FY 2003 RDT&E,N PROGRAM ELEMENT/PROJECT COST BREAKDOWN DATE: FEBRUARY 2002

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603724N
PROGRAM ELEMENT TITLE: Navy Energy Program (ADV)

(U) COST: (Dollars in Thousands)

PROJECT NUMBER & TITLE	FY 2001 ACTUAL	FY 2002 ESTIMATE	FY 2003 ESTIMATE	FY 2004 ESTIMATE	FY 2005 ESTIMATE	FY 2006 ESTIMATE	FY 2007 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
R0829	Energy Conservation (ADV)								
	2,257	2,818	2,858	2,917	2,991	3,039	3,092	CONT.	CONT.
R0838	Mobility Fuels (ADV)								
	2,151	2,163	2,202	2,239	2,295	2,337	2,378	CONT.	CONT.
R2868	Proton Exchange Membrane (PEM) Fuel Cells								
	2,903	1,982	-	-	-	-	-	4,885	4,885
TOTAL	7,311	6,963	5,060	5,156	5,286	5,376	5,470	CONT.	CONT.

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This program supports projects to evaluate, adapt, and demonstrate energy related technologies for ship and aircraft operations to: (a) increase fuel-related weapons systems capabilities such as range and time on station; (b) reduce energy costs; (c) apply energy technologies that improve environmental compliance; (d) relax unnecessarily restrictive fuel specification requirements to reduce cost and increase availability worldwide; (e) provide guidance to fleet operators for the safe use of commercial grade or off-specification fuels when military specification fuels are unavailable or in short supply; and (f) make needed periodic changes to fuel specifications to ensure fuel quality and avoid fleet operating problems. Project R2868 is an FY2001/FY2002 Congressional plus-up to implement Proton Exchange Membrane (PEM) fuel cell technology at Department of Navy sites. This program, and the companion PE 0604710N, Navy Energy Program (ENG) support the achievement of legislated, White House, Department of Defense and Navy Energy Management Goals. It also responds to direction from the Office of the Secretary of Defense, the Secretary of the Navy and the Chief of

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Naval Operations to make up-front investment in technologies that reduce future cost of operation and ownership of the fleet and supporting infrastructure.

(U) JUSTIFICATION FOR BUDGET ACTIVITY: This program is funded under DEMONSTRATION & VALIDATION because it develops and integrates hardware for experimental tests related to specific ship or aircraft applications.

(U) PROGRAM CHANGE SUMMARY FOR TOTAL PE:

	FY 2001	FY 2002	FY 2003
(U) FY 2002 President's Budget:	7,869	5,025	
(U) Adjustments from PRESBUDG:			
(U) Execution Adjustments	-450		
(U) SBIR Adjustment	-108		
(U) Stationary PEM Fuel Cells Cong. Plus-Up		2,000	
(U) Section 8123 Reduction		-62	
(U) FY 2003 President's Budget Submission	7,311	6,963	5,060

(U) CHANGE SUMMARY EXPLANATION:

(U) Schedule: Not applicable.

(U) Technical: Not applicable.

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(U) COST: (Dollars in Thousands)

PROJECT NUMBER & TITLE	FY 2001 ACTUAL	FY 2002 ESTIMATE	FY 2003 ESTIMATE	FY 2004 ESTIMATE	FY 2005 ESTIMATE	FY 2006 ESTIMATE	FY 2007 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
R0829 Energy Conservation	2,257	2,818	2,858	2,917	2,991	3,039	3,092	CONT.	CONT.

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This project improves the energy efficiency of Navy ships and aircraft, and thereby contributes to reduced operating costs and improved fleet sustainability and performance. Major efforts include work to increase the efficiency of aircraft engines; and develop improved hull drag reducing technologies and more efficient energy conversion systems for ships.

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 2001 ACCOMPLISHMENTS:
   - (U) ($600) Aircraft: GE IR&D funds were leveraged to complete aerodynamic design of an advanced energy efficient compressor for the GE23a demonstrator engine. This compressor is sized to provide the airflow needed for a growth F414 engine (+15% thrust, 3-4% improved efficiency) for the F/A-18E/F aircraft. The Energy Program previously funded design of the high-pressure turbine, fan and advanced control system software.
   - (U) ($1,657) Ships: Tow-tank tests of stern flap geometry for LHA-1/LHD-1 classes were conducted; all such testing for existing surface combatants was successfully completed. Evaluated self-polishing reduced copper/cobiocide antifouling hull coatings for copper release and binder hydrolysis rates. Bilge keel panel testing of these coatings was expanded. Performed technology trade-off study to identify commercial technology that could improve LM2500 main propulsion gas turbine engine operation and performance. Evaluated exhaust flow turning techniques to reduce back pressure and improve efficiency of LM2500 engines. Selected materials for DDA-501 turbo-generator anti-degradation compressor blade coating and ceramic turbine blade track.

