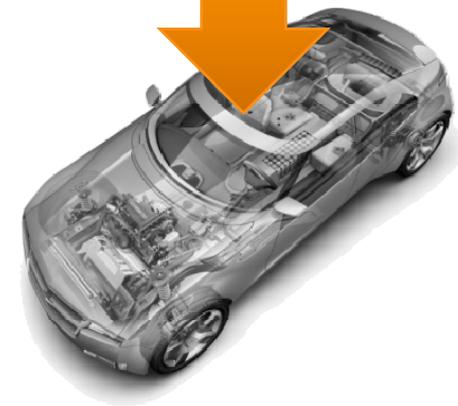
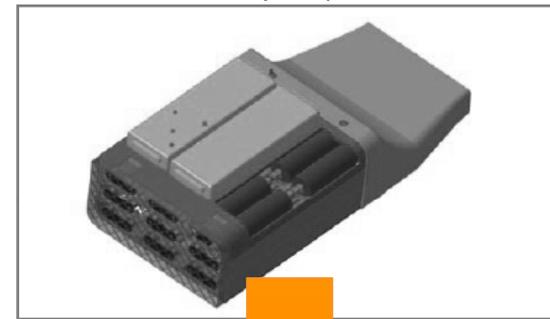
*Cordless Power*



*Grid stabilization*



*Transportation*  
*(Passenger, Heavy Duty, Aerospace)*



# A123Systems Manufacturing Facility; Hopkinton, MA



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power. safety.  
life™

# L5 Hymotion Plug-In Conversion Module (“PCM”) System for Gen II Toyota Prius (Model years 2004-2009)

# A123Systems' Hymotion Prius PHEV



- **A123's Hymotion Prius supplemental battery conversion module is the only currently available PHEV technology that can provide dramatic emissions and oil savings benefits for the nation's consumers on a vehicle-by-vehicle basis with no infrastructure change**
  - Reduction in fuel consumption of up to 70% over typical sedan
  - Reduction in GHG emissions of 60% over stock Prius, and greater vs. typical sedan
  - Reduction of up to 100 tons of CO<sub>2</sub> emissions vs. typical sedan over life of the converted vehicle
  - Necessary infrastructure already exists – standard household outlet and extension cord
  
- **A123's Prius PHEV conversion is rigorously engineered and tested to federal standards, available for large scale production (1,000's) and is commercially available in California and across the US.**
  - Over 1,000,000 miles of highly positive real world data collected.
  - Final stages of California Air Resource Board ("ARB") emissions certification (*commercially available in CA under ARB anti-tampering exemption*).
  - Crash testing complete and FMVSS certified.
  - Safety and reliability testing passed.
  - Hymotion dealers established in California.

**Incentives from policy-makers will speed up consumer adoption of these standardized, mass-produced and fully tested products and will reduce GHG emissions and oil consumption**

# L5 PHEV supplemental battery conversion module system overview



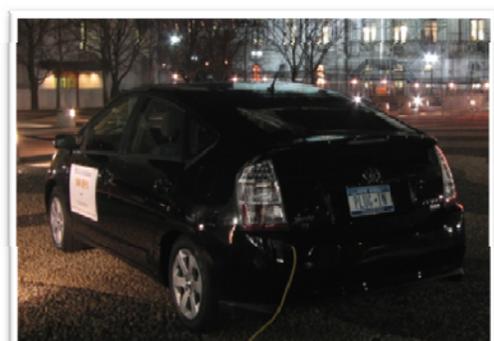
- Manufactured in Hopkinton, MA; A123Systems Energy Solutions Group
- 4 California dealers:
  - Galpin Autosports; Van Nuys, CA
  - A+ Japanese Auto Repair; San Carlos, CA
  - Pat's Garage; San Francisco, CA
  - The Doctor Independent Service; Fountain Valley, CA
- 550 total installations by end of August 2009 across the USA. 150 installs in CA.**
- MSRP \$10,395.00 installed.**
- Commercially available today.**
- All installation work for CA customers completed at one of our CA dealers.**

|                             |                                                      |
|-----------------------------|------------------------------------------------------|
| Energy                      | Approximately 5kWh                                   |
| Charging temperature range  | -20 deg F to 140 deg F                               |
| Operating temperature range | -20 deg F to 140 deg F                               |
| Charging voltage            | 120V                                                 |
| Maximum charging current    | 10A                                                  |
| Charging time               | 5.5 hrs @ 75 deg F                                   |
| Required electrical outlet  | Electrical outlet equipped with GFCI, 15A or greater |
| Weight                      | 187 pounds                                           |

