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<b>RDT&amp;E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)</b>								DATE February 1999		
APPROPRIATION/BUDGET ACTIVITY RDT&E, Defense-wide BA3 Advanced Technology Development					R-1 ITEM NOMENCLATURE Electric Vehicles PE 0603747E, R-1 #43					
COST ( <i>In Millions</i> )	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	Cost To Complete	Total Cost
Total Program Element (PE) Cost	15.000	9.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	N/A
Electric Vehicles EV-01	15.000	9.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	N/A

**(U) Mission Description:**

(U) Electric and hybrid electric drivetrains provide compelling advantages for future tactical and combat vehicles. Of particular importance is a 50-percent reduction in fuel consumption due to higher efficiency, improved acceleration and maneuverability due to immediate torque to the wheels or tracks, and dramatically reduced thermal and acoustic signatures when operating from on-board energy storage. Affordability is addressed through reduced logistics requirements and the dual use applications of these technologies.

(U) The DARPA Electric and Hybrid Vehicle Technology program is pursuing research, development, and demonstrations of technologies for electric and hybrid vehicles that address military missions, modernization, and cost mitigation. Established by Congress in FY 1993, the program has pursued technology development and prototype demonstrations that are essential for future military systems, enhancing national energy security, and facilitating compliance by the Armed Services with federal clean air legislation. DARPA uses a unique decentralized management approach working directly with seven regional consortia. These diverse consortia provide a minimum of 50% of the funding and cooperatively function to overcome the challenges of developing electric and hybrid vehicle technologies. Consortium participants include military laboratories and bases, state and local governments, large and small defense contractors, well-established and startup manufacturers of vehicles and components, electric and gas utilities, public interest groups, and universities. Military requirements and infrastructure are implemented within this program at minimal federal investment, leveraging significant private funds.

(U) Technology development is focused on: High-specific power engine/generator sets, including multi-fuel capable, high efficiency, and low emissions turbines, diesels, and rotary engines; Power control devices, including high-performance power semiconductors, control algorithms, and circuit integration and packaging; Energy storage devices, including advanced batteries, rapid battery recharging, flywheels, and capacitors; Electromechanical conversion, including alternating current, direct current, and linear motors; and lightweight high-strength materials, including space-frames and composites. These dual-use electric drivetrain technologies are being demonstrated in both commercial and military chassis. The

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technologies are directly relevant and are coordinated with the DARPA Combat Hybrid Power Systems (CHPS) and Reconnaissance Surveillance and Targeting Vehicle programs (budgeted under PE 0603764E, Project LNW-01).

(U) The program is transitioning to the Department of Transportation in FY 1999. The Research and Special Programs Administration of DOT has budgeted to continue the program in FY 2000.

(U) **Program Accomplishments and Plans:**

(U) **FY 1998 Accomplishments:**

- Completed development of the hybrid electric Bradley Fighting Vehicle and completed development and field testing of hybrid electric High Mobility Multi-Purpose Wheeled Vehicles (HMMWVs) and electric M-113. (\$ 2.800 Million)
- Developed and tested additional medium and heavy-duty hybrid electric vehicles. (\$ 2.000 Million)
- Developed and tested turboalternator and other auxiliary power units for medium and heavy hybrid electric vehicles. (\$ 1.000 Million)
- Further integrated and tested flywheel energy storage units with containment. (\$ 2.100 Million)
- Developed and tested improved and reliable batteries, battery chargers, and battery management systems. (\$ 4.000 Million)
- Developed and tested improved drivetrain and other components of hybrid electric vehicles. (\$ 3.100 Million)

(U) **FY 1999 Plans:**

- Complete field testing of the hybrid electric Bradley Fighting Vehicle. (\$ 0.700 Million)
- Perform lifetime safety tests on flywheels, improve flywheel bearings, and install flywheels in vehicles. (\$ 1.400 Million)

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- Apply high energy and high power battery systems to vehicles. (\$ 2.500 Million)
- Integrate hybrid electric drivetrain and controls into medium and heavy-duty vehicles. (\$ 4.400 Million)

**(U) FY 2000 Plans:**

- Not Applicable.

**(U) FY 2001 Plans:**

- Not Applicable.

**(U) Program Change Summary: (In Millions)**

	<u>FY1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>
Previous President's Budget	14.522	0.000	0.000	0.000
Current Budget	15.000	9.000	0.000	0.000

**(U) Change Summary Explanation:**

FY 1998      Increase reflects minor program repricing.  
 FY 1999      Funds added in the Appropriations Act to ensure program continuity pending DOT funding.

**(U) Other Program Funding Summary Cost:**

- Not Applicable.

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(U) **Schedule Profile:**

<u>Plan</u>	<u>Milestones</u>
May 98	Completed preliminary designs of turboalternators for hybrid electric vehicles.
Dec 98	Completed demonstration of hybrid electric propulsion of second High Mobility Multi-purpose Wheeled Vehicle (HMMWV).
Dec 98	Completed testing of rapid charging units.
Apr 99	Complete field test of electric M-113.
Apr 99	Complete field test of two hybrid electric HMMWVs.
Jun 99	Complete demonstration of hybrid electric propulsion of Bradley Fighting Vehicle.
Nov 99	Complete field test of hybrid electric Bradley Fighting Vehicle.

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