Advanced Vehicle Testing and Evaluation

**Final Report
October 1, 2005-March 31, 2013**

Prepared for

**US Department of Energy
Vehicle Technologies Office**

Prepared by

Clarity Group, Inc.

**Principal Investigator
Thomas Garetson**

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Clarity Group, Inc.
DBA **ECOTality North America**
430 S. 2nd Avenue
Phoenix, Arizona 85003
(602) 716-9576

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Executive Summary

The objective of the United States (U.S.) Department of Energy's (DOEs) Advanced Vehicle Testing and Evaluation (AVTE) project, part of the Vehicle Technologies Office, contract DE-FC26-05NT42486, was to provide test and evaluation services for advanced technology vehicles, to establish a performance baseline, to determine vehicle reliability, and to evaluate vehicle operating costs in fleet operations.

Vehicles tested include light and medium-duty vehicles in conventional, hybrid, and all-electric configurations using conventional and alternative fuels, including hydrogen in internal combustion engines. Vehicles were tested on closed tracks and chassis dynamometers, as well as operated on public roads, in fleet operations, and over prescribed routes. All testing was controlled by procedures developed specifically to support such testing. Testing and evaluations were conducted in the following phases:

- Development of test procedures, which established testing procedures;
- Baseline performance testing, which established a performance baseline;
- Accelerated reliability testing, which determined vehicle reliability;
- Fleet testing, used to evaluate vehicle economics in fleet operation, and
- End of test performance evaluation.

Test results are reported by two means and posted by Idaho National Laboratory (INL) to their website: quarterly progress reports, used to document work in progress; and final test reports. This final report documents work conducted for the entirety of contract DE-FC26-05NT42486 by the Clarity Group, Inc., doing business as ECotality North America (ECotality).

The contract was performed from 1 October 2005 through 31 March 2013, and includes 19 amendments to the original award with the most recent Amendment 019 dated 31 March 2012.

The final budget for the AVTA project totaled \$10,797,679. As a cooperative agreement, Clarity Group, Inc. was to provide cost share of \$2,138,585, leaving \$8,659,094 as the Federal share of the agreement.

Actual total expenditure for the AVTA project was \$11,147,952. The full \$8,659,094 Federal share was expended and \$2,488,858 of cost share was provided by Clarity Group, Inc. This resulted in an over-share of \$350,273.

There were 113 light-duty on-road (95), off-road (3) and low speed (15) vehicles tested. The breakdown of these vehicles is shown in Table 1.

Table 1- Fleet Vehicle Final Status, October 1, 2005 – March 31, 2013

Vehicle Count	VIN#	Vehicle	Vehicle Type	Task 2	Task 3/4	Initial Mileage	End Mileage	Total Miles Accumulated	Average Fuel Economy (mpg)	Baseline Data Sheet Published	Battery Beg of Life Published	Battery End of Life Published
1	#8237	2005 Escape Hybrid	HEV	2.06	4.03	0	160,274	160,274	26.2	2006		Jul-09
2	#5881	2005 Escape Hybrid	HEV	2.06	4.03	0	160,000	160,000	27.9			Jul-09
3	#1096	2005 Accord Hybrid	HEV	2.05	4.05	0	160,093	160,093	27.7	2005	2006	Jul-09
4	#0657	2005 Accord Hybrid	HEV	2.05	4.05	0	160,166	160,166	28.5		2006	Jul-09
5	#5681	2006 Highlander Hybrid	HEV	2.01, 2.02	4.01	0	159,888	159,888	23.8	Feb-07	Feb-10	Feb-10
6	#6395	2006 Highlander Hybrid	HEV	2.02	4.01	0	160,344	160,344	24.9		Feb-10	Feb-10
7	#3344	2007 Saturn Vue Hybrid	HEV	2.23	4.11	0	152,280	152,280	25.7		2008	n/a
8	#8122	2007 Saturn Vue Hybrid	HEV	2.22, 2.23	4.11	0	102,934	102,934	27.1	Jun-07	2008	n/a
9	#9329	2006 Honda Civic Hybrid	HEV	2.15	4.07	0	160,835	160,835	38.9	Feb-07		Jul-09
10	#8725	2006 Honda Civic Hybrid	HEV	2.15	4.07	0	160,711	160,711	39.2			Jan-09
11	#9664	2005 Silverado 4WD Hybrid	HEV	2.07	4.02	0	160,037	160,037	17.8	2005	2006	2008
12	#9284	2005 Silverado 2WD Hybrid	HEV	2.07	4.02	0	160,539	160,539	18.0		2006	2008
13	#2575	2006 Lexus 400H AWD	HEV	2.08, 2.09	4.04	0	160,111	160,111	23.1		Feb-10	Feb-10
14	#4807	2006 Lexus 400H AWD	HEV	2.08	4.04	0	160,531	160,531	23.1	Jan-07	Feb-10	Feb-10
15	#6330	2007 Camry Hybrid	HEV	2.17	4.08	0	160,035	160,035	34.1	Feb-07	Feb-10	Feb-10
16	#7129	2007 Camry Hybrid	HEV	2.16, 2.17	4.08	0	160,231	160,231	34.1		Feb-10	Feb-10
17	#0301	2006 Lexus 400H FWD	HEV		4.09	32,024	36,362	4,338	26.5	n/a	n/a	n/a
18	#1052	2004 Prius	HEV	2.04	4.23	0	160,274	160,274	44.8	2004		Jul-09
19	#2721	2004 Prius	HEV	2.04	4.23	0	160,115	160,115	43.8			Jul-09
20	#2351	2007 Altima Hybrid	HEV	2.25	4.12	0	160,633	160,633	29.8		Mar-10	Mar-10
21	#7982	2007 Altima Hybrid	HEV	2.24, 2.25	4.12	0	161,596	161,596	29.7	May-08	Mar-10	Mar-10
22	#5170	2008 Tahoe Hybrid	HEV	2.29	4.14	0	160,069	160,069	21.7	Oct-08	Jul-09	Apr-12
23	#7400	2008 Tahoe Hybrid	HEV	2.28, 2.29	4.14	0	160,124	160,124	21.4	Oct-08	Jul-09	Apr-12
24	#5670	2008 BMW Mini-E	BEV	2.34, 2.35	3.12	0	3,686	3,686	104.1 miles @65mph**	Mar-10	n/a	n/a
25	#1181	2009 Escape PHEV (Ford CRADA)	PHEV	2.40, 2.41	4.20	1,826	65,423	63,597	38.0			
26	#0141	2010 Insight EX	HEV	2.32, 2.33	4.16	0	160,172	160,172	40.4	Dec-09	Oct-09	Jan-13
27	#1748	2010 Insight LX	HEV	2.32, 2.34	4.16	0	160,015	160,015	39.5	Dec-09	Oct-09	Jan-13
28	#4699	2010 Ford Fusion Hybrid	HEV	2.36	4.18	0	74,964	74,964	33.8	Dec-09	Nov-09	n/a
29	#4757	2010 Ford Fusion Hybrid	HEV	2.36	4.18	0	160,110	160,110	35.5	Dec-09	Sep-09	Jan-13
30	#0462	2010 Prius	HEV	2.42	4.22	0	160,150	160,150	45.4	Dec-09	Oct-09	Jan-13
31	#6063	2010 Prius	HEV	2.42	4.22	0	160,160	160,160	43.1	Dec-09	Oct-09	Jan-13
32	#6231	2010 Merc. S400 Hybrid*	HEV	2.49	4.21	21	132,123	132,102	26.1	Mar-10		
33	#5883	2011 Merc. S400 Hybrid	HEV	2.49	4.21	23	160,478	160,455	25.6	Mar-10		
34	#5577	2010 Honda Civic (UBC)	HEV	2.73, 2.74	4.38	11	97,875	97,864	n/a	May-12	Sep-12	Jun-13
35	#2982	2011 Honda CR-Z Hybrid	HEV	2.81, 2.82	4.29	72	121,783	121,711	35.4	May-12	Sep-12	DE-EE0005901
36	#4466	2011 Honda CR-Z Hybrid	HEV	2.81, 2.82	4.29	52	129,551	129,499	37.1	May-12	Sep-12	DE-EE0005901
37	#5777	2010 Volkswagen Golf Diesel	S/S	2.51, 2.54	4.24	24	103,642	103,618	43.5	May-12	n/a	n/a
38	#8111	2010 Volkswagen Golf Diesel	S/S	2.51, 2.54	4.24	11	99,036	99,025	42.9	May-12	n/a	n/a
39	#1865	2010 Mazda3 Hatchback	S/S	2.52, 2.55	4.25	19	108,787	108,768	28.8	May-12	n/a	n/a
40	#2736	2010 Mazda3 Hatchback	S/S	2.52, 2.55	4.25	29	116,785	116,757	28.2	May-12	n/a	n/a
41	#6644	2010 Smart4Two *	S/S	2.53, 2.56	4.26	9	58,876	58,867	36.3	May-12	n/a	n/a
42	#6659	2010 Smart4Two *	S/S	2.53, 2.56	4.26	9	49,578	49,570	36.8	May-12	n/a	n/a
43	#6476	2010 Smart4Two	S/S		3.13	6	42,760	42,754	37.0	May-12	n/a	n/a
44	#0178	2011 Nissan Leaf-HQ	BEV		3.23	12	15,187	15,175	n/a	n/a	n/a	n/a
45	#0356	2011 Nissan Leaf	BEV	2.59, 2.60	4.31	3	22,606	22,603	65.3 miles @60mph**	Jan-13	Jan-13	Jun-13
46	#0815	2011 Chevy Volt	PHEV	2.75, 2.76	4.39	25	26,898	26,873	31.0 miles @60mph**	Jan-13	Jan-13	Jun-13
47	#0914	2011 Chevy Volt-HQ	PHEV		3.23	25	27,705	27,680	n/a	n/a	n/a	n/a
48	#3539	2011 Hyundai Sonata Hybrid	HEV	2.57, 2.58	4.27	12	145,916	145,904	34.0	May-12	Sep-12	DE-EE0005901
49	#4932	2011 Hyundai Sonata Hybrid*	HEV	2.57, 2.58	4.27	12	120,507	120,495	33.9	May-12	Sep-12	Jun-13
50	#8916	IWHUP HICE 5000	HICE		4d	0	31,221	31,221	13.5 mpgge	n/a	n/a	n/a
51	#0409	IWHUP HICE 5445	HICE		3.05	0	16,417	16,417	13.5 mpgge	n/a	n/a	n/a
52	#2843	IWHUP HICE 5561	HICE		3.05	0	13,458	13,458	13.5 mpgge	n/a	n/a	n/a
53	#1292	IWHUP HICE 5562	HICE		3.05	0	17,288	17,288	13.5 mpgge	n/a	n/a	n/a
54	#5684	IWHUP HICE 5563	HICE		3.05	0	25,373	25,373	13.5 mpgge	n/a	n/a	n/a
55	#1319	IWHUP HICE 5564	HICE		3.05	0	11,550	11,550	13.5 mpgge	n/a	n/a	n/a
56	#0975	IWHUP HICE 5565	HICE		3.05	0	18,064	18,064	13.5 mpgge	n/a	n/a	n/a
57	#1945	IWHUP HICE 5566	HICE		3.05	0	15,278	15,278	13.5 mpgge	n/a	n/a	n/a
58	#0945	IWHUP HICE 5567	HICE		3.05	0	18,087	18,087	13.5 mpgge	n/a	n/a	n/a
59	#9148	HICE-SC Truck	HICE		3.07	0	8,472	8,472	13.5 mpgge	n/a	n/a	n/a
60	#5823	HICE-NY RED	HICE		3.07	0	26,417	26,417	13.5 mpgge	n/a	n/a	n/a
61	#7156	HICE-NY BLUE	HICE		3.07	0	14,096	14,096	13.5 mpgge	n/a	n/a	n/a
62	#8841	2006 Energy CS PHEV	PHEV	2.10, 2.12, 2.13	3.06	0	17,330	17,330	51.0***	Jun-07	n/a	n/a
63	#9616	2003 Kangoo PHEV	PHEV	2.46	3.08	0	14,207	14,207	42.4***	May-08	n/a	n/a
64	#8820	2007 HyMotion Prius Gen I PHEV	PHEV		3.09	0	9,344	9,344	79.5***	Jun-07	n/a	n/a
	#8820	2007 HyMotion Prius Gen II PHEV	PHEV	2.11	3.09	9,344	18,698	9,354	48.0***	Dec-09	n/a	n/a
65	#0175	2007 HyMotion Escape PHEV	PHEV	2.10	3.04	0	18,038	18,038	42.5***	Dec-08	n/a	n/a
66	#7842	2007 Electrova Escape PHEV	PHEV	2.10, 2.11	3.04	0	14,121	14,121	36.7***	May-08	n/a	n/a
67	#8810	2007 Hybrids Plus Escape PHEV	PHEV	2.10, 2.12	3.04	0	6,455	6,455	38.0***	Jul-09	n/a	n/a
68	#2610	2007 E-85 Hybrid Escape	HEV		5.03	0	2,362	2,362	n/a	n/a	n/a	n/a
72	4	HCNG Fleet	CNG		4a	0	158,223	158,223	n/a	n/a	n/a	n/a
73	#1505	2006 Roush REV Truck	BEV		4e	0	8,068	8,068	n/a	n/a	n/a	n/a
74	#4601	F-150 with 2 Valve HICE Engine	HICE		3a	0	15,181	15,181	n/a	2005	n/a	n/a
75	#0528	F-150 with 4 Valve HICE Engine	HICE	2.a	3.c	0	12,791	12,791	12.3 mpgge	n/a	n/a	n/a
85	10	NEVs	NEV	2.48		0	0	0	n/a	n/a	n/a	n/a
90	5	USPS Vehicles	BEV		3.20	0	0	0	n/a	n/a	n/a	n/a
110	20	SCAQMD Quantum Escape Fleet	PHEV		4.42	0	150,068	150,068	35.0	n/a	n/a	n/a
111	1	eGSE Pushback Tractor	eGSe		2.b	0	0	0	n/a	n/a	n/a	2006
113	2	eGSE Demonstration Project	eGSE		3.17	0	0	0	n/a	n/a	n/a	n/a
		Vehicle engine/battery failure/removed from testing					TOTAL:	6,639,994				
		** Charge-Depleting Electric Range										
		*** Accelerated Testing Only										

Approach

The AVTA requirements included detailed evaluations of advanced vehicles and technologies, as well as coordinated and participated in demonstrations of specific advanced vehicles. The period of performance for this cooperative agreement was from October 2005 through March 2013

Each AVTA vehicle evaluation consists of following tasks;

- Baseline Vehicle Performance Testing
- Baseline Battery Performance Testing
- Fleet Vehicle Testing
- Accelerated Vehicle Testing
- Final Battery Performance Testing

Vehicles evaluated were predominantly HEVs, with an increased emphasis on PHEVs, BEVs and NEVs. This supported of the California Air Resources Board (CARB), which necessitates evaluating these vehicle types, as well. The AVTA also conducted evaluations of HICE vehicles in the fleet evaluation program.

The work program was divided into five tasks:

- **Task 1** – Consisted of the development and modification of procedures to support testing
 - Over the AVTA period of performance, test procedures utilized for testing advanced vehicle types were created and updated. As technologies advanced in vehicle testing, the procedures to properly test the vehicles were updated, as well. Further refinements to the procedures will occur with AVTE. The AVTA procedures can be found at the bottom of each webpage:
 - <http://avt.inel.gov/hev.shtml>
 - <http://avt.inel.gov/fsev.shtml>
 - <http://avt.inel.gov/nev.shtml>
 - <http://avt.inel.gov/hydrogen.shtml>
 - <http://avt.inel.gov/pdf/phev/phevtestplan.pdf> (procedures listed in the appendix of the weblink)
 - <http://avt.inel.gov/groundsupport.shtml>

- **Task 2** – Consisted of the conduct of baseline testing, including battery capacity
 - The baseline vehicle testing is conducted at closed test tracks located near Phoenix, AZ, vehicle fuel economy testing at Argonne National Laboratory on their chassis dyno, battery capacity testing at Clarity Group, Inc., fleet testing in a local Phoenix courier delivery fleet, and end-of-life testing at Clarity Group, Inc.
 - Closed test track testing consists of the following test procedures (the hybrid electric vehicle procedures are shown below):
 - <http://avt.inel.gov/pdf/hev/http001r2.pdf>
 - <http://avt.inel.gov/pdf/hev/http002ra.pdf>
 - <http://avt.inel.gov/pdf/hev/http003ra.pdf>
 - <http://avt.inel.gov/pdf/hev/http004r1.pdf>
 - <http://avt.inel.gov/pdf/hev/http005ra.pdf>
 - <http://avt.inel.gov/pdf/hev/http006r2.pdf>
 - <http://avt.inel.gov/pdf/hev/http007ra.pdf>
 - <http://avt.inel.gov/pdf/hev/http008r1.pdf>
 - <http://avt.inel.gov/pdf/hev/http009ra.pdf>
 - <http://avt.inel.gov/pdf/hev/http010ra.pdf>
 - <http://avt.inel.gov/pdf/hev/http011r1.pdf>
 - <http://avt.inel.gov/pdf/hev/http012ra.pdf>
 - <http://avt.inel.gov/pdf/hev/http013r0.pdf>
 - Vehicle dynamometer testing conducted at Argonne National Laboratory consisted of the following test procedure (the hydrogen internal combustion engine vehicle procedure is shown below):
 - <http://avt.inel.gov/pdf/hydrogen/http03.pdf>
 - More information on dynamometer fuel economy testing at Argonne National Lab and recent vehicles tested can be found here:
 - http://www.transportation.anl.gov/D3/pdfs/ANL_APRF_DynoTestingReference_April2013.pdf
 - <http://www.transportation.anl.gov/D3/>
 - Baseline battery testing conducted at Clarity Group, Inc. and consists of battery capacity and power testing with the following test procedures:
 - http://avt.inel.gov/battery/pdf/usabc_manual_rev2.pdf
 - http://avt.inel.gov/energy_storage/lib.shtml
 - End-of-life battery testing conducted at Clarity Group, Inc. and consists of battery capacity and power testing to determine battery degradation over the fleet testing period utilizing the following test procedures:
 - http://avt.inel.gov/battery/pdf/usabc_manual_rev2.pdf
 - http://avt.inel.gov/energy_storage/lib.shtml
- **Task 3** – Consisted of the conduct of accelerated testing for vehicles requiring specialized fueling infrastructure
 - Accelerated testing is conducted over controlled routes on public roads with Clarity Group, Inc. drivers
 - Accelerated fleet testing was conducted over approximately 5,400 miles and in accordance with the schedule shown in tables 2-5.