# Hymotion L5 Preserves Prius Look and Feel



Hymotion L5 PCM



- *Minimum Modification (OEM battery not removed)*
- *Simple Installation (~3 hrs), replaces spare tire*

- *Small footprint (does not affect trunk space)*
- *Plug and Play, Integrated Lightweight Module*

- *Prius with L5 PCM Battery being recharged from standard outlet*

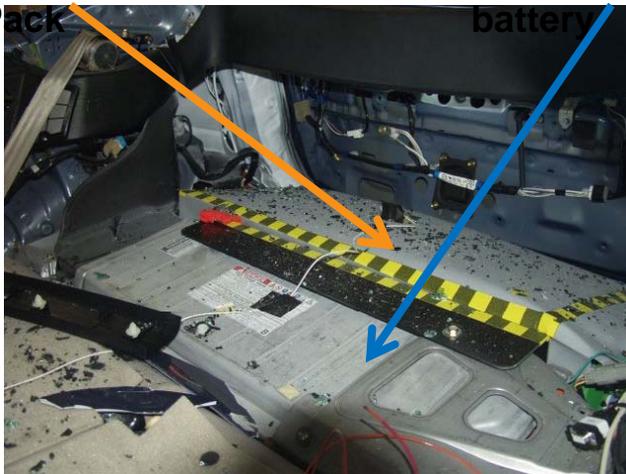
**L5 PCM sits unobtrusively in spare tire well**

# Testing to Federal New Vehicle Safety Standards



Hymotion Pack

Prius battery



## Test Results Summary

A 1550kg 2005 Toyota Prius 4-door sedan was impacted from the rear by a 1797kg moving barrier at a velocity of 52.9 kph (32.9 mph). The test was performed by Calspan on October 2, 2007.

The test vehicle was equipped with a Hymotion auxiliary battery that weighed 85.36kg placed in the spare tire position. Water was added to fuel tank to achieve test weight for additional ballast. For the purpose of acquiring information for applied research, one instrumented Part 572 E 50<sup>th</sup> percentile male Anthropomorphic Test Device (ATD) and one uninstrumented Part 572 E 50<sup>th</sup> percentile male ATD were placed in the front occupant seating positions and three X-accelerometers were added to the test vehicle. Research data is presented in an appendix attached to this report.

The crash event was recorded by four high-speed cameras and one real-time camera. Camera locations and other pertinent camera information are found on pages 3-9 and 3-10 of this report. Pre- and post-test photographs of the vehicle can be found in Appendix A.

**There was no structural damage to Hymotion battery following the impact or during any portion of the static rollover test. The average vehicle longitudinal crush was 251 millimeters.**

Tested to NHTSA and FMVSS standards with no damage to A123 battery, OEM component or test dummies. -- Calspan Corporation Final Report of October 2, 2007 Hymotion 2005 Toyota Prius Hybrid 30 MPH Rear Impact Test

# L5 PCM Testing and Performance

# INL Accelerated On-Road Testing

## Hymotion Prius – Accelerated Testing

| Cycle | Urban   | Highway | Charge | Reps | Total | Electricity      | Gasoline |       |
|-------|---------|---------|--------|------|-------|------------------|----------|-------|
| (mi)  | (10 mi) | (10 mi) | (hr)   | (N)  | (mi)  | kWh              | Gals     | MPG   |
| 10    | 1       | 0       | 4      | 60   | 600   | 136.33           | 4.81     | 127.2 |
| 20    | 1       | 1       | 8      | 30   | 600   | 122.02           | 5.37     | 115.9 |
| 40    | 4       | 0       | 12     | 15   | 600   | 84.10            | 6.05     | 101.1 |
| 40    | 2       | 2       | 12     | 15   | 600   | 87.22            | 5.78     | 106.9 |
| 40    | 0       | 4       | 12     | 15   | 600   | 79.82            | 8.54     | 73.1  |
| 60    | 2       | 4       | 12     | 10   | 600   | 55.33            | 8.98     | 68.9  |
| 80    | 2       | 6       | 12     | 8    | 640   | 43.99            | 11.36    | 58.3  |
| 100   | 2       | 8       | 12     | 6    | 600   | 35.98            | 8.43     | 73.2  |
| 200   | 2       | 18      | 12     | 3    | 600   | 15.0             | 11.02    | 54.8  |
| Total | 2540    | 3100    | 1404   | 167  | 5,440 | Weighted Average |          | 79.5  |