2. (U) FY 2002 PLAN:

- (U) ($600) Aircraft: GE has developed a reduced drag turbine rear frame conceptual design. These funds will begin detailed design of this component which meets growth requirements of the current F414 engine. This component will reduce fuel comsumption of the growth engine by 2%, mostly when afterburning.
- (U) ($2,218) Ships: Evaluate effectiveness and maintenance requirements (application, repair and removal) of self-polishing reduced copper/cobiocide hull coatings. Screen candidate coatings by rates of copper release and binder hydrolysis--best paints will undergo large scale testing in PE 0604710N to demonstrate suitability for Navy use. Continue screening and model testing of simple hydrodynamic mods for future ships to improve energy efficiency: complete LSD-41/LSD-49 stern flap model tests. Complete technology application study to identify cost effective improvements for 501-K17/34 ship service turbo-generators. Add performance algorithms to digital engine controls/fuel control system (being developed by LM2500 Life Cycle Manager for condition based maintenance) to enable condition based operation. Select materials for anti-degradation coating for LM2500 compressor; evaluate available materials for turbine applications.

3. (U) FY 2003 PLAN:

- (U) ($1,050) Aircraft: Complete detailed design of the turbine rear frame for a growth F414 engine and support prototype fabrication and rig testing.
- (U) ($1,808) Ships: Continue screening of self-polishing reduced copper/cobiocide coatings (and other advanced antifouling coatings) through laboratory tests of toxicant and binder release rates, and exposure testing on panels to determine application, maintenance and performance characteristics. Select promising candidates for large-scale testing via PE 0604710N. Develop improved correlations between model and full-scale tests for hull drag reducing appendages. Evaluate bow-fins for TA0-187 class ships. Evaluate benefits of digital fuel controls, condition based operation, improved inlet flow and other cost-effective improvements for both 501-K34 turbogenerator and LM2500 main propulsion gas turbines. Evaluate electronic control system for FFG-7 diesel generators.

C. (U) OTHER PROGRAM FUNDING SUMMARY: Not applicable.

FY 2003 RDT&E,N PROGRAM ELEMENT/PROJECT COST BREAKDOWN DATE: FEBRUARY 2002

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603724N PROJECT NUMBER: R0829
PROGRAM ELEMENT TITLE: Navy Energy Program (ADV) PROJECT TITLE: Energy Conservation (ADV)

(U) RELATED RDT&E:

(U) PE 0601153N (Defense Research Sciences)
(U) PE 0602236N (Warfighter Sustainment Applied Research)
(U) PE 0603236N (Warfighter Sustainment Advanced Technology)
(U) PE 0603513N (Shipboard Systems Component Development)
(U) PE 0603573N (Advanced Surface Machinery Systems)
(U) PE 0603721N (Environmental Protection)
(U) PE 0604710N (Navy Energy Program (ENG))

D. (U) SCHEDULE PROFILE: Not applicable.

FY 2003 RDT&E,N PROGRAM ELEMENT/PROJECT COST BREAKDOWN DATE: FEBRUARY 2002

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603724N PROGRAM ELEMENT TITLE: Navy Energy Program (ADV) PROJECT NUMBER: R0829 PROJECT TITLE: Energy Conservation (ADV)

A. (U) PROJECT COST BREAKDOWN: ($ in thousands)

Project Cost Categories	FY 2001	FY 2002	FY 2003
a. System Development and Integration	2,257	2,818	2,858

B. (U) BUDGET ACQUISITION HISTORY AND PLANNING INFORMATION: Not applicable.

FY 2003 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET DATE: FEBRUARY 2002

BUDGET ACTIVITY: 4

PROGRAM ELEMENT: 0603724N
PROGRAM ELEMENT TITLE: Navy Energy Program (ADV)

(U) COST: (Dollars in thousands)

PROJECT NUMBER & TITLE	FY 2001 ESTIMATE	FY 2002 ESTIMATE	FY 2003 ESTIMATE	FY 2004 ESTIMATE	FY 2005 ESTIMATE	FY 2006 ESTIMATE	FY 2007 ESTIMATE	TO COMPLETE	TOTAL PROGRAM
R0838 Mobility Fuels (ADV)	2,151	2,163	2,202	2,239	2,295	2,337	2,378	CONT.	CONT.

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This project provides data through engine and fuel system tests which relate the effects of changes in Navy fuel procurement specification properties to the performance and reliability of Naval ship and aircraft engines and fuel systems. This information is required to: (a) determine the extent to which unnecessarily restrictive specification features can be relaxed to reduce cost and increase availability worldwide; (b) provide guidance to fleet operators for the safe use of off-specification or commercial grade fuels when military specification fuels are unavailable or in short supply; and (c) make needed periodic changes to fuel specifications to ensure fuel quality and avoid fleet operating problems while accommodating evolutionary changes in the fuel supply industry. Recent problems with fuel quality have adversely affected ship and aircraft system performance and reliability and resulted in degradation of fuel in storage. The resulting readiness impacts, additional maintenance costs, and the cost of lost equipment, although difficult to quantify, are many times the cost of this project. Over the next decade, the potential for fuel quality related problems will increase because of changing industry practices required to comply with new environmental regulations. This project represents the only investment designed to maintain the Navy's ability to operate as a "smart" customer for fuels that cost over $2B per year to procure, transport, store and consume and are essential to fleet operations.