- **Task 4** – Consisted of the conduct of fleet testing for vehicles using conventional fueling infrastructure.
 - Fleet testing is conducted on public roads and in conjunction with a private fleet operator
 - Fleet testing accumulates 160,000 miles of real-world use
 - While accumulating miles, the fleet testing also collects vehicle fuel use, maintenance, and repair information and costs from the fleet operator
 - A Clarity Group, Inc. fleet coordinator utilizes the following procedure to work with the fleet (hybrid example shown):
 - http://avt.inel.gov/pdf/hev/fep_001_r0.pdf
- **Task 5** – Consisted of the conduct of tasks as assigned by the DOE technical representative or contract manager

Vehicle baseline test and battery test reports were produced and distributed from Baseline Performance Testing. Detailed evaluation reports containing data analysis were produced for Fleet and Accelerated Testing. All AVTA-produced documents were posted to the AVTA website of the INL.

In addition to vehicle testing and evaluation, a limited number of non-vehicle tasks were conducted as part of this cooperative agreement. Those tasks include an advanced battery demonstration project with electric Ground Support equipment (eGSE) and the baseline testing of eGSE.

Discussion of Results

Task 1 – Procedure Development

Task 1.a: Airport Ground Support Equipment (GSE) Baseline Test Procedures

Develop test procedures for Baseline Performance Testing of an electric pushback tractor. Testing shall be based upon Vehicle Specifications developed under agreement DE-FC07-00ID13859.

Deliverable: Electronic copy of *Electric Pushback Tractor Baseline Test Procedures*.

Status: This task has been completed. The Procedures have been posted to the AVTA website.

<http://avt.inel.gov/groundsupport.shtml>

eGSE America Test Specifications and Procedures

The following specifications contain the minimum requirements for baseline performance testing:

- Electric Aircraft Cargo Conveyor (EACC) - August 2005 ([PDF 69KB](#))
- Electric Aircraft PushBack Tractor (EAPT) - June 2008 ([PDF 112KB](#))
- Electric Baggage Tow Tractor (EBTT) - August 2004 ([PDF 136KB](#))
- ETA-GAC001 Control, Close-out, and Storage of Documentation ([PDF 36KB](#))
- ETA-GAC002 Control of Test Conduct ([PDF 98KB](#))
- ETA-GAC003 Preparation and Issuance of Test Reports ([PDF 33KB](#))
- ETA-GAC004 Review of Test Results ([PDF 40KB](#))
- ETA-GAC005 Training and Certification Requirements for Personnel Utilizing ETA Procedures ([PDF 36KB](#))
- ETA-GAC006 Receipt Inspection ([PDF 60KB](#))
- ETA-GAC007 Control of Measuring and Test Equipment (M&TE) ([PDF 45KB](#))
- ETA-GTP001 Vehicle Verification ([PDF 183KB](#))
- ETA-GTP002 Traction System Test ([PDF 188KB](#))
- ETA-GTP003 Battery Capacity and Depth of Discharge Test ([PDF 99KB](#))
- ETA-GTP004 Electromagnetic Interference and Susceptibility Test ([PDF 96KB](#))
- ETA-GTP005 Battery Charger Performance ([PDF 97KB](#))

Task 1.01: Hybrid Electric Vehicle (HEV) Battery Test Procedures

Develop test procedures for HEV battery end-of-life testing. Procedures shall utilize US Advance Battery Consortium (USABC) test guidance as appropriate for capacity and hybrid pulse power test procedure development.

Deliverable: Electronic copy of HEV Battery Test Procedures.

Status: Procedures have been developed and trialed in round-robin testing with INL. Feedback from INL has been incorporated to improve usefulness of results. Revisions incorporated minor changes to static capacity and HPPC testing. PHEV and mild hybrid (42 volt) battery test procedures have been completed. The Procedures have been posted to the AVTA website.

http://avt.inel.gov/energy_storage_lib.shtml

Task 1.02: Plug-In HEV Baseline Test Procedure

Develop vehicle specifications and baseline test procedures to conduct Baseline Performance Testing of a plug-in hybrid electric vehicle (PHEV). Specifications and procedures shall incorporate applicable HEV America requirements.

Deliverable: Electronic copy of plug-in HEV Vehicle Specifications and Baseline Test Procedures.

Status: This task has been completed. The Procedures have been posted to the AVTA website.

<http://avt.inel.gov/phev.shtml>

Task 1.03: Enhanced HEV Baseline Test Procedure (ANL)

Revise HEV Baseline Test Procedures to incorporate requirements for dynamometer testing at Argonne National Laboratory (ANL).

Deliverable: Electronic copy of revised HEV Baseline Test Procedures.

Status: This task has been completed. The Procedures have been posted to the AVTA website.

<http://avt.inel.gov/hev.shtml>

Hybrid Electric Vehicle EVAmerica Procedures:

- HEV Baseline Test Sequence ([PDF 39KB](#))
- HEV End Of Life Test Sequence ([PDF 27KB](#))
- ETA-HTP01 Implementation of SAE Standard J1263 - Road Load Measurement and Dynamometer Simulation Using Coast Down Techniques ([PDF 114KB](#))
- ETA-HTP02 Implementation of SAE Standard J1666 May 93 - Hybrid Electric Vehicle Acceleration, Gradeability, and Deceleration Test Procedure ([PDF 225KB](#))
- ETA-HTP03 Implementation of SAE J1634 May 93 - Electric Vehicle Energy Consumption and Range Test Procedure ([PDF 96KB](#))
- ETA-HTP04 Hybrid Electric Vehicle Constant Speed Range Tests ([PDF 70KB](#))
- ETA-HTP05 Hybrid Electric Vehicle Rough Road Course Test ([PDF 63KB](#))
- ETA-HTP06 Braking Test ([PDF 83KB](#))
- ETA-HTP07 Road Course Handling Test ([PDF 86KB](#))
- ETA-HTP08 Rechargeable Energy Storage System (RESS) Charging ([PDF 47KB](#))
- ETA-HTP09 Measurement and Evaluation of Magnetic Fields (EMF) and Electromagnetic Radiation (EMI) Generated by Hybrid Electric Vehicles ([PDF 160KB](#))
- ETA-HTP10 Measurement and Evaluation of Hybrid Electric Vehicle Battery Charger Performance ([PDF 55KB](#))
- ETA-HTP11 Vehicle Verification ([PDF 79KB](#))
- ETA-HTP12 Evaluation of Hybrid Electric Vehicle Energy Management System(s) [EMS] ([PDF 50KB](#))
- ETA-HTP13 Onboard Generator Energy Efficiency Test ([PDF 46KB](#))
- ETA-HAC01 Control, Close-out and Storage of Documentation ([PDF 44KB](#))
- ETA-HAC02 Control of Test Conduct ([PDF 48KB](#))
- ETA-HAC03 Preparation of Issuance of Test Reports ([PDF 42KB](#))
- ETA-HAC04 Review of Test Results ([PDF 49KB](#))
- ETA-HAC05 Training and Certification Requirements for Personnel Utilizing ETA Procedures ([PDF 44KB](#))
- ETA-HAC06 Receipt Inspection ([PDF 73KB](#))
- ETA-HAC07 Control of Measuring and Test Equipment (M&TE) ([PDF 54KB](#))
- ETA-HQA01 Audit of the Quality Assurance Program for the Control and use of Measuring and Test Equipment ([PDF 63KB](#))
- ETA-HQP01 Quality Program ([PDF 53KB](#))

Task 1.04: Enhanced HEV Fleet Test Procedure

Revise HEV Fleet Test Procedures to incorporate requirements for additional data collection to support vehicle modeling conducted by Argonne National Laboratory.

Deliverable: Electronic copy of revised HEV Fleet Test Procedures.

Status: Process updates made previously for AVTA fleet testing were conducted with onboard data loggers. All fleet data was transmitted monthly to INL. The Fleet test procedure will be updated to reflect a new process for future testing.

Task 1.05: 2007 Procedure Updates & Revisions

Update HEV, PHEV, and HICE Vehicle Specifications and Baseline Test Procedures based upon lessons learned from testing conducted in 2007.

Deliverable: Electronic copy of updated Vehicle Specifications and Baseline Test Procedures.

Status: This task has been completed. Work conducted in 2007 includes reformatting HEV procedures to new AVTA format, updating NEV procedures following completion of testing in Task 2d, and maintaining HEV fleet procedures as data is collected using electronic data recorders. Significant changes to Data Logger procedures include an additional test sequence following installation of the data logger, which validates recorder data by running various vehicle operations under a test sequence to allow for collection and review of "test data" prior to release to fleet with scheduled uploads. A revised NEV Vehicle Specification was prepared and posted to the INL website.

Task 1.06: 2008 Procedure Updates & Revisions

Update HEV, PHEV, and HICE Vehicle Specifications and Baseline Test Procedures based upon lessons learned from testing conducted in 2008.

Deliverable: Electronic copy of updated Vehicle Specifications and Baseline Test Procedures.

Status: This task is complete. Work conducted in 2008 includes posting reformatted HEV procedures (significant changes to coastdown procedure and deletion of wet braking). HEV procedures were amended to reflect moving to the Volvo proving ground for Baseline Performance testing. NEV procedures have been updated and posted to the INL website.

Task 1.07: 2009 Procedure Updates & Revisions

Update HEV, PHEV, and HICE Vehicle Specifications and Baseline Test Procedures based upon lessons learned from testing conducted in 2009.

Deliverable: Electronic copy of updated Vehicle Specifications and Baseline Test Procedures.

Status: NEV test procedures have been updated based on recent testing. Changes were updated, reviewed by INL, and posted to the AVTA website.

Task 1.08: (Added in A015) 2010 Procedure Updates and Revisions

Update BEV, HEV, PHEV, and HICE Vehicle Specifications and Baseline Test Procedures based upon lessons learned from testing conducted in 2010.

Deliverable: Electronic copy of updated Vehicle Specifications and Baseline Test Procedures.

Status: This task has been completed. Internal updates to procedures were conducted throughout the year and submitted to INL for posting on the AVTA website.

Task 1.09: 2011 & 2012 Procedure Updates and Revisions

Update BEV, HEV, PHEV, and HICE Vehicle Specifications and Baseline Test Procedures based upon lessons learned from testing conducted in 2011.

Deliverable: Electronic copy of updated Vehicle Specifications and Baseline Test Procedures.

Status: BEV, PHEV, HEV, and HICE test procedures have been reorganized and are ready for review and implementation as common procedures for all vehicle types with the AVTE contract.

Task 2 – Baseline Performance Testing

Task 2.a: HICE F-150 4V Baseline Test

Conduct Baseline Performance Testing of a Ford F-150 pickup truck equipped with a 4-valve HICE engine using Hydrogen Internal Combustion Engine Vehicle (HICEV) America test procedures developed under agreement DE-FC07-00ID13859.

Deliverable: Electronic copy of HICEV America Summary Data Sheet.

Status: This task has been completed. The Summary Data Sheet has been posted to the AVTA website.

http://avt.inel.gov/pdf/hydrogen/f150_32v_hice_fact.pdf

Task 2.b: GSE Baseline Testing - FMC Pushback Tractor

Conduct Baseline Performance Testing of an electric pushback tractor using GSEAmerica test procedures developed under agreement DE-FC07-00ID13859.

Deliverable: Electronic copy of GSEAmerica Summary Performance Data Sheet.

Status: This task has been completed. The Summary Data Sheet has been posted to the AVTA website.

<http://avt.inel.gov/pdf/airport/pushbackTractorFactSheet.pdf>

Task 2.c: HICE Silverado Baseline Test

Conduct Baseline Performance Testing of an HICE Chevrolet 3v Roush Silverado pickup truck using HICEVAmerica test procedures developed under agreement DE-FC07-00ID13859.

Deliverable: Electronic copy of HICEVAmerica Summary Data Sheet.

Status: This task has been completed. The Summary Data Sheet has been posted to the AVTA website.

http://avt.inel.gov/pdf/hydrogen/roush_hev_fact.pdf

Task 2.d: Neighborhood Electric Vehicle (NEV) Roush Electric Vehicle Baseline Test

Conduct Baseline Performance Testing of a NEV Roush Electric Vehicle using NEVAmerica test procedures developed under agreement DE-FC07-00ID13859.

Deliverable: Electronic copy of NEVAmerica Summary Data Sheet.

Status: This task has been completed. The Summary Data Sheet has been posted to the AVTA website.

<http://avt.inel.gov/pdf/nev/roush2008nevamerica.pdf>

Task 2.01: HEV Highlander Baseline Testing (1 Baseline Test w/ANL Dyno and 2 Battery Pre-Tests)

Conduct Baseline Performance Testing of one Toyota Highlander HEV using previously prepared HEVAmerica test procedures. Dynamometer testing shall be conducted by Argonne National Laboratory. Conduct Battery Baseline Pre-Testing of two Toyota Highlander HEVs.

Deliverable: Electronic copy of HEVAmerica Summary Data Sheet and battery test results.

Status: This task has been completed. The Summary Data Sheet has been posted to the AVTA website. The battery baseline test results are included in the reports located under Task 2.02.

<http://avt.inel.gov/pdf/hev/factHighlander2006.pdf>

Task 2.02: 2 HEV Highlander End-of-Life Baseline Testing (Battery Post Test)

Conduct Battery Baseline Post Testing of two Highlander vehicles.

Deliverable: Electronic copy of end-of-life battery test results.

Status: This task has been completed. The Test Results and Summary Data Sheet have been posted to the AVTA website.

<http://avt.inel.gov/pdf/hev/batteryhighlander5681.pdf>

2006 Toyota Highlander-5681 Hybrid Electric Vehicle Battery Test Results

<http://avt.inel.gov/pdf/hev/batteryhighlander6395.pdf>

2006 Toyota Highlander-6395 Hybrid Electric Vehicle Battery Test Results

Task 2.04: 2 HEV Prius End-of-Life Baseline Testing (Battery Post Test)

Conduct Battery Baseline Post Testing of two Hybrid Prius vehicles.

Deliverable: Electronic copy of end-of-life battery test results.

Status: This task has been completed. The Test Results and Summary Data Sheet have been posted to the AVTA website.

<http://avt.inel.gov/pdf/hev/batteryprius1052.pdf>

<http://avt.inel.gov/pdf/hev/batteryprius2721.pdf>

Task 2.05: 2 HEV Honda Accord End-of-Life Baseline Testing (Battery Post Test)

Conduct Battery Baseline Post Testing of two Honda Accord vehicles.

Deliverable: Electronic copy of end-of-life battery test results.

Status: This task has been completed. The Test Results and Summary Data Sheet have been posted to the AVTA website.

<http://avt.inel.gov/pdf/hev/batteryaccord0657.pdf>

<http://avt.inel.gov/pdf/hev/batteryaccord1096.pdf>

Task 2.06: 2 HEV Escape End-of-Life Baseline Testing (Battery Post Test)

Conduct Battery Baseline Post Testing of two Ford Escape vehicles.

Deliverable: Electronic copy of end-of-life battery test results.

Status: This task has been completed. The Test Results and Summary Data Sheet have been posted to the AVTA website.

<http://avt.inel.gov/pdf/hev/batteryescape5881.pdf>

<http://avt.inel.gov/pdf/hev/batteryescape8237.pdf>

Task 2.07: 2 HEV Silverado End-of-Life Baseline Testing (Battery Post Test)

Conduct Battery Baseline Post Testing of two Silverado vehicles.