Each total distance slightly greater than 600 and 640 miles. HEV version = 44 mpg

Over 100 mpg in up to 40 mile trips with urban driving

Highway mpg lower, but close to 2x average over 5440 miles

*INL accelerated on-road testing validates 100 mpg capability*

# Google test results

## RechargeIT.org: A Google.org Project

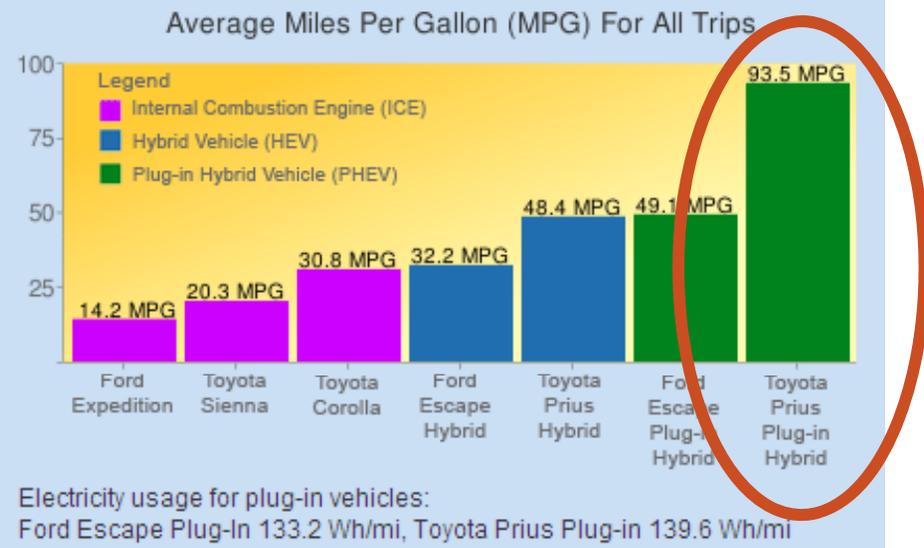


RechargeIT is a [Google.org](http://Google.org) initiative that aims to reduce CO2 emissions, cut oil use, and stabilize the electrical grid by accelerating the adoption of plug-in electric vehicles. We have a demonstration fleet of plug-ins at our headquarters in Mountain View, and we're collecting and posting data on plug-in performance, investing in innovative technologies, and advocating for the passage of important legislation. Our vision is that one day thousands of cars will be plugging into a greener grid.

### RechargeIT Driving Experiment

We've had our RechargeIT plug-ins on the road for about a year now, collecting data when driven by Google employees in our free car-share program. But we wanted to see how they would perform in a controlled test. The results of our seven-week driving experiment are in – and the plug-ins did great, getting as much as 93 MPG average across all trips, and 115 MPG for city trips! [See the full results](#) to explore detailed data from the experiment. (And check back often as we'll be posting even more comprehensive data from our test over the next few weeks.)

[See full results »](#)



# L5 PHEV Supplemental Conversion Battery Warranty

1. Term of warranty: **5-years or 75,000 miles** on Hymotion PCM.
2. Meets the requirements of May 28<sup>th</sup> approved Appendix B to the **“CALIFORNIA CERTIFICATION AND INSTALLATION PROCEDURES FOR OFF-VEHICLE CHARGE CAPABLE CONVERSION SYSTEMS FOR 2000 AND SUBSEQUENT MODEL YEAR HYBRID ELECTRIC VEHICLES”**
3. Additional language added to protect the customer in the event of future warranty claims on the Prius OEM battery and emissions system: ***“In the event you make a warranty claim to Toyota for either a failure of your emission control system during the 15 year warranty period from the date of original purchase or a failure of the Toyota original equipment battery during the 10 year warranty period from the date of original purchase, and Toyota rejects such a claim on the basis that the Product has been the direct or indirect cause of such a system failure, A123 will cause such repair to be made and in consideration assume the rights to any claims you may have against Toyota.”***

# Summary: Incentives in support of Hymotion PCM in CA



- As presented here, product has real impact on vehicle performance; doubling fuel efficiency, reducing greenhouse gas emissions, and reducing California's petroleum dependence.
- Current product cost is most significant barrier to greater scale and market expansion.
  - Financial Incentives needed to reduce initial capital requirements for Hymotion customers.
- Product is commercially available today at one of 4 installers in CA ; 13 nationwide.

# For more information

Websites: [www.hymotion.com](http://www.hymotion.com)  
[www.a123systems.com](http://www.a123systems.com)