FY 2003 RDT&E,N PROGRAM ELEMENT/PROJECT COST BREAKDOWN DATE: FEBRUARY 2002

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603724N PROJECT NUMBER: R0838
PROGRAM ELEMENT TITLE: Navy Energy Program (ADV) PROJECT TITLE: Mobility Fuels (ADV)

(U) PROGRAM ACCOMPLISHMENTS AND PLANS:

1. (U) FY 2001 Accomplishments:
   - (U) ($990) Ships: Continued gas turbine engine, high-and medium-speed diesel engine fuel injection systems, and shipboard fuel handling systems component tests with low lubricity ship diesel fuels to determine effects on durability. Initiated evaluation of lubricity enhancing additives for use with low-lubricity ship diesel fuels. Completed Phase I task (availability and cost issues for JP-5) to determine the feasibility of specifying JP-5 as the single fuel for use by all Naval systems (ships, aircraft and ground equipment). Initiated Phase II task (engine and fuel systems hardware maintenance issues, operational and shipboard impacts) to determine the feasibility of specifying JP-5 as the single fuel. Initiated work to quantify effects of low thermal stability Navy distillate fuels on maintenance requirements for navy gas turbine and diesel engines.
   - (U) ($1,161) Aircraft: Initiated evaluation of the impact of copper contaminated fuel and +100 thermal stability improving additives on Naval Joint Strike Fighter engine performance and maintenance requirements. Initiated development of improved test devices for shipboard fuel contamination and water detection. Conducted field testing of prototype copper contamination removal system. Initiated field evaluation of +100 additive compatible shipboard fuel/water separator elements. Completed evaluation of effects of +100 additive on F/A-18E/F and AV-8B engine systems.

2. (U) FY 2002 Plan:
   - (U) ($976) Ships: Complete testing of Navy gas turbine, high-and medium-speed diesel engine fuel injection systems, and shipboard fuel handling systems with low-lubricity ship diesel fuels. Use results to specify minimum lubricity levels and test methods to be used for fuel acceptance. Complete evaluation of lubricity enhancing additives for use with Navy distillate fuels. Continue component tests to determine effects of low thermal stability Navy distillate fuels on maintenance requirements for Navy gas turbine and diesel engines. Continue phase II assessment of the feasibility of specifying JP-5 as the single fuel for use by all Naval Systems (ships, aircraft. and ground equipment).
   - (U) ($1,187) Aircraft: Conduct evaluation of copper contamination removal system. Complete evaluation of the impact of copper contaminated fuel and +100 additives on Naval Joint Strike Fighter engine performance and maintenance requirements. Initiate JP-5 specification requirements and specification test review to determine and remove

unnecessary requirements and increase worldwide availability. Evaluate prototype shipboard fuel contamination and free water detection equipment. Continue T45 +100 additive field evaluation.

3. (U) FY 2003 PLAN:

- (U) ($1,000) Ships: Complete testing of Navy gas turbine, high-and medium-speed diesel engine fuel injection systems, and shipboard fuel handling systems with low-lubricity ship diesel fuels. Use results to specify minimum lubricity levels and test methods to be used for fuel acceptance. Continue component tests to determine effects of low thermal stability Navy distillate fuels on maintenance requirements for Navy gas turbine and diesel engines. Complete assessment of the feasibility of specifying JP-5 as the single fuel for use by all Naval Systems (ships, aircraft and ground equipment).
- (U) ($1,202) Aircraft: Complete shipboard evaluation of copper contamination removal system. Complete JP-5 specification requirements and specification test review to determine and remove unnecessary requirements and increase worldwide availability. Evaluate impact of Tischer-Tropsch produced, and other non-petroleum derived jet fuels on Naval aircraft engines and fuel systems.
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C. (U) OTHER PROGRAM FUNDING SUMMARY: Not applicable.

(U) RELATED RDT&E:

(U) PE 0601152N (In-House Laboratory Independent Research)
(U) PE 0205632N (Aviation Improvements)

D. (U) SCHEDULE PROFILE: Not applicable.

FY 2003 RDT&E,N PROGRAM ELEMENT/PROJECT COST BREAKDOWN DATE: FEBRUARY 2002

BUDGET ACTIVITY: 4 PROGRAM ELEMENT: 0603724N PROJECT NUMBER: R0838
PROGRAM ELEMENT TITLE: Navy Energy Program (ADV) PROJECT TITLE: Mobility Fuels (ADV)

A. (U) PROJECT COST BREAKDOWN: ($ in thousands)

Project Cost Categories	FY 2001	FY 2002	FY 2003
a. Reliability, Maintainability, and Availability	2,151	2,163	2,202

B. (U) BUDGET ACQUISITION HISTORY AND PLANNING INFORMATION: Not applicable.