Deliverable: Electronic copy of end-of-life battery test results.

Status: Battery testing data was shown to be invalid due to in-vehicle failures. No report was released due to vehicle failures.

Task 2.08: 2 HEV 400h Lexus End-of-Life Baseline Testing (Battery Post Test)

Conduct Battery Baseline Post Testing of two 400 H Lexus vehicles.

Deliverable: Electronic copy of end-of-life battery test results.

Status: This task has been completed. The Test Results and Summary Data Sheet have been posted to the AVTA website.

<http://avt.inel.gov/pdf/hev/batterylexus2575.pdf>

2006 Lexus RX400h-2575 Hybrid Electric Vehicle Battery Test Results

<http://avt.inel.gov/pdf/hev/batterylexus4807.pdf>

2006 Lexus RX400h-4807 Hybrid Electric Vehicle Battery Test Results

**Task 2.09 (Added per A003, April 2006): HEV Lexus 400h Baseline Testing
(1 Baseline Test w/ANL Dyno and 2 Battery Pre-Tests)**

Conduct Baseline Performance Testing of one Lexus 400h HEV using previously prepared HEVAmerica test procedures. Dynamometer testing shall be conducted by Argonne National Laboratory. Conduct Battery Baseline Pre-Testing of two Lexus 400h HEVs.

Deliverable: Printed and electronic copy of HEVAmerica Summary Data Sheet.

Status: This task has been completed. The Summary Data Sheet has been posted to the AVTA website. The battery baseline test results are included in the reports located under Task 2.08.

<http://avt.inel.gov/pdf/hev/lexus2006.pdf>

Task 2.10: PHEV Baseline Testing (4 Baseline w/ANL Dyno)

Conduct Baseline Performance Testing of four (4) NYSERDA Plug-in Hybrid Electric Vehicles using test procedures developed in Task 1.2. Dynamometer testing shall be conducted by Argonne National Laboratory.

Deliverable: Electronic copy of PHEVAmerica Summary Data Sheet.

Status: Baseline tests for the Energy CS Prius, HyMotion Prius, Electrovaya Escape, and HyMotion Escape have been completed. The Summary Data Sheets have been posted to the AVTA website. The Hybrids Plus Escape has been returned to Hybrids Plus for repair and did not complete testing.

<http://avt.inel.gov/phev.shtm/>

<p>PHEVAMERICA U.S. DEPARTMENT OF ENERGY ADVANCED VEHICLE TESTING ACTIVITY</p> <p>Base Vehicle Description Make: Toyota Model: Prius Year: 2006 VIN: JTDKB20U767508841 Number of Passengers: 5 Hybrid Configuration: Series/Parallel</p>
<p>Energy CS Plug-In Hybrid</p>	<p>PHEVAMERICA U.S. DEPARTMENT OF ENERGY ADVANCED VEHICLE TESTING ACTIVITY</p> <p>Base Vehicle Description Make: Toyota Model: Prius Year: 2007 VIN: JTDKB20U577558820 Number of Passengers: 5 Hybrid Configuration: Series/Parallel</p>
<p>Hymotion Plug-In Hybrid</p>	<p>PHEVAMERICA U.S. DEPARTMENT OF ENERGY ADVANCED VEHICLE TESTING ACTIVITY</p> <p>Base Vehicle Description Make: Ford Model: Escape Year: 2007 VIN: 1FMYU59H37KA77842 Number of Passengers: 5 Hybrid Configuration: Series/Parallel</p>
<p>Electrovaya Plug-In Hybrid</p>	<p>PHEVAMERICA U.S. DEPARTMENT OF ENERGY ADVANCED VEHICLE TESTING ACTIVITY</p> <p>Base Vehicle Description Make: Ford Model: Escape Year: 2007 VIN: 1FMCU59H37KB70175 Number of Passengers: 5 Hybrid Configuration: Series/Parallel</p>
<p>Hymotion Plug-In Hybrid</p>	

Task 2.11: NYSERDA PHEV End-of-Life Baseline Testing (4 Battery Post Test)

Conduct Battery Baseline Post Testing of four plug-in hybrid vehicles.

Deliverable: Electronic copy of end-of-life battery test results.

Status: End-of-Life Battery testing for the HyMotion Escape was not conducted as its production was cancelled. The Electrovaya Escape was destroyed by fire before it could be tested. The Hybrids Plus Escape was recalled by Hybrids Plus before completion of accelerated testing. The second generation HyMotion Prius was substituted for the HyMotion Civic. The battery post-test report for the second generation Hymotion Prius conversion was submitted to INEL and posted to the AVTA website to satisfy this task.

<http://avt.inel.gov/pdf/phev/batterygenIIprius8820.pdf>

2007 Toyota Prius 8820 with Gen II Hymotion Prius Conversion Plug-In Hybrid Battery Test Results

Task 2.12: PHEV Energy CS Prius Baseline Testing (1 Baseline Test w/ANL Dyno)

Conduct Baseline Performance Testing of Energy CS Prius hybrid using test procedures developed in Task 1.2. Dynamometer testing shall be conducted by Argonne National Laboratory.

Deliverable: Electronic copy of PHEVAmerica Summary Data Sheet.

Status: This task has been completed. The Summary Data Sheet has been posted to the AVTA website.

<http://avt.inel.gov/pdf/phev/toyotaPriusHymotionFact.pdf>

Task 2.13: PHEV Energy CS Prius End-of-Life Testing (1 Battery Post Test/End of Life)

End-of-life testing following completion of 4,200 urban driving routes. Conduct Battery Testing of Energy CS Prius hybrid using test procedures developed in Task 1.02.

Deliverable: Electronic copy of PHEVAmerica Summary Data Sheet.

Status: This task has been completed. The battery post-test report has been completed, submitted to INL for review, then posted on the AVTA website.

**2007 Toyota Prius VIN 8841 with Energy CS
Conversion
Plug-In Hybrid Battery Test Results**

Task 2.14: Gen II Civic HEV Baseline Testing (1 Baseline Test w/ANL Dyno and 2 Battery Pre-Tests)

Conduct Baseline Performance Testing of one future HEV using previously prepared HEVAmerica test procedures. Dynamometer testing shall be conducted by Argonne National Laboratory. Conduct Battery Baseline Pre-Testing of two future HEVs.

Deliverable: Electronic copy of HEVAmerica Summary Data Sheet.

Status: This task has been completed. The Summary Data Sheet has been posted to the AVTA website. The battery baseline test results are included in the reports listed under Task 2.15.

<http://avt.inel.gov/pdf/hev/factCivic2006.pdf>

Task 2.15: 2 HEV Civic End-of-Life Baseline Testing (2 Battery Post Test)

Conduct Battery Baseline Post Testing of two Hybrid Civic vehicles.

Deliverable: Electronic copy of end-of-life battery test results.

Status: This task has been completed. The Test Results and Summary Data Sheet have been posted to the AVTA website.

<http://avt.inel.gov/pdf/hev/batterycivic8725.pdf>

<http://avt.inel.gov/pdf/hev/batterycivic9329.pdf>

Task 2.16: Toyota Camry Baseline Testing (1 Baseline Test w/ANL Dyno and 2 Battery Pre-Tests)

Conduct Baseline Performance Testing of one future HEV using previously prepared HEVAmerica test procedures. Dynamometer testing shall be conducted by Argonne National Laboratory. Conduct Battery Baseline Pre-Testing of two future HEVs.

Deliverable: Electronic copy of HEVAmerica Summary Data Sheet.

Status: This task has been completed. The Summary Data Sheet has been posted to the AVTA website. The battery baseline test results are included in the reports listed under Task 2.17.

<http://avt.inel.gov/pdf/hev/fact7129Camry07.pdf>

Task 2.17: 2 HEV Camry End-of-Life Baseline Testing (2 Battery Post Test)

Conduct Battery Baseline Post Testing of two Hybrid Camry vehicles.

Deliverable: Electronic copy of end-of-life battery test results.

Status: This task has been completed. The Test Results and Summary Data Sheets have been posted to the AVTA website.

<http://avt.inel.gov/pdf/hev/batterycamry6330.pdf>

2007 Toyota Camry-6330 Hybrid Electric Vehicle Battery Test Results

<http://avt.inel.gov/pdf/hev/batterycamry7129.pdf>

2007 Toyota Camry-7129 Hybrid Electric Vehicle Battery Test Results

Task 2.20: NYSERDA PHEV Battery Baseline Pre-Tests (2 Battery Pre-Tests)

Conduct Battery Baseline Pre-Testing of two PHEVs.

Deliverable: Electronic copy of battery test results.

Status: This task was cancelled due to inability to establish NYSERDA fleet.

Task 2.21: NYSERDA PHEV Battery Baseline Post-Tests (2 Battery Post-Tests)

Conduct Battery Baseline Pre-Testing of two PHEVs.

Deliverable: Electronic copy of battery test results.

Status: This task was cancelled due to inability to establish NYSERDA fleet.

Task 2.22: Saturn VUE Baseline Testing (1 Baseline Test w/ANL Dyno and 2 Battery Pre-Tests)

Conduct Baseline Performance Testing of one Saturn VUE HEV using previously prepared HEVAmerica test procedures. Dynamometer testing shall be conducted by Argonne National Laboratory. Conduct Battery Baseline Pre-Testing of two future HEVs.

Deliverable: Printed and electronic copy of HEVAmerica Summary Data Sheet and battery test results.

Status: This task has been completed. The Summary Data Sheet has been posted to the AVTA website.

<http://avt.inel.gov/pdf/hev/factSaturnVue.pdf>

Task 2.23: Saturn VUE End-of-Life Baseline Testing (2 Battery Post Test)

Conduct Battery Baseline Post Testing of two Saturn VUE vehicles.

Deliverable: Electronic copy of end-of-life battery test results.

Status: This task has been completed. One vehicle was in a collision and the battery damaged. No testing was conducted for this vehicle. The other vehicle finished accumulating miles for fleet testing. There was no end-of-life testing, as the battery was replaced during testing.

Task 2.24: Nissan Altima Baseline Testing (1Baseline w/ANL Dyno and 2 Battery Pre-test)

Conduct Baseline Performance Testing of one Nissan Altima HEV, using previously prepared HEVAmerica test procedures. Dynamometer testing shall be conducted by Argonne National Laboratory. Conduct Battery Baseline Pre-Testing of two Nissan Altima HEVs.

Deliverable: Printed and electronic copy of HEVAmerica Summary Data Sheet and battery test results.

Status: This task has been completed. The Summary Data Sheet has been posted to the AVTA website. The battery baseline test results are included in the reports listed under Task 2.25.

http://avt.inel.gov/pdf/hev/fact_sheet7982.pdf

Task 2.25: Nissan Altima End-of-Life Baseline Testing (2 Battery Post Test)

Conduct Battery Baseline Post Testing of two Nissan Altima vehicles.

Deliverable: Electronic copy of end-of-life battery test results.

Status: This task has been completed. The Test Results and Summary Data Sheet have been posted to the AVTA website.

<http://avt.inel.gov/pdf/hev/batteryaltima2351.pdf>

2007 Nissan Altima-2351 Hybrid Electric Vehicle Battery Test Results

<http://avt.inel.gov/pdf/hev/batteryaltima7982.pdf>

2007 Nissan Altima-7982 Hybrid Electric Vehicle Battery Test Results

Task 2.28: HEV Chevy Tahoe Baseline Testing (1 Baseline w/ANL Dyno and 2 Battery Pre-test)

Conduct Baseline Performance Testing of a Chevy Tahoe using HEVAmerica test procedures. Dynamometer testing shall be conducted by Argonne National laboratory. Conduct Battery Baseline Pre-Testing.

Deliverable: Electronic copy of HEVAmerica Summary Data Sheet and battery test results.

Status: This task has been completed. The Summary Data Sheet and battery pre-test reports have been posted to the AVTA website.

http://avt.inel.gov/pdf/hev/fact_sheet08Tahoe.pdf

<http://avt.inel.gov/pdf/hev/batterytahoe7400.pdf>

<http://avt.inel.gov/pdf/hev/batterytahoe5170.pdf>

Task 2.29: HEV Chevy Tahoe End-of-Life Baseline Testing (2 Battery Post Test)

Conduct Battery Baseline Post Testing of two Hybrid Chevy Tahoe vehicles.

Deliverable: Electronic copy of end-of-life battery test results.

Status: This task has been completed. The Test Results and Summary Data Sheet have been posted to the AVTA website.

<http://avt.inel.gov/pdf/hev/batterytahoeEOT7400.pdf>

2008 Chevrolet Tahoe-7400 Hybrid Electric Vehicle Battery Test Results

<http://avt.inel.gov/pdf/hev/batterytahoeEOT5170.pdf>

2008 Chevrolet Tahoe-5170 Hybrid Electric Vehicle Battery Test Results

Task 2.30: GEM NEV (Neighborhood Electric Vehicle) Baseline Testing (2 Vehicles)

Conduct Baseline testing of two GEM NEVs using previously prepared NEVAmerica test procedures.

Deliverable: Electronic copy of NEVAmerica Data Sheet.

Status: This task has been completed. The Summary Data Sheet has been posted to the AVTA website.

<http://avt.inel.gov/pdf/nev/gem2007eIXD.pdf>

<http://avt.inel.gov/pdf/nev/gem2007e6.pdf>

Task 2.31: Mercedes S400 HEV Baseline Testing (1 Baseline Test w/ANL Dyno and 2 Battery Pre-Tests)

Conduct Baseline Performance Testing of one Mercedes S400 HEV using previously prepared HEVAmerica test procedures. Dynamometer testing shall be conducted by Argonne National Laboratory. Conduct Battery Baseline Pre-Testing of two Mercedes S400 HEVs.

Deliverable: Electronic copy of HEVAmerica Summary Data Sheet and battery test results.

Status: This task has been completed. The Summary Data Sheet has been posted to the AVTA website. Two battery pre-tests were not performed due to the complexity of the battery.

<http://avt.inel.gov/pdf/hev/fact2010mercedesbenz.pdf>

Task 2.32: Honda Insight Baseline Testing (1 Baseline w/ANL Dyno and 2 Battery Pre-Test)

Conduct Baseline Performance Testing of one Honda Insight, using previously prepared HEVAmerica test procedures. Dynamometer testing shall be conducted by Argonne National Laboratory. Conduct Battery Baseline Pre-Testing of two Honda Insights.

Deliverable: Electronic copy of HEVAmerica Summary Data Sheet.

Status: This task has been completed. The Summary Data Sheet has been posted to the AVTA website. The battery pre-test results are included with the end-of-life reports in Task 2.33.

<http://avt.inel.gov/pdf/hev/fact2010hondainsight.pdf>

Task 2.33: Honda Insight HEV End-of-Life Baseline Testing (2 Battery Post Test)

Conduct Battery Baseline Post Testing of two Honda Insight HEVs.

Deliverable: Electronic copy of end-of-life battery test results.

Status: This task has been completed. The Test Results and Summary Data Sheets have been posted to the AVTA website.

<http://avt.inel.gov/pdf/hev/batteryinsight0141.pdf>

**2010 Honda Insight VIN 0141 Hybrid
Electric Vehicle Battery Test Results**

<http://avt.inel.gov/pdf/hev/batteryinsight1748.pdf>

**2010 Honda Insight VIN 1748 Hybrid
Electric Vehicle Battery Test Results**

Task 2.34: (Added in A014) Mini E Baseline Testing (1 ANL Dyno and 1 Battery Pre-Test)

Conduct Baseline Performance Testing of one Mini E battery electric vehicle using EVAmerica test procedures. Dynamometer testing shall be conducted by Argonne National Laboratory. Conduct Battery Baseline Pre-Testing.

Deliverable: Electronic copy of EVAmerica Summary Data Sheet and battery test results.

Status: Vehicle is no longer available for testing. The Baseline and accelerated testing has been completed. The Baseline Performance report has been posted to the AVTA website. Accelerated durability testing partially completed when the task cancelled.

<http://avt.inel.gov/pdf/uev/fact2009bmwmini.pdf>

Task 2.35: RESERVED

Task 2.36: Ford Fusion HEV Baseline Testing (1 ANL Dyno and 2 Battery Pre-Test)

Conduct Baseline Performance Testing of one Ford Fusion HEV using HEVAmerica test procedures. Dynamometer testing shall be conducted by Argonne National Laboratory. Conduct Battery Baseline Pre-Testing on two vehicles.

Deliverable: Electronic copy of HEVAmerica Summary Data Sheet and battery test results.

Status: This task has been completed. The Summary Data Sheet and battery pre-test report for the vehicle that was in a collision have been posted to the AVTA website. The battery post-test report for the vehicle that completed the mileage accumulation is posted under Task 2.37.

<http://avt.inel.gov/pdf/hev/fact2010fordfusion.pdf>

<http://avt.inel.gov/pdf/hev/batteryfusion4699.pdf>

Task 2.37: Ford Fusion HEV End-of-Life Baseline Testing (2 Battery Post Test)

Conduct Battery Baseline Post Testing of two future hybrid electric vehicles.

Deliverable: Electronic copy of end-of-life battery test results.

Status: Fleet testing was completed on one vehicle; the other vehicle was in a collision and no longer operational. The battery pack from the vehicle in the collision was still operational, therefore End-of-Life testing was performed. Data from the battery pack was found to be marginalized by the collision at 74,964 miles and not valid for use in a report. The battery testing has been completed on the operable vehicle. The battery post-test report has been completed and posted on the AVTA website.

<http://avt.inel.gov/pdf/hev/batteryfusion4757.pdf>

**2010 Ford Fusion VIN 4757 Hybrid Electric
Vehicle Battery Test Results** **Task 2.38: (Added in A014) Gen 2 HyMotion Prius PHEV Baseline Testing
(1 Baseline Test w/ANL Dyno)**

Conduct Baseline Performance Testing of a HyMotion Gen 2 Prius PHEV using test procedures developed in Task 1.2. Dynamometer testing shall be conducted by Argonne National Laboratory.

Deliverable: Electronic copy of PHEVAmerica Summary Data Sheet.

Status: This task has been completed. The Summary Data Sheet has been posted to the AVTA website. The battery pre-test results are included with the end-of-life report in Task 2.39.

<http://avt.inel.gov/pdf/phev/HymotionGen2Fact.pdf>

Task 2.39: (Added in A014) Gen 2 HyMotion Prius PHEV End-of-Life Testing (1 Battery Post Test/End of Life)

Conduct Battery Testing of future gasoline PHEV using test procedures developed in 1.2.

Deliverable: Electronic copy of PHEVAmerica Summary Data Sheet.

Status: This task has been completed. The battery post-test report has been completed, reviewed by INL, and posted to the AVTA website.

<http://avt.inel.gov/pdf/phev/batterygenIiprius8820.pdf>

2007 Toyota Prius 8820 with Gen II Hymotion Prius Conversion Plug-In Hybrid Battery Test Results

Task 2.40: (Added in A014) Ford Escape Gasoline PHEV Baseline Testing (1 Baseline Test)

Conduct Baseline Performance Testing of Ford Escape gasoline PHEV using test procedures developed in Task 1.2. Dynamometer testing shall be conducted by Argonne National Laboratory.

Deliverable: Electronic copy of PHEVAmerica Summary Data Sheet.

Status: This task has been completed. The Summary Data Sheet has been posted to the AVTA website.

<http://avt.inel.gov/pdf/phev/FordEscapePHEVfact.pdf>

A photograph of a white 2010 Ford Escape PHEV parked in front of a red building. A blue banner is overlaid on the right side of the image, containing text about the vehicle and the testing activity. The banner includes the PHEVAmerica logo and the U.S. Department of Energy Advanced Vehicle Testing Activity logo.

PHEVAMERICA
U.S. DEPARTMENT OF ENERGY ADVANCED VEHICLE TESTING ACTIVITY

Base Vehicle Description
Make: Ford
Model: Escape PHEV Year: 2010
VIN: 1FMCU49369KB61181
Number of Passengers: 5
Hybrid Configuration: Power-split

**2010 Ford Escape
Advanced Research Vehicle**

Task 2.41: (Added in A014) Ford Escape Gasoline PHEV End-of-Life Testing (1 Battery Post Test/End of Life)

Conduct Battery Testing of Ford Escape gasoline PHEV using test procedures developed in 1.2.

Deliverable: Electronic copy of PHEVAmerica Summary Data Sheet.

Status: This task was cancelled. The Battery test was not performed due to the vehicle is part of a Cooperative R&D agreement with Ford and is a non-production prototype vehicle.

Task 2.42: (Added in A014) Gen 3 Prius HEV Baseline Testing (1 ANL Dyno and 1 Battery Pre-Test)

Conduct Baseline Performance Testing of one Gen 3 Prius HEV using HEVAmerica test procedures. Dynamometer testing shall be conducted by Argonne National Laboratory. Conduct Battery Baseline Pre-Testing on two vehicles.

Deliverable: Electronic copy of HEVAmerica Summary Data Sheet and battery test results.

Status: This task has been completed. The battery test results and Summary Data Sheet have been posted to the AVTA website. The battery pre-test results are included with the end-of-life reports in Task 2.43.

<http://avt.inel.gov/pdf/hev/fact2010toyotaprius.pdf>

Task 2.43: Gen 3 Prius HEV End-of-Life Baseline Testing (2 Battery Post Test)

Conduct Battery Baseline Post Testing of two future hybrid electric vehicles.

Deliverable: Electronic copy of end-of-life battery test results.

Status: This task has been completed. The Test Results have been posted to the AVTA website.

<http://avt.inel.gov/pdf/hev/batterygenIIIprius0462.pdf>

**2010 Toyota Prius VIN 0462 Hybrid Electric
Vehicle Battery Test Results**

<http://avt.inel.gov/pdf/hev/batterygenIIIprius6063.pdf>

**2010 Toyota Prius VIN 6063 Hybrid Electric
Vehicle Battery Test Results**

Task 2.44: Reserved

Task 2.45: Reserved

Task 2.46: Kangoo Baseline Testing (1 Baseline Test w/ANL Dyno)

Conduct Baseline Performance Testing of Kangoo plug-in hybrid using test procedures developed in Task 1.2. Dynamometer testing shall be conducted by Argonne National Laboratory.

Deliverable: Electronic copy of PHEVAmerica Summary Data Sheet.

Status: This task has been completed. The Summary Data Sheet has been posted to the AVTA website.

<http://avt.inel.gov/pdf/phev/KangooFact.pdf>

Task 2.47: Gen 1 HyMotion Prius PHEV Baseline Testing (1 Baseline Test w/ANL Dyno)

Conduct Baseline Performance Testing of HyMotion Prius hybrid using test procedures developed in Task 1.2. Dynamometer testing shall be conducted by Argonne National Laboratory.

Deliverable: Electronic copy of PHEVAmerica Summary Data Sheet and battery test results.

Status: This task has been completed. The Summary Data Sheet has been posted to the AVTA website.

<http://avt.inel.gov/pdf/phev/toyotaPriusHymotionFact.pdf>

Task 2.48: Baseline Testing of 4 NEVs

Conduct Baseline Performance Testing of four future NEVs per year for two years using previously prepared NEVAmerica test procedures.

Deliverable: Electronic copy of NEVAmerica Summary Sheet.

Status: Seven NEVs have completed baseline testing: two Miles Automotive, two Vantages, one ZENN NEV, one EVI E-mega, and one BRP Commander Electric NEV. Seven Summary Data Sheets have been completed and posted to the AVTA website.

<http://avt.inel.gov/pdf/nev/Zenn2008.pdf>

<http://avt.inel.gov/pdf/nev/Miles2008ZX40ST.pdf>

<http://avt.inel.gov/pdf/nev/Miles2008ZX40S.pdf>

http://avt.inel.gov/pdf/nev/nev_vantage_pickup_EVX1000.pdf

http://avt.inel.gov/pdf/nev/nev_vantage_van_EVC1000.pdf

<http://avt.inel.gov/pdf/nev/EVI2010.pdf>

<http://avt.inel.gov/pdf/nev/fact2013brpcommanderelectric.pdf>

2013 BRP Commander Electric – VIN 0002
Advanced Vehicle Testing Activity – Baseline Testing Results

Task 2.49: Mercedes S400 HEV End-of-Life Baseline Testing (Battery Post Test)

Conduct Battery Baseline Post Testing of plug-in gasoline hybrid.

Deliverable: Printed and electronic copy of battery test results.

Status: This task has been completed. Two battery post-tests were not performed due to the complexity of the batteries.

**Task 2.50: Gen 1 HyMotion Prius PHEV End-of-Life Testing
(1 Battery Post Test/End of Life)**

End-of-life testing following the completion of 4,200 urban driving routes. Conduct Battery Testing of HyMotion Prius hybrid using test procedures developed in 1.2.

Deliverable: Results to be posted to electronic copy of PHEVAmerica Summary Data Sheet.

Status: This task has been completed. The battery post-test report has been completed, reviewed by INL, and posted to the AVTA website.

<http://avt.inel.gov/pdf/phev/batterygenIprius8820.pdf>

**2007 Toyota Prius 8820 with Gen I
Hymotion Prius Conversion
Plug-In Hybrid Battery Test Results** **Task 2.51: (Added January 2010) Diesel Volkswagen Golf Idle-Stop Technology
Vehicle Baseline Testing (1 Baseline Test w/ANL Dyno)**

Conduct Baseline Performance Testing of one Idle-Stop Technology Volkswagen Golf 4-door with diesel engine using test procedures developed by AVTA. Dynamometer testing shall be conducted by Argonne National Laboratory (ANL).

Deliverable: Electronic copy of HEVAmerica Summary Data Sheet.

Status: Baseline performance and dynamometer testing have been completed. Battery performance testing was not conducted due to the conventional 12V battery chemistry utilized on this vehicle.

<http://avt.inel.gov/pdf/mhv/fact2010volkswagengolf.pdf>

**2010 Volkswagen Golf TDI Bluemotion – VIN 8111
Advanced Vehicle Testing – Baseline Testing Results**

Task 2.52: (Added January 2010) Mazda3 I-stop Idle-Stop Technology Vehicle Baseline Testing (1 Baseline Test w/ANL Dyno)

Conduct Baseline Performance Testing of one Idle-Stop Technology Mazda3 I-stop using combustion restart using test procedures developed by AVTA. Dynamometer testing shall be conducted by Argonne National Laboratory.

Deliverable: Electronic copy of HEVAmerica Summary Data Sheet

Status: Baseline performance and dynamometer testing have been completed. Battery performance testing was not conducted due to the conventional 12V system battery chemistry utilized on this vehicle.

<http://avt.inel.gov/pdf/mhv/fact2010mazda3.pdf>

2010 Mazda 3 i-Stop – VIN 1865
Advanced Vehicle Testing – Baseline Testing Results

Task 2.53: (Added January 2010) Smart mhd fortwo Idle-Stop Technology Vehicle Baseline Testing (1 Baseline Test w/ANL Dyno and 2 Battery Pre-Test)

Conduct Baseline Performance Testing using test procedures developed by AVTA of one Idle-Stop Technology Smart mhd fortwo coupe with a conventional gas engine and electric restart. Dynamometer testing shall be conducted by Argonne National Laboratory.

Deliverable: Electronic copy of HEVAmerica Summary Data Sheet

Status: Baseline performance and dynamometer testing have been completed. Battery performance testing was not conducted due to the conventional 12V system battery chemistry utilized on this vehicle.

<http://avt.inel.gov/pdf/mhv/fact2010smartfortwo.pdf>

2010 Smart fortwo mhd – VIN 6476
Advanced Vehicle Testing – Baseline Testing Results

Task 2.54: (Added January 2010) Diesel Volkswagen Golf Idle-Stop Vehicle Technology End-of-Life Testing (2 Battery Post Test)

Conduct Battery Baseline Post Testing of two Idle-Stop Technology vehicles.

Deliverable: Electronic copy of end-of life battery test results.

Status: End-of-Life battery testing was not conducted due to the conventional 12V batteries utilized on this vehicle.

Task 2.55: (Added January 2010) Mazda3 I-stop Idle-Stop Vehicle Technology End-of-Life Testing (2 Battery Post Test)

Conduct Battery Baseline Post Testing of two Idle-Stop Technology vehicles.

Deliverable: Electronic copy of end-of life battery test results.

Status: End-of-Life battery testing was not conducted due to the conventional 12V batteries utilized on this vehicle.

Task 2.56: (Added January 2010) Smart mhd fortwo Idle-Stop Vehicle Technology End-of-Life Testing (2 Battery Post Test)

Conduct Battery Baseline Post Testing of two Idle-Stop technology vehicles.

Deliverable: Electronic copy of end-of life battery test results.

Status: End-of-Life battery testing will not be conducted due to the conventional 12V batteries utilized on this vehicle.

Task 2.57: (Added January 2010) Hyundai Sonata Hybrid (1 Baseline Test w/ANL Dynamometer and 2 Battery Pre-Tests)

Conduct Baseline Performance Testing of one Hyundai Sonata Hybrid using previously prepared HEVAmerica test procedures. Dynamometer testing shall be conducted by Argonne National Laboratory. Conduct Battery Baseline Pre-Testing of two Hyundai Sonata Hybrids.

Deliverable: Electronic copy of HEVAmerica Summary Data Sheet and Battery Test Results.

Status: This task has been completed. The Test Results and Summary Data Sheets have been posted to the AVTA website.

<http://avt.inel.gov/pdf/hev/fact2011hyundaisonata.pdf>

2011 Hyundai Sonata Hybrid – VIN 4932
Advanced Vehicle Testing – Baseline Testing Results

<http://avt.inel.gov/pdf/hev/batterysonata3539.pdf>

2011 Hyundai Sonata Hybrid – VIN 3539
Advanced Vehicle Testing – Beginning-of-Test Battery Testing Results

<http://avt.inel.gov/pdf/hev/batterysonata4932.pdf>

2011 Hyundai Sonata Hybrid – VIN 4932
Advanced Vehicle Testing – Beginning-of-Test Battery Testing Results

Task 2.58: (Added January 2010) Hyundai Sonata Hybrid End-of-Life Testing (2 Battery Post Test)

Conduct Battery Baseline Post Testing of two future HEVs.

Deliverable: Electronic copy of End-of-Life Battery Test Results.

Status: One vehicle experienced a drivetrain failure prior to completing 160k miles. The battery was removed and a end-of-life test was conducted on this vehicle. The second vehicle completed fleet testing under AVTA and has transitioned to cooperative agreement DE-EE0005501 to continue to 160k miles. Battery post test results will be available on the AVTA website at the conclusion of fleet testing under cooperative agreement DE-EE0005501.

Task 2.59: (Added January 2010) Nissan LEAF BEV Battery Baseline Testing (1 Baseline w/ANL Dyno and Fast Charge and 1 Battery Pre-Test)

Conduct Baseline Performance Testing of one Nissan LEAF BEV using previously prepared EVAmerica test procedures. Dynamometer testing shall be conducted by Argonne National Laboratory. Conduct Battery Baseline Pre-Testing of one Nissan LEAF BEV.

Deliverable: Electronic copy of EVAmerica Summary Data Sheet and Battery Test Results.

Status: This task has been completed. The Test Results and Summary Data Sheet have been posted to the AVTA website.

<http://avt.inel.gov/pdf/fsev/fact2011nissanleaf.pdf>

<http://avt.inel.gov/pdf/fsev/batteryleaf0356.pdf>

Task 2.60: (Added January 2010) Nissan LEAF BEV End-of-Life Baseline Testing (1 Battery Post Test)

Conduct Battery Baseline Post Testing of one Nissan LEAF BEV.

Deliverable: Electronic copy of Battery Test Results.

Status: The vehicle completed fleet testing under AVTA and transitioned to cooperative agreement DE-EE0005501 to continue to 60k miles. Battery post test results will be available on the AVTA website at the conclusion of fleet testing under cooperative agreement DE-EE0005501.

**2011 Nissan Leaf VIN 0356 Electric Vehicle
Battery Test Results** **Task 2.61: (Added January 2010) BEV Battery Baseline Testing (1 Baseline w/ANL Dyno and Battery Pre-Test)**

This task was cancelled due to lack of vehicle availability within project budget period.

Task 2.62: (Added January 2010) BEV End-of-Life Baseline Testing (1 Battery Post Test)

This task was cancelled due to lack of vehicle availability within project budget period.

Task 2.63: (Added January 2010) BEV Battery Baseline Testing (1 Baseline w/ANL Dyno & Battery Pre-Test)

This task was cancelled due to lack of vehicle availability within project budget period.

Task 2.64: (Added January 2010) BEV End-of-Life Baseline Testing (1 Battery Post Test)

This task was cancelled due to lack of vehicle availability within project budget period.

Task 2.65: (Added January 2010) BEV Battery Baseline Testing (1 Baseline w/ANL Dyno and Battery Pre-Test)

This task was cancelled due to lack of vehicle availability within project budget period.

Task 2.66: (Added January 2010) BEV End-of-Life Baseline Testing (1 Battery Post Test)

This task was cancelled due to lack of vehicle availability within project budget period.

Task 2.67: (Added January 2010) BEV Battery Baseline Testing (1 Baseline w/ANL Dyno and Fast Charge and 1 Battery Pre-Test)

This task was cancelled due to lack of vehicle availability within project budget period.

**Task 2.68: (Added January 2010) BEV End-of-Life Baseline Testing
(1 Battery Post Test)**

This task was cancelled due to lack of vehicle availability within project budget period.

**Task 2.69: (Added January 2010) BEV Battery Baseline Testing (1 Baseline
w/ANL Dyno & Battery Pre-Test)**

This task was cancelled due to lack of vehicle availability within project budget period.

**Task 2.70: (Added January 2010) BEV End-of-Life Baseline Testing
(1 Battery Post Test)**

This task was cancelled due to lack of vehicle availability within project budget period.

**Task 2.71: (Added January 2010) BEV Battery Baseline Testing (ANL
Dynamometer and Battery Pre-Test)**

This task was cancelled due to lack of vehicle availability within project budget period.

**Task 2.72: (Added January 2010) BEV End-of-Life Baseline Testing
(1 Battery Post Test)**

This task was cancelled due to lack of vehicle availability within project budget period.

**Task 2.73: Honda Civic Ultra-Battery HEV Baseline Testing
(1 Baseline Test and Battery Pre-Test)**

Conduct Baseline Performance Testing of one Ultra-Battery HEV using previously prepared HEVAmerica test procedures. Dynamometer testing shall be conducted by Argonne National Laboratory. Conduct Battery Baseline Pre-Testing of one future HEV.

Deliverable: Electronic copy of HEVAmerica Summary Data Sheet and Battery Test Results.

Status: This task has been completed. The Test Results and the Summary Data Sheet have been posted to the AVTA website.

<http://avt.inel.gov/pdf/hev/fact2010ultrabatteryhondacivic.pdf>

2010 Ultra-Battery Honda Civic Hybrid – VIN 5577
Advanced Vehicle Testing – Baseline Testing Results

<http://avt.inel.gov/pdf/hev/batteryhondacivic5577.pdf>

2010 Honda Civic Hybrid UltraBattery Conversion – VIN 5577
Advanced Vehicle Testing – Beginning-of-Test Battery Testing Results

Task 2.74: Honda Civic Ultra-Battery HEV End-of-Life Baseline Testing (Battery Post Test)

Conduct Battery Baseline Post Testing of Honda Civic Ultra-Battery HEV.

Deliverable: Electronic copy of End-of-Life Battery Test Results.

Status: The vehicle completed fleet testing under AVTA and has transitioned to a separate contract to continue accumulating mileage. Battery post test results from reaching a fleet mileage of 100K miles will be posted to the AVTA website.

2010 Honda Civic Hybrid UltraBattery Conversion 5577 - Hybrid Electric Vehicle Battery Test Results

Task 2.75 (Added January 2010) Chevrolet Volt PHEV Baseline Testing (1 Baseline Test w/ANL Dyno and Battery Pre-Test)

Conduct Baseline Performance Testing of one Chevrolet Volt PHEV using test procedures developed by AVTA. Dynamometer testing shall be conducted by Argonne National Laboratory. Conduct Battery Baseline Pre-Testing of one future HEV.

Deliverable: Electronic copy of PHEVAmerica Summary Data Sheet.

Status: This task has been completed. The Test Results and Summary Data Sheets have been posted to the AVTA website.

<http://avt.inel.gov/pdf/EREV/fact2011chevroletvolt.pdf>

2011 Chevrolet Volt – VIN 0815
Advanced Vehicle Testing – Baseline Testing Results

<http://avt.inel.gov/pdf/EREV/batteryvolt0815.pdf>

2011 Chevrolet Volt – VIN 0815
Advanced Vehicle Testing – Beginning-of-Test Battery Testing Results

Task 2.76: (Added January 2010) Chevrolet Volt PHEV End-of-Life Testing (1 Battery Post Test)

Conduct Battery Baseline Post Testing of one Chevrolet Volt PHEV.

Deliverable: Electronic copy of End-of-Life Battery Test Results.

Status: The vehicle has completed fleet testing under AVTA and has transitioned to cooperative agreement DE-EE0005501 to continue to 195k miles. Battery post test results will be available on the AVTA website at the conclusion of fleet testing under cooperative agreement DE-EE0005501.

2011 Chevrolet Volt VIN 0815 Plug-In Hybrid Electric Vehicle Battery Test Results **Task 2.77 (Added January 2010) PHEV Baseline Testing (1 Baseline Test w/ANL Dyno)**

This task was cancelled. The vehicle was not available in time to support AVTA contract period.

Task 2.78: (Added January 2010) PHEV End-of-Life Testing (1 Battery Post Test)

This task was cancelled. The vehicle was not available in time to support AVTA contract period.

Task 2.79: (Added January 2010) HEV Baseline Testing (1 Baseline Test w/ANL Dyno & 2 Battery Pre-Tests)

This task was cancelled. The vehicle was not available in time to support AVTA contract period.

Task 2.80: (Added January 2010) HEV End-of-Life Testing (2 Battery Post Test)

This task was cancelled. The vehicle was not available in time to support AVTA contract period.

Task 2.81: (Added January 2010) Honda CR-Z HEV Baseline Testing (1 Baseline Test w/ANL Dynamometer and 2 Battery Pre-Tests)

Conduct Baseline Performance Testing of one Honda CR-Z HEV using test procedures developed by AVTA. Dynamometer testing shall be conducted by Argonne National Laboratory.

Deliverable: Electronic copy of HEVAmerica Summary Data Sheet.

Status: This task has been completed. The Summary Data Sheets have been posted to the AVTA website.

<http://avt.inel.gov/pdf/hev/fact2011hondacz.pdf>

<http://avt.inel.gov/pdf/hev/batterycrz2982.pdf>

2011 Honda CR-Z – VIN 2982
Advanced Vehicle Testing – Beginning-of-Test Battery Testing Results

<http://avt.inel.gov/pdf/hev/batterycrz4466.pdf>

2011 Honda CR-Z – VIN 4466
Advanced Vehicle Testing – Beginning-of-Test Battery Testing Results

**Task 2.82: (Added January 2010) Honda CR-Z HEV End-of-Life Testing
(2 Battery Post Test)**

Conduct Battery Baseline Post Testing of two HEVs.

Deliverable: Electronic copy of End-of-Life Battery Test Results.

Status: The vehicles have completed fleet testing under AVTA and have transitioned to cooperative agreement DE-EE0005501 to continue to 160k miles. Battery post test results will be available on the AVTA website at the conclusion of fleet testing under cooperative agreement DE-EE0005501.

Task 2.83: Reserved

Task 2.84: Reserved

Task 2.85: (Added 2010) BEV Battery Baseline Testing

This task was cancelled. The vehicle was not available in time to support the AVTA contract period.

Task 3 – Accelerated Reliability Testing

Task 3.a: HICE Ford F-150 2V Accelerated Reliability Test (6mo/6K mi)

Complete 6-month/6000 mile Accelerated Reliability testing of a Ford F-150 pick-up truck equipped with a 2-valve HICE engine (3 months and 3,000 miles completed under agreement DE-FC07-00ID13859).

Deliverable: Electronic reliability test data on a monthly basis.

Status: This task was cancelled due to the vehicle not being operational.

Task 3.b: 2 HEV Prius Accelerated Reliability (100K mi)

Complete 100,000 mile Accelerated Reliability testing of 2 Gen II Toyota Prius (40,000 miles/vehicle completed under agreement DE-FC07-00ID13859).

Deliverable: Electronic reliability test data on a monthly basis and Fleet Data Sheet upon test completion.

Status: This task has been completed. Further mileage is reported under task 4.23.

http://avt.inel.gov/pdf/hev/1052_04prius_factsheet.pdf

http://avt.inel.gov/pdf/hev/1052_04prius_maintain.pdf

<http://avt.inel.gov/pdf/hev/2721ToyotaPrius04factsheet.pdf>

http://avt.inel.gov/pdf/hev/2721_04prius_maintain.pdf

Task 3.c: HICE F-150 4V Accelerated Reliability Testing (6 mo/6K mi) (6mo/6K miles)

Complete 6-month/6,000 mile Accelerated Reliability testing of a Ford F-150 pick-up truck equipped with a 4-valve HICE engine completed under agreement DE-FC07-00ID13859.

Deliverable: Electronic reliability test data on a monthly basis and Fleet Data Sheet upon test completion.

Status: The task has been completed. The Summary Data Sheet has been posted to the AVTA website.

<http://avt.inel.gov/pdf/hydrogen/FactSheetFord32VHydrogenICE.pdf>

Task 3.01: (Added in A014) Grid-Connected Vehicle Data Collection and Charging Hardware

Fabricate and provide Level II charger "wall boxes" to support fleet data collection by the Idaho National Laboratory.

Deliverable: Level II fleet vehicle EVSE units.

Status: All fleet locations have been identified for equipment installation.

Task 3.02: (Added in A014) Smart Grid Communication Interface

Develop, test and validate communication protocol interfacing grid-connected vehicle chargers with the smart grid. Coordinate this protocol with the SAE and DOE to codify the protocol in an SAE standard.

Deliverable: Draft SAE standard defining smart grid communication protocol, a prototype charger "wall box" incorporating smart grid communications and test reports validating communication protocol electromagnetic compatibility and sub-metering accuracy.

Status: SAE has not determined protocols for Smart Grid interaction. Clarity Group, Inc. produced an EVSE that can interface to a utility and accept demand response commands (on/off) via a connection to the Clarity Group, Inc. back office systems in preparation for future Smart Grid capability.

Task 3.03: Monitor H2 Station Performance

Monitor Arizona Public Services Hydrogen Fueling Station operation using the monitoring system installed under cooperative agreement. Prepare reports on a semi-annual basis.

Deliverable: Ten (10) semi-annual reports in electronic format.

Status: This task has been completed. Work on this task ended in 2008.

Task 3.04: PHEV Accelerated Reliability Testing (4 NYSERDA vehicles) (6mo/4,200mi)

Complete 4,200 miles Accelerated Reliability Testing of four (4) PHEV NYSERDA vehicles (to be on loan for duration of testing).

Deliverable: Electronic reliability test data on a monthly basis and Fleet Data Sheet upon test completion.

Status: This task was cancelled.

Task 3.05: HICE Fleet Testing (8 Integrated Waste Hydrogen Utilization Project Vehicles 24 mo/24K mi)

Complete 24 month/24,000 mile Accelerated Reliability testing of 8 HICE vehicles in one or more fleets.

Deliverable: Electronic reliability test data on a monthly basis and Fleet Data Sheet upon test completion.

Status: Mileage has been completed for the current program. The Summary Data Sheet has been posted to the AVTA website.

<http://avt.inl.gov/pdf/hydrogen/FactSheetChevy1500HDHydrogenICE.pdf>

Task 3.06: Energy CS Prius Accelerated Reliability Testing (4,200 miles)

Conduct Accelerated Reliability testing of a plug-in gasoline hybrid electric vehicle to 4,200 miles using dedicated drivers.

Deliverable: Electronic reliability test data on a monthly basis and Fleet Data Sheet upon test completion.

Status: This task has been completed. All 4,200 miles of tests have been completed.

Task 3.07: Future HICE Fleet Testing (3 Vehicles 16 mo/8K mi)

Complete 12-month/8,000 mile Accelerated Reliability testing of three HICE vehicles in one or more fleets.

Deliverable: Electronic reliability test data on a monthly basis and Fleet Data Sheet upon test completion.

Status: This task has been completed. The Summary Data Sheet has been posted to the AVTA website.

<http://avt.inl.gov/pdf/hydrogen/FactSheetChevy1500HDHydrogenICE.pdf>

Task 3.08: (Added in A003) Kangoo HEV Accelerated Reliability Testing (4,200 miles)

Accelerated Reliability testing of a plug-in gasoline hybrid electric vehicle to 4,200 miles using dedicated drivers.

Deliverable: Electronic reliability test data on a monthly basis and Fleet Data Sheet upon test completion.

Status: This task has been completed. Results are presented in Table 2, below.

Table 2 - Kangoo HEV Accelerated Reliability Testing Results

Cycle (mi)	Urban (10 mi)	Highway (10 mi)	Charge (hr)	Repetitions (N)	Status Kangoo
10	1	0	4	60	Complete 5/18/07
20	1	1	8	30	Complete 11/13/07
40	4	0	12	5	Complete 12/3/07
40	2	2	12	5	Complete 12/11/07
40	0	4	12	5	Complete 12/19/07
60	2	4	12	10	Complete 1/25/08
80	2	6	12	8	Complete 3/14/08

Task 3.09: (Added per A003) Gen 1 HyMotion Prius PHEV Accelerated Reliability Testing

Accelerated Reliability testing of a plug-in gasoline hybrid electric vehicle to 4,200 miles of testing using dedicated drivers at billed rate of \$40/hr.

Deliverable: Electronic reliability test data on a monthly basis and Fleet Data Sheet upon test completion.

Status: This task has been complete. Results are presented in Table 3, below.

Table 3 - Gen 1 HyMotion Prius PHEV Accelerated Reliability Testing Results

HyMotion Prius Gen I

Cycle (mi)	Urban (10 mi)	Highway (10 mi)	Charge (Hr)	Repetitions (N)	Total (mi)	Repetitions (%)	Miles (%)	Cumulative (mi)	Electricity (kwh)	Gasoline	MPG Summary	Status
10	1	0	4	60	600	37%	11%	600	136.33	4.814	127.2	Complete 4/21/08
20	1	1	8	30	600	19%	11%	1200	122.09	5.371	115.9	Complete 9/20/2007
40	4	0	12	5	200	3%	4%	1400	29.84	1.870	108.9	Complete 9/28/07
40	4	0	12	10	400	6%	7%	1800	54.26	4.180	97.6	Complete 5-6-08
40	2	2	12	15	600	9%	11%	2400	87.22	5.784	106.8	Complete 12/10/07
40	0	4	12	15	600	9%	11%	3000	79.82	8.540	73.1	Complete 1/10/08
60	2	4	12	10	600	6%	11%	3600	55.33	8.984	68.9	Complete 3/6/08
80	2	6	12	8	640	5%	12%	4240	43.99	11.355	58.3	Complete 2/13/08
100	2	8	12	6	600	4%	11%	4840	34.98	8.428	73.2	Complete 8/2/07
200	2	18	12	3	600	2%	11%	5440	15.00	11.017	54.8	Complete 1/24/08
Total	20	43	108	162	5440			5440				

Task 3.10: RESERVED**Task 3.11: BEV Accelerated Reliability Testing (1 Vehicle 12 months / 12,000 miles)**

Complete 12-month/ 12,000 mile Fleet testing of one (1) BEV.

Deliverable: Electronic reliability test data on a monthly basis and Fleet Data Sheet upon test completion.

Status: This task was cancelled. The vehicle was not available in time to support AVTA contract period.

Task 3.12: (Added in A014) Mini E Accelerated Reliability Testing (1 Vehicle 12 months / 12,000 miles)

Complete 12-month/ 12,000 mile Fleet testing of one (1) BEV.

Deliverable: Electronic reliability test data on a monthly basis and Fleet Data Sheet upon test completion.

Status: Accelerated testing began, but the vehicle was removed from service by the dealer. Further testing was cancelled. Refer to Table 4, below.

Table 4 - Mini E Accelerated Reliability Testing Results

BEV Drive Schedule		Vehicle: Mini E - VIN# 5670				Charge #: CO02678			A83.12	
Test Date (Start/End)	Cycle (Mi.)	Urban (10 Mi.)	Highway (10Mi.)	Repetitions (N)	Total (Mi.)	Actual (Mi.)	Total (KWh)	KWh (per mile)	MPGe*	
11/3/09-11/10/09	10	1	0	10	100	100.2	40	0.399202	84.43103	
11/12/09-11/17/09	10	0	1	10	100	103.0	38	0.368932	91.35829	
11/18/09-11/24/09	20	1	1	10	200	203.1	72	0.354505	95.07619	
11/25/09-12/11/09	40	2	2	10	400	448.4	155	0.345674	97.5053	
12/14/09-12/29/09	40	4	0	10	400	402.3	134	0.333085	101.1905	
	40	0	4	10	400					
	60	2	4	10	600					
	80	2	6	10	800					
	Total	1200	1800	80	3000					
	Average	40%	60%							

Task 3.13: (Added January 2010) Smart mhd fortwo Idle-Stop Technology Fuel Economy Study

Complete field and dynamometer evaluation of the fuel economy benefit of idle-stop technology, including creation of dynamometer drive cycle tests and field experience.

Deliverable: Draft and final reports presenting findings of the dynamometer and field testing of idle-stop technology.

Status: This task has been completed. The fuel economy study final report has been posted to the AVTA website.

<http://avt.inel.gov/pdf/mhv/Idle-StopLightDutyPassengerVehicles.pdf>

Task 3.14: (Added January 2010) Test Procedure Development for Fast Chargers Utilizing Energy Storage

Fast chargers for on-road EVs will soon appear that utilize energy storage. No procedural methods currently exist to evaluate the performance of these chargers as used with on-road EVs. This task will conduct modeling of a fast charger utilizing energy storage and will conduct cycling of batteries to develop procedures for evaluation of energy storage devices associated with on-road EV fast chargers. A typical on-road EV fast charger will be modeled to establish performance targets for capacity, voltage range, maximum power output, cost, and availability, based on system loads up to 100% of the total fast charging load. Based on this modeling, a battery test cycle will be developed for testing batteries in the laboratory, simulating likely daily use. Excess time when the battery is not operating during the cycle will be eliminated to accelerate the actual time needed to perform life cycle testing on the battery. The cycle will be derived based on maximum power and energy values a complete battery pack will need to support fast charging. The laboratory test cycle will then be trialed using three different battery chemistries. A string of three battery cells from each chemistry will be cycled for a period of three months to validate the test cycle. This testing will yield information on how each battery's chemistry reacts on the proposed test cycle and the ability of the test cycle to quantify battery performance in on-road EV fast charger energy storage duty.

Deliverable: On-Road EV Battery Fast Charger Energy Storage Device Test Procedure, including a Laboratory Test Cycle and a report describing the validation of such procedure.

Status: This task has been completed. The Test Procedures and validation report have been posted to the AVTA website.

<http://avt.inel.gov/pdf/energystorage/EnergyStorageForDCFC.pdf>

Task 3.15: (Added January 2010) DCFC Battery Test Procedure Development

In consultation with INL battery test team, evaluate various alternative test procedures for evaluating on-road vehicle batteries under DCFC charging conditions. Conduct laboratory testing, as required.

Deliverable: Draft and final reports summarizing testing conducted in support of Level 3 battery test procedures.

Status: This task has been completed. The test specification (procedure) for on-road vehicle battery testing with DCFC has been submitted to INL for review and will be finalized once a vehicle is tested under cooperative agreement DE-EE0005501.

Task 3.16: (Added January 2010) Support SAE Level 3 Communication Standard Development

Attend and support national meetings associated with Level 3 charge port standard development, and performing programmable logic controller testing.

Deliverable: Draft SAE standard defining Level 3 communication protocol and connector.

Status: Clarity Group, Inc. participated and continues to participate in the SAE committee. It appears that the committee has elected to invent a new physical and digital interface rather than accept the CHAdeMO protocol. Clarity Group, Inc. implemented the CHAdeMO protocol for use with the DC fast charger.

Task 3.17: (added January 2010) Advanced Material Handling Electrification Evaluation

Advanced batteries will soon be available for use in electric ground support equipment (eGSE). Additionally, smart charging is currently available to improve the interface between eGSE and the electric grid supplying charge energy. Adoption and use of eGSE is currently limited by issues with adequate battery capacity in cold weather operations, short battery life in high-temperature climates, capacity challenges when operating in a partial state of charge operation (PSOC), the cost of electricity, and impacts to the local electrical grid with high charger power demands. Advanced batteries are capable of resolving the problems of battery capacity. These batteries, coupled with smart charging concepts adapted from current state-of-the-art on-road charge infrastructure, have the potential to solve each issue identified and significantly enhance the adoption of eGSE. This task will test the performance of eGSE using advanced lead-carbon and lithium batteries in conjunction with smart charging in diverse climatic regions, with particular attention to this configuration's ability to resolve barriers to eGSE deployment. Results of this testing will be made available to the industry in a report and in a presentation at a major industry conference.

Under this task, two battery chemistries will be evaluated, lead-carbon batteries developed by East Penn Manufacturing and lithium-based batteries from a supplier currently funded by a DOE battery manufacturing contract. Electric bag tractors operating with these batteries will be instrumented to allow evaluation of vehicle performance. Chargers supplying energy to these vehicles will be updated with Internet communications and data transmittal capability to allow real-time monitoring of status and power consumption. Data will be collected from the vehicles and from the charge stations to monitor the performance of the advanced batteries in the varying climates and operations. Strategies to utilize the communications and control-enabled charge infrastructure to maintain battery state-of-charge while avoiding any impacts to the electrical grid and minimizing electricity costs will be evaluated.

Deliverables:

1. Two electric baggage tractors converted to utilize East Penn Manufacturing lead-carbon battery. Tractors shall conform to specifications issued by the AVTA.
2. Two electric baggage tractors converted to utilize a lithium-based battery. Tractors shall conform to specifications issued by the AVTA.
3. Four 15 kW chargers (or two 30 kW dual port chargers) using a power manager to facilitate installation and with Internet conductivity and data collection capability, installed at an operational airport and ready to support charging of tractors converted in Tasks 1 and 2.
4. Data from operational batteries and chargers reported informally on a monthly basis and six months of operational data reported in a formal report suitable for publication.

Status: Four baggage tractors consisting of two lead-acid and two lithium-ion battery packs have completed their six month demonstration period at an operational airport. A report was reviewed by INL and posted to the AVTA website.

http://avt.inel.gov/pdf/airport/inl-ext-13-29680_r0_eGSE.pdf

Task 3.18: Conduct USPS Factory Tests (5 vehicles)

Conduct factory testing (inspection and measurement) of five United States Postal Service (USPS) prototype electric vehicles using test procedures developed from USPS vehicle specifications.

Deliverable: Test reports for each vehicle consistent with AVTA report format.

Status: This task has been completed. Test results were sent to INL for delivery to USPS.

Task 3.19: Develop USPS Baseline Test Procedures

Develop Baseline Test procedures (dynamic testing) for USPS prototype electric vehicles using USPS vehicle specifications.

Deliverable: Baseline Test procedures consistent with AVTA test format.

Status: This task has been completed. Test procedures have been developed and approved by INL.

Task 3.20: Conduct USPS Baseline Testing (5 vehicles)

Conduct Baseline Testing of five USPS prototype electric vehicles.

Deliverable: Baseline Test reports consistent with AVTA report format.

Status: This task has been completed. All data has been delivered to INL.

Task 3.21: Develop USPS Accelerated Reliability Test Procedures

Develop Accelerated Reliability Test procedures for field testing of USPS prototype electric vehicles.

Deliverable: Accelerated reliability Test procedures consistent with AVTA test format.

Status: Accelerated reliability test procedures were conducted via field evaluation by USPS. All test procedures have been delivered to INL.

Task 3.22: Conduct USPS Accelerated Reliability Testing (5 vehicles)

Conduct Accelerated Reliability Testing of five USPS prototype electric vehicles.

Deliverable: Accelerated Reliability Test reports consistent with AVTA report format.

Status: This task was cancelled. Testing is to be completed by USPS.

Task 3.23: (Added January 2011) PEV Fleet Testing

Place one battery electric vehicle and one extended range electric vehicle with associated wall mounted EVSE charger in fleet service at DOE headquarters. Monitor vehicle usage in this fleet environment for six months and evaluate any issues that arise with their use in this fleet mission.

Deliverable: Electronic copy of charger and vehicle data sent to INL and final report on vehicle use.

Status: One Chevrolet Volt and one Nissan LEAF were returned from DOE headquarters and placed into fleet testing at Clarity Group, Inc. in Phoenix, AZ. The Chevrolet Volt and Nissan Leaf have completed fleet testing under AVTA and have transitioned to cooperative agreement DE-EE0005501. The Chevrolet Volt will continue to 195K miles, while the Nissan LEAF will continue to 60K miles under cooperative agreement DE-EE0005501. See Table 1 for the final status under AVTA.

Task 4 – Fleet Testing

Task 4.a: Fleet Test 8 HCNG Vehicles

Collect fleet data (mileage and fuel-related repair costs) for at least eight vehicles operated over a total of 40,000 miles utilizing a blended fuel of 15% hydrogen in compressed natural gas (initiated under agreement DE-FC07-00ID13859).

Deliverable: Electronic reliability test data on a monthly basis and Fleet Data Sheet upon test completion.

Status: This task has been completed. The report has been posted to the AVTA website.

http://avt.inel.gov/pdf/hydrogen/2006_h2_summary_report.pdf

Task 4.b: Extended HEV Fleet Testing (2-Silverado, 2-Escape & 2 Lexus 400h)

Complete fleet testing of 2 Silverado trucks to 72,000 miles, 2 Ford Escape SUVs to 100,000 miles (will now be reported under Task 4.03) and 2 Lexus 400h SUVs to 100,000 miles (initiated under agreement DE-FC07-00ID13859).

Deliverable: Electronic reliability test data on a monthly basis and Fleet Data Sheet upon test completion.

Status: This task has been complete. The data has been posted to the AVTA website.

Silverado: http://avt.inel.gov/pdf/hev/04chevroletsilverado_ar.pdf

Escape: http://avt.inel.gov/pdf/hev/fordescape_ar.pdf

Lexus: http://avt.inel.gov/pdf/hev/fact_sheet4807.pdf

Task 4.c: 2 Accord Fleet Testing (100K mi)

Complete fleet testing of 2 Honda Accord sedans to 100,000 miles (initiated under agreement DE-FC07-00ID13859).

Deliverable: Electronic reliability test data on a monthly basis and Fleet Data Sheet upon test completion.

Status: This task has been completed. The data has been posted to the AVTA website. Further accumulated miles is reported under Task 4.5.

http://avt.inel.gov/pdf/hev/hondaaccord_ar.pdf

http://avt.inel.gov/pdf/hev/fact_sheet0657.pdf

http://avt.inel.gov/pdf/hev/ms_0657_05_Honda_Accord.pdf

http://avt.inel.gov/pdf/hev/fact_sheet1096.pdf

http://avt.inel.gov/pdf/hev/ms_1096_05_Honda_Accord.pdf

Task 4.d: Roush HICE Silverado Fleet Testing (12 mo/12K mi)

Complete 12-month/12,000 mile Fleet testing of a Chevrolet Silverado pick-up truck equipped with an HICE engine (initiated under agreement DE-FC07-00ID13859).

Deliverable: Electronic reliability test data on a monthly basis and Fleet Data Sheet upon test completion.

Status: This task has been complete. The Summary Data Sheet has been posted to the AVTA website.

<http://avt.inel.gov/pdf/hydrogen/FactSheetChevy1500HDHydrogenICE.pdf>

Task 4.e: NEV Roush Electric Vehicle Fleet Testing (6K mi)

Complete 6-month/6,000 mile Fleet testing of an NEV Roush Electric Vehicle (initiated under agreement DE-FC07-00ID13859).

Deliverable: Electronic reliability test data on a monthly basis and Fleet Data Sheet upon test completion.

Status: This task has been completed. The battery test results after 6,000 miles have been posted to the AVTA website.

<http://avt.inel.gov/pdf/nev/batteryroushrev1505.pdf>

Task 4.f: GSE Life Cycle Cost Study

Develop a life cycle cost estimate for electric bag tractors operating in ground support duty (initiated under agreement DE-FC07-00ID13859). Benchmark this estimate using data from at least two airports. Summarize results in a report for distribution via the INL website.

Deliverable: Electronic copy of GSE Life Cycle Cost Report and Modeling software program.

Status: This task has been completed. A cost estimating model has been completed and posted to the AVTA website.

<http://avt.inel.gov/pdf/airport/GSECostBenefitHigh.pdf>

<http://avt.inel.gov/pdf/airport/GSEModel111.zip>

Task 4.01: HEV Highlander Fleet Testing (2 New Vehicles 36mo/160K mi)

Complete 36-month/160,000 mile Fleet testing of 2 Toyota Highlander HEVs.

Deliverable: Electronic reliability test data on a monthly basis and Fleet Data Sheet upon test completion.

Status: This task has been completed. The Fleet Data Sheets have been posted to the AVTA website.

http://avt.inel.gov/pdf/hev/fact_sheet5681.pdf

http://avt.inel.gov/pdf/hev/ms_toyota_highlander_5681.pdf

http://avt.inel.gov/pdf/hev/fact_sheet6395.pdf

http://avt.inel.gov/pdf/hev/ms_toyota_highlander_6395.pdf

Task 4.02: Extend 2 HEV Silverado Fleet Test (72K mi to 160K mi)

Extend Fleet testing of 2 Silverado HEVs from 72,000 to 160,000 miles.

Deliverable: Electronic reliability test data on a monthly basis and Fleet Data Sheet upon test completion. See Task 4b for posted data sheets to 100k miles.

Status: This task has been completed. The Fleet Data Sheets have been posted to the AVTA website.

http://avt.inel.gov/pdf/hev/9284_2wd_silverado_factsheet.pdf

http://avt.inel.gov/pdf/hev/9664silverado_factsheet.pdf

http://avt.inel.gov/pdf/hev/ms_9284_04_2WD_Silverado.pdf

http://avt.inel.gov/pdf/hev/ms_9664_04_4WD_Silverado.pdf

Task 4.03: Extend 2 HEV Escape Fleet Test (100K mi to 160K mi)

Extend Fleet testing of 2 Ford Escape HEVs from 100,000 to 160,000 miles.

Deliverable: Electronic reliability test data on a monthly basis and Fleet Data Sheet upon test completion. See Task 4b for posted data sheets to 100k miles.

Status: This task has been completed. The Fleet Data Sheets have been posted to the AVTA website.

http://avt.inel.gov/pdf/hev/fact_sheet5881.pdf

http://avt.inel.gov/pdf/hev/ms_5881_05_Escape_2WD.pdf

http://avt.inel.gov/pdf/hev/fact_sheet8237.pdf

http://avt.inel.gov/pdf/hev/ms_8237_05_Escape_4WD.pdf

Task 4.04: Extend 2 Lexus 400h Fleet Test (100K mi to 160K mi)

Extend Fleet testing of 2 Lexus 400h HEVs from 100,000 to 160,000 miles.

Deliverable: Electronic reliability test data on a monthly basis and Fleet Data Sheet upon test completion. See Task 4b for posted data sheets to 100k miles.

Status: This task has been completed. The Fleet Data Sheets have been posted to the AVTA website.

<http://avt.inel.gov/pdf/hev/4807LexusRX400h06factsheet.pdf>

http://avt.inel.gov/pdf/hev/ms_lexus_4807.pdf

<http://avt.inel.gov/pdf/hev/2575LexusRX400h06factsheet.pdf>

http://avt.inel.gov/pdf/hev/ms_lexus_2575.pdf

Task 4.05: Extend 2 HEV Accord Fleet Test (100K mi to 160K mi)

Extend Fleet testing of 2 Honda Accord HEVs from 100,000 to 160,000 miles.

Deliverable: Electronic reliability test data on a monthly basis and Fleet Data Sheet upon test completion. See Task 4c for posted data sheets to 100k miles.

Status: This task has been completed. The Fleet Data Sheets have been posted to the AVTA website.

http://avt.inel.gov/pdf/hev/fact_sheet0657.pdf

http://avt.inel.gov/pdf/hev/ms_0657_05_Honda_Accord.pdf

http://avt.inel.gov/pdf/hev/fact_sheet1096.pdf

http://avt.inel.gov/pdf/hev/ms_1096_05_Honda_Accord.pdf

Task 4.06: Monitor HICE National Fleet Status

Monitor deployment of HICE vehicles in United States fleets. Develop and maintain a database containing the fleet location, number of vehicles, and general description of vehicle missions.

Deliverable: Electronic copy of 10 semi-annual HICE Fleet Status Reports.

Status: This task has been completed. Work on this task ended in 2008.

Task 4.07: Gen II Civic Fleet Testing (2 Vehicles 36mo/160K mi)

Complete 36-month/160,000 mile Fleet testing of 2 Gen II Civics Hybrid

Deliverable: Electronic reliability test data on a monthly basis and Fleet Data Sheet upon test completion.

Status: This task has been completed. The Fleet Data Sheets have been posted to the AVTA website.

http://avt.inel.gov/pdf/hev/ms_8725_06_Honda_Civic.pdf

http://avt.inel.gov/pdf/hev/ms_9329_06_Honda_Civic.pdf

http://avt.inel.gov/pdf/hev/hondacivicII_ar.pdf

Task 4.08: Toyota Camry HEV Fleet Testing (2 Vehicles 36mo/160K mi)

Complete 36-month/160,000 mile Fleet testing of Toyota Camry Hybrid

Deliverable: Electronic reliability test data on a monthly basis and Fleet Data Sheet upon test completion.

Status: This task has been completed. The Fleet Data Sheets have been posted to the AVTA website.

http://avt.inel.gov/pdf/hev/ms_7129_07_Toyota_Camry.pdf

http://avt.inel.gov/pdf/hev/ms_6330_07_Toyota_Camry.pdf

http://avt.inel.gov/pdf/hev/toyotacamry_ar.pdf

Task 4.09: Lexus 400H 2WD HEV Fleet Testing (1 Vehicles 36mo/36K mi)

Complete 36-month/60,000 mile Urban Fleet testing

Deliverable: Electronic reliability test data on a monthly basis and Fleet Data Sheet upon test completion.

Status: This task has been complete. The Fleet Data Sheets have been posted to the AVTA website.

<http://avt.inel.gov/pdf/hev/4807LexusRX400h06factsheet.pdf>

<http://avt.inel.gov/pdf/hev/2575LexusRX400h06factsheet.pdf>

http://avt.inel.gov/pdf/hev/lexus_ar.pdf

Task 4.10: Future PHEV Fleet Testing (20 NYSERDA Vehicles)

Complete 12mo/12,000 mile fleet testing for each of 20 NYSERDA vehicles.

Deliverable: Electronic reliability test data on a monthly basis and Fleet Data Sheet upon test completion.

Status: This task was cancelled.

Task 4.11: Saturn VUE HEV Fleet Testing (2 Vehicles 36mo/160K mi)

Complete 36-month/160,000 mile Fleet testing of 2 future HEVs

Deliverable: Electronic reliability test data on a monthly basis and Fleet Data Sheet upon test completion.

Status: This task has been completed. The Fleet Data Sheets have been posted to the AVTA website. One vehicle was destroyed in a collision at 102,934 miles. See Table 1 for status.

<http://avt.inel.gov/pdf/hev/factSaturnVue.pdf>

http://avt.inel.gov/pdf/hev/saturnvue_ar.pdf

<http://avt.inel.gov/pdf/hev/3344SaturnVue07factsheet.pdf>

<http://avt.inel.gov/pdf/hev/8122SaturnVue07factsheet.pdf>

Task 4.12: Nissan Altima HEV Fleet Testing (2 Vehicles 36mo/160K mi)

Complete 36-month/160,000 mile Fleet testing of 2 Nissan Altima HEVs

Deliverable: Electronic reliability test data on a monthly basis and Fleet Data Sheet upon test completion.

Status: This task has been completed. The Fleet Data Sheets have been posted to the AVTA website.

http://avt.inel.gov/pdf/hev/ms_7982_07_Altima.pdf

http://avt.inel.gov/pdf/hev/ms_altima_2351.pdf

http://avt.inel.gov/pdf/hev/altima_ar.pdf

Task 4.14: Chevy Tahoe HEV Fleet Testing (2 Vehicles 36mo/160K mi)

Complete 36-month/160K mile fleet testing of 2 Chevy Tahoe Hybrids.

Deliverable: Electronic reliability test data on a monthly basis and Fleet Data Sheet upon test completion.

Status: This task has been completed. The Fleet Data Sheets have been posted to the AVTA website.

http://avt.inel.gov/pdf/hev/fact_sheet08Tahoe.pdf

http://avt.inel.gov/pdf/hev/chevrolettahoe_ar.pdf

<http://avt.inel.gov/pdf/hev/5170ChevyTahoe08factsheet.pdf>

http://avt.inel.gov/pdf/hev/ms_5170_08_Chevrolet_Tahoe.pdf

<http://avt.inel.gov/pdf/hev/7400ChevyTahoe08factsheet.pdf>

http://avt.inel.gov/pdf/hev/ms_7400_08_Chevrolet_Tahoe.pdf

Task 4.16: Honda Insight Fleet Testing (2 Vehicles 36mo/160K mi)

Complete 36-month/160,000 mile fleet testing of 2 Honda Insight HEVs.

Deliverable: Electronic reliability test data on a monthly basis and Fleet Data Sheet upon test completion.

Status: This task has been completed. The Fleet Data Sheets have been posted to the AVTA website.

http://avt.inel.gov/pdf/hev/hondainsightII_ar.pdf

<http://avt.inel.gov/pdf/hev/fs2010insight0141.pdf>

<http://avt.inel.gov/pdf/hev/ms2010insight0141.pdf>

<http://avt.inel.gov/pdf/hev/fs2010insight1748.pdf>

<http://avt.inel.gov/pdf/hev/ms2010insight1748.pdf>

Task 4.17: PHEV Fleet Testing (6 vehicles 12 months)

Monitor six (6) PHEVs converted by Energy CS. Collect data using the EnergyCS onboard data collection system. Transfer data to the Idaho National Laboratory for processing.

Deliverable: Electronic reliability test data on a monthly basis.

Status: This task has been completed. A report has been posted to the AVTA website.

<http://avt.inel.gov/pdf/phev/EnergyCSPriusAccelTestingResultsReport.pdf>

Task 4.18: Ford Fusion HEV Fleet Testing (2 Vehicles 36mo/160K mi)

Complete 36-month/160K mile fleet testing of 2 Ford Fusion HEVs.

Deliverable: Electronic reliability test data on a monthly basis and Fleet Data Sheet upon test completion.

Status: This task has been completed. The Fleet Data Sheets have been posted to the AVTA website for one vehicle. The second vehicle was made inoperable due to a collision at 74,964 miles. See Table 1 for status.

http://avt.inel.gov/pdf/hev/fordfusion_ar.pdf

<http://avt.inel.gov/pdf/hev/4699FordFusion10factsheet.pdf>

http://avt.inel.gov/pdf/hev/ms_4699_2010_ford_fusion.pdf

<http://avt.inel.gov/pdf/hev/fs2010fusion4757.pdf>

<http://avt.inel.gov/pdf/hev/ms2010fusion4757.pdf>

Task 4.19: (Added in A014) HyMotion Gen II PHEV Accelerated Reliability Testing (6 months / 5,400 miles)

Complete 6-month/ 5,400 mile Accelerated Reliability testing of a plug-in gasoline hybrid electric vehicle.

Deliverable: Electronic reliability test data on a monthly basis and Fleet Data Sheet upon test completion.

Status: This task has been completed. The Fleet Data Sheet has been posted to the AVTA website.

<http://avt.inel.gov/pdf/phev/HymotionPriusV2GreenApr08-Sept11.pdf>

Task 4.20: (Added in A014) Ford Escape Gasoline PHEV Accelerated Reliability Testing (6 months / 5,400 miles)

Complete 6-month/ 5,400 mile Accelerated Reliability testing of a plug-in gasoline hybrid electric vehicle.

Deliverable: Electronic reliability test data on a monthly basis and Fleet Data Sheet upon test completion.

Status: This task has been completed. Test results are shown in Table 5, presented below.

Table 5 – PHEV Ford Escape Accelerated Reliability Testing Results

PHEV-15 2009 Ford Escape VIN# 1181													
Test Date	Cycle (mi)	Urban (10 mi)	Highway (10 mi)	Charge (Hr)	Repetitions (N)	Total (mi)	Repetitions (%)	Miles (%)	Cumulative (mi)	Electricity (kwh)	Fuel (E-85)	MPG	Status
4/5-5/20/11	10	1	0	4	60	610	37%	11%	610	238.26	2.000	305.0	
2/15/11-4/4/11	20	1	1	8	30	621.6	19%	11%	1231.6	224.57	6.900	90.1	
1/24/-2/14/11	40	4	0	12	15	612.8	9%	11%	1844.4	186.12	3.200	191.5	
8/24-9/15/10	40	2	2	12	15	620	9%	11%	2464.4	171.74	7.300	84.9	
12/3/10- 1/7/11	40	0	4	12	15	632.6	9%	11%	3097	200.02	9.700	65.2	
11/17-12/2/10	60	2	4	12	10	624.2	6%	11%	3721.2	124.16	11.800	52.9	
9/16-9/27/10	80	2	6	12	8	664.1	5%	12%	4385.3	89.50	13.600	48.8	
8/16-8/23/10	100	2	8	12	6	603	4%	11%	4988.3	64.01	13.700	44.0	shortened last day of route due to low fuel
8/1-8/3/10	200	2	18	12	3	557.2	2%	10%	5545.5	31.53	15.28 gal	36.5	shortened last day of route due to low fuel
Total	16	43	96	162	5546								

Task 4.21: Mercedes Benz HEV Fleet Testing (2 Vehicles / 36 months / 160K mi)

Complete 36-month/ 160,000 mile Fleet testing of 2 Future HEVs.

Deliverable: Electronic reliability test data on a monthly basis and Fleet Data Sheet upon test completion.

Status: This task has been completed. The Fleet Data Sheet have been posted to the AVTA website. The second vehicle had a high voltage battery failure during fleet testing and was considered inoperable.

<http://avt.inel.gov/pdf/hev/ptr2010benz5883.pdf>

<http://avt.inel.gov/pdf/hev/ptr2010benz6231.pdf>

Task 4.22: (Added in A014) Gen 3 Prius HEV Fleet Testing (2 Vehicles / 36mo/160K mi)

Complete 36-month/160K mile fleet testing of 2 Gen 3 Prius HEVs.

Deliverable: Electronic reliability test data on a monthly basis and Fleet Data Sheet upon test completion.

Status: This task has been completed. The Fleet Data Sheets have been posted to the AVTA website.

http://avt.inel.gov/pdf/hev/toyotapriusIII_ar.pdf

<http://avt.inel.gov/pdf/hev/fs2010prius0462.pdf>

<http://avt.inel.gov/pdf/hev/ms2010prius0462.pdf>

<http://avt.inel.gov/pdf/hev/fs2010prius6063.pdf>

<http://avt.inel.gov/pdf/hev/ms2010prius6063.pdf>

Task 4.23 (Added in A003): Extend 2 HEV GEN II Prius Fleet Test (100K mi to 160K mi)

Extend fleet testing of 2 Gen II Toyota Priuses HEVs from 100,000 to 160,000 miles.

Deliverable: Electronic reliability test data on a monthly basis and Fleet Data Sheet upon test completion.

Status: This task has been completed. The Fleet Data Sheets have been posted to the AVTA website.

http://avt.inel.gov/pdf/hev/04toyotaprius_ar.pdf

http://avt.inel.gov/pdf/hev/1052_04prius_factsheet.pdf

http://avt.inel.gov/pdf/hev/1052_04prius_maintain.pdf

http://avt.inel.gov/pdf/hev/2721_04prius_factsheet.pdf

http://avt.inel.gov/pdf/hev/2721_04prius_maintain.pdf

Task 4.24: (Added January 2010) Diesel Volkswagen Golf Idle-Stop Technology Fleet Testing (2 Vehicles 36 mo/160K mi)

Complete 36-month/160,000 mile Fleet testing of two Idle-Stop Technology Volkswagen Golfs equipped with diesel engines.

Deliverable: Electronic Reliability test data on a monthly basis and Fleet Data Sheet upon test completion.

Status: This task has been completed. The Fleet Data Sheets have been posted to the AVTA website.

http://avt.inel.gov/pdf/mhv/volkswagengolf_ar.pdf

<http://avt.inel.gov/pdf/mhv/fs2010golf5777.pdf>

<http://avt.inel.gov/pdf/mhv/ms2010golf5777.pdf>

<http://avt.inel.gov/pdf/mhv/fs2010golf8111.pdf>

<http://avt.inel.gov/pdf/mhv/ms2010golf8111.pdf>

Task 4.25: (Added January 2010) Mazda3 I-stop Idle-Stop Technology Fleet Testing (2 Vehicles 36 mo/160K mi)

Complete 36-month/160,000 mile Fleet testing of two Idle-Stop Technology Mazda3 I-stops equipped with combustion re-start technology.

Deliverable: Electronic Reliability test data on a monthly basis and Fleet Data Sheet upon test completion.

Status: This task has been completed. The Fleet Data Sheets have been posted to the AVTA website.

http://avt.inel.gov/pdf/mhv/mazda3_ar.pdf

<http://avt.inel.gov/pdf/mhv/fs2010mazda31865.pdf>

<http://avt.inel.gov/pdf/mhv/ms2010mazda31865.pdf>

<http://avt.inel.gov/pdf/mhv/fs2010mazda32736.pdf>

<http://avt.inel.gov/pdf/mhv/ms2010mazda32736.pdf>

Task 4.26: (Added January 2010) Smart mhd fortwo Idle-Stop Technology Fleet Testing (2 Vehicles 36 mo/160K mi)

Complete 36-month/160,000 mile Fleet testing of two Idle-Stop Technology Smart mhd fortwos equipped with conventional gasoline engine and electric re-start.

Deliverable: Electronic Reliability test data on a monthly basis and Fleet Data Sheet upon test completion.

Status: This task has been completed. Both vehicles experienced a mechanical failure and were removed from the fleet. The fuel economy study Smart mhd fortwo was substituted for fleet testing and completed fleet testing. Refer to Table 1 for results. The Fleet Data Sheets have been posted to the AVTA website.

http://avt.inel.gov/pdf/mhv/smartfortwo_ar.pdf

<http://avt.inel.gov/pdf/mhv/fs2010smart6476.pdf>

<http://avt.inel.gov/pdf/mhv/ms2010smart6476.pdf>

<http://avt.inel.gov/pdf/mhv/fs2010smart6644.pdf>

<http://avt.inel.gov/pdf/mhv/ms2010smart6644.pdf>

<http://avt.inel.gov/pdf/mhv/fs2010smart6659.pdf>

<http://avt.inel.gov/pdf/mhv/ms2010smart6659.pdf>

Task 4.27: (Added January 2010) Hyundai Sonata Hybrid HEV Fleet Testing (2 Vehicles 36 mo/160K mi)

Complete 36-month/160,000 mile Fleet testing of two Hyundai Sonata Hybrids

Deliverable: Electronic Reliability test data on a monthly basis and Fleet Data Sheet upon test completion.

Status: This task has been completed. One vehicle has experienced a drivetrain failure prior to completing 160k miles. The second vehicle completed fleet testing under AVTA and transitioned to cooperative agreement DE-EE0005501 to continue to 160k miles. See Table 1 for the final status under AVTA. The Fleet Data Sheets have been posted to the AVTA website.

http://avt.inel.gov/pdf/hev/hyundaisonata_ar.pdf

<http://avt.inel.gov/pdf/hev/fs2011sonata3539.pdf>

<http://avt.inel.gov/pdf/hev/ms2011sonata3539.pdf>

<http://avt.inel.gov/pdf/hev/fs2011sonata4932.pdf>

<http://avt.inel.gov/pdf/hev/ms2011sonata4932.pdf>

Task 4.28: (Added January 2010) Future HEV Fleet Testing (2 Vehicles 36 mo/160K mi)

This task has been cancelled. The vehicle was not available in time to support AVTA contract period.

Task 4.29: (Added January 2010) Honda CR-Z HEV Fleet Testing (2 Vehicles 36 mo/160K mi)

Complete 36-month/160,000 mile Fleet testing of two Honda CR-Z HEVs

Deliverable: Electronic Reliability test data on a monthly basis and Fleet Data Sheet upon test completion.

Status: The vehicles have completed fleet testing under AVTA and have transitioned to cooperative agreement DE-EE0005501 to continue to 160k miles. See Table 1 for the final status under AVTA. The Fleet Data Sheets have been posted to the AVTA website.

http://avt.inel.gov/pdf/hev/hondacrz_ar.pdf

<http://avt.inel.gov/pdf/hev/fs2011crz2982.pdf>

<http://avt.inel.gov/pdf/hev/ms2011crz2982.pdf>

<http://avt.inel.gov/pdf/hev/fs2011crz4466.pdf>

<http://avt.inel.gov/pdf/hev/ms2011crz4466.pdf>

Task 4.30: Reserved**Task 4.31: (Added January 2010) Nissan LEAF BEV Fleet Testing (1 Vehicle, 12 mo / 12k mi)**

Complete 12-month/ 12,000 mile Fleet testing of one (1) Nissan LEAF BEV.

Deliverable: Electronic Reliability test data on a monthly basis and Fleet Data Sheet upon test completion.

Status: This task has been completed. The vehicle completed fleet testing under AVTA and transitioned to cooperative agreement DE-EE0005501 to continue to 60k miles. See Table 1 for the final status under AVTA.

Task 4.32: (Added January 2010) BEV Accelerated Reliability Testing (1 Vehicle, 12 mo / 12k mi)

This task has been cancelled due to lack of vehicle availability within the project period.

Task 4.33: (Added January 2010) BEV Accelerated Reliability Testing (1 Vehicle, 12 mo / 12k mi)

This task has been cancelled due to lack of vehicle availability within the project period.

Task 4.34: (Added January 2010) BEV Accelerated Reliability Testing (1 Vehicle, 12 mo / 12k mi)

This task has been cancelled due to lack of vehicle availability within the project period.

Task 4.35: (Added January 2010) BEV Accelerated Reliability Testing (1 Vehicle, 12 mo / 12k mi)

This task has been cancelled due to lack of vehicle availability within the project period.

Task 4.36: (Added January 2010) BEV Accelerated Reliability Testing (1 Vehicle, 12 mo / 12k mi)

This task has been cancelled due to lack of vehicle availability within the project period.

Task 4.37: (Added January 2010) BEV Accelerated Reliability Testing (1 Vehicle, 12 mo / 12k mi)

This task has been cancelled due to lack of vehicle availability within the project period.

Task 4.38: (Added January 2010) Honda Civic Ultra-Battery HEV Fleet Testing (1 Vehicle, 24 mo / 100k mi)

Complete 24-month/100,000 mile Fleet Testing of Honda Civic Ultra-Battery HEV.

Deliverable: Electronic Reliability test data on a monthly basis and Fleet Data Sheet upon test completion.

Status: This task has been completed. The battery report, which includes the fleet data results, has been uploaded to the AVTA website.

<http://avt.inel.gov/pdf/hev/batteryultrabattery Civic5577.pdf>

Task 4.39: (Added January 2010) Chevrolet Volt PHEV Fleet Testing (12 mo / 12k mi)

Complete 12-month/ 12,000 mile Fleet testing of a Chevrolet Volt plug-in gasoline PHEV.

Deliverable: Electronic Reliability test data on a monthly basis and Fleet Data Sheet upon test completion.

Status: This task has been completed. The vehicle completed fleet testing under AVTA and transitioned to cooperative agreement DE-EE0005501 to continue to 60k miles. See Table 1 for the final status under AVTA.

Task 4.40: (Added January 2010) Plug-In Gasoline HEV Accelerated Reliability Testing (6 mo/5,400 mi)

This task has been cancelled due to lack of vehicle availability within the project period.

Task 4.41: (Added January 2011) Evaluation of Federal Fleets

Coordinate through FEMP to install data loggers on up to 40 federal fleet vehicles. Gather vehicle use data from these vehicles for approximately 60 days, and then move the loggers to new vehicles in additional fleets until data has been collected for a total of up to 200 vehicles.

Deliverable: Electronic copy of vehicle data sent to INL and a final report characterizing vehicle missions.

Status: Clarity Group, Inc. partnered with five agencies and 13 site locations in support of the AVTA Federal Fleet Data Logging and Characterization Study. Located in 11 states and the District of Columbia, Clarity Group, Inc. completed data collection on 142 fleet vehicles (60 vehicles in 2011-2012 and 82 vehicles 2012-2013) and collected nearly 200,000 miles of vehicle data. Data was analyzed for each agency/site and reports were prepared and provided to agencies for their use. A separate contract with Battelle Energy Alliance, LLC, (BEA) continued this initial work conducted under AVTA. A final FEMP report for all vehicle data collected for this task and the BEA contract was submitted to INL for review, then posted to the AVTA website.

Task 4.42: (Added January 2011) PHEV Fleet Testing

Install vehicle monitoring instrumentation to 20 Ford Escape vehicles that have been converted to plug-in hybrids. Collect vehicle performance data and monitor the vehicle usage for up to 12 months or 12,000 miles.

Deliverable: Electronic copy of charger and vehicle data sent to INL and final report on vehicle use.

Status: This task has been completed. The Data collection has been completed for all 20 vehicles in the PHEV fleet. Reports have been published to the INL website for the 12 months of the study.

<http://avt.inel.gov/pdf/phev/QuantumJanuary2012.pdf>

<http://avt.inel.gov/pdf/phev/QuantumFebruary2012.pdf>

<http://avt.inel.gov/pdf/phev/QuantumMarch2012.pdf>

<http://avt.inel.gov/pdf/phev/QuantumApril2012.pdf>

<http://avt.inel.gov/pdf/phev/QuantumMay2012.pdf>

<http://avt.inel.gov/pdf/phev/QuantumJune2012.pdf>

<http://avt.inel.gov/pdf/phev/QuantumJuly2012.pdf>

<http://avt.inel.gov/pdf/phev/QuantumAugust2012.pdf>

<http://avt.inel.gov/pdf/phev/QuantumSeptember2012.pdf>

<http://avt.inel.gov/pdf/phev/QuantumOctober2012.pdf>

<http://avt.inel.gov/pdf/phev/QuantumNovember2012.pdf>

<http://avt.inel.gov/pdf/phev/QuantumDecember2012.pdf>

Task 5 – Communication and Outreach Support (2005-2013)

Task 5.a (Added in A003): Model NEV Program

Incorporate NEV fleet data collected under previous AVTA Tasks into the Model NEV Report (prepared under agreement DE-FC07-00ID13859) to substantiate recommendations presented.

Deliverable: Electronic copy of a Model NEV Report incorporating NEV fleet data.

Status: This task has been completed. The Data has been posted to the AVTA website.

http://avt.inel.gov/pdf/nev/nev_deploy_guidelines_report.pdf

Task 5.01 (Added in A003): 2006 DOE Ad Hoc Requests for Data, Analysis, and Reports

Conduct work beneficial only to the Department of Energy (DOE) as requested by the DOE.

Deliverable: Electronic report summarizing results of work performed, filed quarterly and annually.

Status: This task has been completed. All activities that generated data, analysis, or reports in the period were included as tasks in above. No additional ad hoc requests were received.

Task 5.02 (Added in A003): 2007 DOE Ad Hoc Requests for Data, Analysis, and Reports

Conduct work beneficial only to the Department of Energy (DOE) as requested by the DOE.

Deliverable: Electronic report summarizing results of work performed.

Status: This task has been completed. All activities that generated data, analysis, or reports in the period were included as tasks in above. No additional ad hoc requests were received.

Task 5.03 (Added in A003): 2008 DOE Ad Hoc Requests for Data, Analysis, and Reports

Conduct work beneficial only to the Department of Energy (DOE) as requested by the DOE.

Deliverable: Electronic report summarizing results of work performed.

Status: This task has been completed. Data collection and analysis of project tasks were reported to DOE as requested monthly and posted per contract requirements.

The first task was to host a meeting at the Clarity Group facilities in Phoenix, AZ where George Blaisdell and Albert Nunez from the NSF were able to inspect the following NEV models;

- GEM 6 passenger
- GEM eL XD long bed
- Roush REV
- Miles ZX40ST truck

- Miles ZX40S-AD sedan
- ZENN 2 passenger sedan (MY 2008)
- ZENN 2 passenger sedan (MY 2006)

The second task was to prepare a table of the capabilities, sizes, costs, etc. for available and claimed available NEVs for the NSF.

In addition to cold temperatures, Antarctica presents unique vehicle operations requirements, including the need for sufficient space in the cab for operations by personnel with large coats and heavy boots. NSF seemed to be most interested in a NEV pickup from Miles Automotive due to space in the cab and the pickup bed.

A question was raised regarding NEV petroleum displacement. Analysis indicated that the Miles Pickup would achieve an equivalent of approximately 65 miles per gallon of diesel fuel used to generate electricity in Antarctica. The Miles pickup uses 156 AC watt hours per mile, with a 50% penalty assumed for cold weather operations with heater use, resulting in 234 AC watt hours per mile. The diesel-powered generator is assumed to be about 40% efficient, resulting in about 585 AC watt hours per mile. Diesel fuel can generate about 38,000 watt hours per gallon. With 38,000 watt hours per gallon divided by 585 AC watt hours per mile, approximately 65 miles per gallon can be achieved. The type of internal combustion engine pickups the NEVs will replace would likely get between 15 and 20 miles per gallon in "normal" domestic operations, but these vehicles are idled for extended periods of time and are operated inefficiently in Antarctica, so a likely mpg would be in the 10 to 12 mpg range at best. This provides the NEV with a 5 to 6 times improvement in petroleum use. In addition to significant savings in petroleum use, it is anticipated that savings of a similar magnitude can be achieved in vehicle maintenance.

As part of this Task 5.03, additional support was provided through the following activities.

ORNL requested the drive train from the 04 Prius VIN 1052, which had previously been sold. Clarity Group, Inc. reacquired the vehicle and removed the requested parts and shipped them to ORNL, at the request of DOE Project Management in support of the overall Vehicle Technologies development testing as part of Task 5 activities. The balance of the vehicle was scrapped.

A Ford Escape PHEV was tested using the 10 and 20-mile cycles of the PHEV accelerated reliability test. Results were transmitted to INL under a Non-Disclosure Agreement with Ford.

Task 5.04 (Added in A003): 2009 DOE Ad Hoc Requests for Data, Analysis, and Reports

Conduct work beneficial only to the Department of Energy (DOE) as requested by the DOE.

Deliverable: Electronic report summarizing results of work performed.

Status: This task has been completed. All activities that generated data, analysis, or reports in the period were included as tasks in above. No additional ad hoc requests were received.

Task 5.05 (Added in A003): 2010-2013 DOE Ad Hoc Requests for Data, Analysis, and Reports

Conduct work beneficial only to the DOE as requested by the DOE.

Deliverable: Electronic report summarizing results of work performed.

Status: This task has been completed. All activities that generated data, analysis, or reports in the period were included as tasks in above. Ad hoc requests completed included providing PHEV vehicle used in AVTA fleet testing to INL for first-hand use and Winter performance analysis.

Task 5.06 2006 DOE Administrative Tasks

Administrative tasks conducted as required by DOE in support of award. Administrative work needed to comply with contract requirements.

Deliverable: Electronic reports required by contract.

Status: This task has been completed. Clarity Group, Inc. personnel participated in the Electric Drive Transportation Association Conference in Vancouver from December 6-8, 2005, and also the WestStart Clean Heavy Duty Vehicle Conference on February 22, 2006 to discuss HICE integration. Three displays were created for the HICE discussions, including one on the Hydrogen fueling station and fleet data, Hydrogen and blended fuel, and the third display on the Roush HICE truck. The Roush HICE truck and IWHUP project were presented at the National Hydrogen Association Meeting during the week of March 12, 2006. A paper was presented regarding baseline and end-of-life battery testing at the SAE Congress in Detroit, MI in April 2006. At the request of the DOE Project Manager, Clarity Group personnel participated in a DOE led Plug-In Hybrid Discussion meeting on May 4-5, 2006 at DOE headquarters in Washington, DC. Clarity personnel participated in breakout session discussions. Clarity Group, Inc. personnel also participated in the Phoenix Clean Cities Meeting on May 8-10, 2006. Data from the Drive AVTA Testing presented during the Advanced Automobile Battery Conference in Baltimore, Maryland in May 2006. The annual DOE summit was conducted at Clarity Group, Inc. in Phoenix on June 6, 2006 to discuss current and ongoing vehicle tasks.

Task 5.07 2007 DOE Administrative Tasks

Administrative tasks conducted as required by DOE in support of award. Administrative work needed to comply with contract requirements.

Deliverable: Electronic reports required by contract.

Status: This task has been completed. A DOE meeting to discuss current and future tasks was held on October 24, 2007. The annual DOE summit was conducted at Clarity Group, Inc. in Phoenix on January 18, 2007 to discuss 2007 and future vehicle tasks. Clarity Group, Inc. personnel participated in a Clean Cities Legislative presentation. Hydrogen, electric, and hybrid vehicles were displayed at the state capitol building as part of this presentation on February 28, 2007. A presentation was given on Alternative Fuel Vehicles at the Transportation and Environment Issue Day on August 17, 2007. No additional administrative tasks were required in 2007.

Task 5.08 2008 DOE Administrative tasks

Administrative tasks conducted as required by DOE in support of award. Administrative work needed to comply with contract requirements.

Deliverable: Electronic reports required by contract.

Status: This task has been completed. The annual DOE summit was conducted at Clarity Group, Inc. in Phoenix in January 2008 to discuss 2008 and future vehicle tasks. No additional administrative tasks were required in 2008.

Task 5.09 2009 DOE Administrative tasks

Administrative tasks conducted as required by DOE in support of award. Administrative work needed to comply with contract requirements.

Deliverable: Electronic reports required by contract.

Status: This task has been completed and included the investigation of a battery failure in a plug-in hybrid electric vehicle. A Ford Escape Hybrid was converted to a Plug-In Hybrid Electric Vehicle configuration by Electrovaya and delivered to the New York State Energy Research and Development Authority in August, 2007. The vehicle was tested for both NYSERDA and the US Department of Energy for performance, emissions and reliability. At the conclusion of this test work, the vehicle was parked and plugged into a wall outlet. It was found several days later to have suffered a catastrophic failure of the battery pack, which destroyed portions of the cargo area of the vehicle. The vehicle was equipped with an add-on battery pack that increased battery capacity by 12kWh. At least two repairs were made to the vehicle prior to the incident. The vehicle suffered a severe overheating of the battery, but no signs of sustained fire were found. All cells in the pack were found to be in place but destroyed. Components with low melting points were missing; aluminized pouch bag, solvents and polymer separators. The electrodes, graphite, carbon, and copper foil were all present. Aluminum containers were deformed and in many places found melted and/or disintegrated. All circuit boards were found delaminated. The cause of the incident appears to be continuous overcharge. Data recorded from an energy meter connected to the wall outlet shows an average power draw of 200W for the 11 days during which the vehicle was parked and plugged into the wall. The exact cause of this overcharge is uncertain, but likely due to a failure in the onboard battery charger or the Battery Management System, which controls the onboard charger. In spite of the high heat created by this overcharge condition, the vehicle did not catch fire, or at least was not consumed by any fire. The battery cells remained in place and did not explode. There is no evidence of extreme electrical shorting, arcing or sparking. While the battery pack was completely destroyed, damage to the vehicle was limited.

In addition to the battery failure investigation, at the request of the DOE Project Manager, Clarity Group personnel participated in a DOE-led PHEV Market Introduction Study Workshop meeting on December 1-2, 2008 at DOE headquarters in Washington, DC. Clarity Group, Inc. personnel participated in breakout session discussions. The annual DOE summit was conducted at Clarity Group, Inc. in Phoenix in January 2009 to discuss 2009 and future vehicle tasks.

Task 5.10 2010-2013 DOE Administrative Tasks

Administrative tasks conducted as required by DOE in support of award. Administrative work needed to comply with contract requirements.

Deliverable: Electronic reports required by contract.

Status: This task has been completed. The annual DOE summit was conducted annually in January at Clarity Group, Inc. in Phoenix to discuss 2010 through project close vehicle tasks. Any new requests will be through cooperative agreement DE-EE0005501. No additional administrative tasks were required in 2010-2013.

Task 5.11 Support Chinese Battery & Vehicle Manufacturer Interface

Develop a status report of Chinese battery and vehicle manufacturers and conduct interface work with these manufacturers as requested by DOE.

Deliverable: Status report of battery and vehicle manufacturers and ad hoc reports as required by DOE

Status: A Clarity Group, Inc. engineer visited battery suppliers and vehicle converters during Q1 of FY 2012. Initial discovery information was shared with INL. It was determined that no further interface was necessary at this time.

Task 5.12 Support Chinese Sister Cities

Conduct work required to support DOE Chinese Sister Cities Program.

Deliverable: Electronic reports as required by DOE

Status: China travel by a Clarity Group, Inc. engineer included Sister City Shanghai. As in task 5.11, general information was shared with INL that was later utilized for a workgroup review that INL personnel participated in. No formal report will be issued.

Accomplishments

Over the course of 90 months, a total of 113 vehicles have been tested during this cooperative agreement. These advanced technology vehicles evaluated included the following;

- 37 Hybrid Electric Vehicles
- 29 Plug-In Hybrid Electric Vehicles
- 9 Battery Electric Vehicles
- 10 Neighborhood Electric Vehicles
- 14 Hydrogen Internal Combustion Engine Vehicles
- 4 Natural Gas-fueled Vehicles
- 7 Stop-Start Vehicles (Micro-Hybrids)
- 3 eGSE Vehicles (Off-Road)

These vehicles accumulated over 6,600,000 test miles.

The following observations and accomplishments were identified during the conduct of the AVTA vehicle testing activity:

- Highest average fuel economy for a hybrid: 44.2 mpg average for the two 2010 Toyota Prius Hybrids and also for the two 2004 Toyota Prius Hybrids
- Highest average fuel economy for a mid-size hybrid sedan: 35.0 mpg average for the two 2010 Ford Fusion Hybrids
- Highest average fuel economy for a hybrid SUV: 27.0 mpg average for the two 2005 Ford Escape Hybrids
- Highest average fuel economy for a hybrid pickup truck: 17.9 mpg average for the two 2004 Chevrolet Silverado Hybrids
- Highest average fuel economy for an idle-stop vehicle: 43.2 mpg average for the two 2010 Volkswagen Golf Diesels (Imported from Europe)
- Highest charge depleting range at a constant 60 mph for a plug-in hybrid: 31.0 miles for the 2011 Chevrolet Volt
- Highest charge depleting range at a constant 60 mph for a battery electric vehicle: 65.3 miles for the 2011 Nissan Leaf.

Seven (7) vehicles had to abort testing or provided incomplete test results due to catastrophic part failure or accident damage.

157 separate tasks were defined and conducted that generated over 250 reports over the period of performance.

Recommendations

As a result of conducting the Advanced Vehicle Testing and Evaluation, Clarity Group, Inc. offers the following recommendations for future advanced vehicle testing;

- a) Seven (7) vehicles failed to complete the scheduled testing due to catastrophic part failure or a traffic accident, which "totaled" the vehicle. In one case both vehicles of a model being tested failed to complete the testing and in five (5) other cases, only one vehicle of the model being tested completed the testing.

RECOMMENDATION: More than two samples of an advanced vehicle model should be tested. This would provide a more statistically valid evaluation of the vehicle model and the associated technology's operating costs, fuel economy and durability.

- b) Computer technology for data logging and transfer of data collected by loggers has advanced since 2005, and provides greater speed, larger on-board storage, and greater reliability when data is downloaded automatically.

RECOMMENDATION: Update data loggers to systems that are up-to-date technology and able to transfer data remotely (wirelessly via wi-fi or by cellular communication).

- c) Throughout the conduct of the AVTA project, Clarity Group, Inc. has relied on only one fleet at a time. Although both fleets used over the project period of performance were reliable, the flexibility to modify mileage accumulation rates, to access vehicles for additional evaluation, adding vehicles to or taking vehicles from the fleet can be problematic when the test fleet makes up a significant portion of the operator's overall fleet.

RECOMMENDATION: Additional fleet operators would increase flexibility for testing and evaluation, and enable the AVTA program to increase the number of vehicles tested.

- d) Testing advanced technology vehicles often involved non-traditional transportation fuels and fueling infrastructure (CNG, Hydrogen, Electricity, Propane), and the infrastructure is often an enabler for the advanced vehicle technology.

RECOMMENDATION: Testing and evaluating the fueling infrastructure that supports these advance vehicle technologies would enhance the value to the Advanced Vehicle Testing Activity. Including the evaluation of fueling technologies, especially electric vehicle charging, which can also add an additional level of control on "fuel" consumption aspect of AVTA.