Exhibit R-2, RDT&E Budget Item Justification: PB 2013 Navy										DATE: February 2012	
APPROPRIATION/BUDGET ACTIVITY 1319: *Research, Development, Test & Evaluation, Navy* BA 4: *Advanced Component Development & Prototypes (ACD&P)*				R-1 ITEM NOMENCLATURE PE 0603573N: *Advanced Surface Machinery Sys*							
COST ($ in Millions)	**FY 2011**	**FY 2012**	**FY 2013 Base**	**FY 2013 OCO**	**FY 2013 Total**	**FY 2014**	**FY 2015**	**FY 2016**	**FY 2017**	**Cost To Complete**	**Total Cost**
Total Program Element	5.295	18.239	29.897	-	29.897	35.568	26.350	20.414	20.044	Continuing	Continuing
2471: *Integrated Power Systems (IPS)*	5.295	18.239	29.897	-	29.897	35.568	26.350	20.414	20.044	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Electric Ships Office (ESO), PMS-320, is responsible for developing and executing the Next Generation Integrated Power System (NGIPS) Technology Development Roadmap (TDR) and transition plans, as well as providing power system solution alternatives to new and existing platforms. The ESO's efforts are to coordinate the ongoing electric power efforts of the PEOs and Office of Naval Research, establish the technical basis and strategic direction for Naval power system architectures, develop decision making tools, and establish technical standards.

In October 2009, SECNAV outlined a set of specific objectives supporting U.S. Navy energy reform including several aimed at significantly reducing Fleet fuel consumption and improving our energy security posture. The ESO supports the DON Energy Goals by employing an integrated approach to develop and transition more affordable technologies that satisfy increasing shipboard power demands and high operational tempo while improving energy efficiency, reducing fuel consumption, and reducing Total Ownership Cost.

This PE funds the development of specific and future electric surface ship technologies for all future ships, with the focus on integrated power systems, which provide total ship electric power, including electric propulsion, power conversion and distribution, and combat system and mission load interfaces to the electric power system.

Exhibit R-2, RDT&E Budget Item Justification: PB 2013 Navy		DATE: February 2012
APPROPRIATION/BUDGET ACTIVITY 1319: *Research, Development, Test & Evaluation, Navy* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	R-1 ITEM NOMENCLATURE PE 0603573N: *Advanced Surface Machinery Sys*	

B. Program Change Summary ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
Previous President's Budget	5.459	18.249	28.345	-	28.345
Current President's Budget	5.295	18.239	29.897	-	29.897
Total Adjustments	-0.164	-0.010	1.552	-	1.552
• Congressional General Reductions	-	-0.010			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.136	-			
• Program Adjustments	-	-	1.608	-	1.608
• Rate/Misc Adjustments	-	-	-0.056	-	-0.056
• Congressional General Reductions Adjustments	-0.028	-	-	-	-

Change Summary Explanation

FY13 increase for DDG 51 Flt III's Air & Missile Defense Radar (AMDR) power interface & reduction for ICAS Installation & Tech Adjustments.

Exhibit R-2A, RDT&E Project Justification: PB 2013 Navy			DATE: February 2012
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COST ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total	FY 2014	FY 2015	FY 2016	FY 2017	Cost To Complete	Total Cost
2471: *Integrated Power Systems (IPS)*	5.295	18.239	29.897	-	29.897	35.568	26.350	20.414	20.044	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0		

A. Mission Description and Budget Item Justification

This project supports the Integrated Power Systems (IPS) program. IPS provides total ship electric power, including electric propulsion, and power conversion and distribution. The DDG 1000 will be an electric drive ship with an integrated power architecture. USS MAKIN ISLAND (LHD 8) integrates an electric auxiliary propulsion motor for low speed operations and mechanical drive for higher speed operations. IPS reduces acquisition and operating costs of naval ships and increases military effectiveness. IPS leverages investments in technologies that will be useable by both military and commercial sectors. The IPS project develops and transitions technologies that implement the DON Energy Goals to reduce ship platform consumption of fossil fuels thereby reducing dependence upon foreign petroleum sources and greenhouse gas emissions.

IPS has the potential to revolutionize the design, construction, and operation of U.S. naval ships by using electricity as the primary energy transfer medium aboard ship. The flexibility of electric power transmission allows power generating modules with various power ratings to be connected to propulsion loads and ship service in any arrangement that supports the ship's mission at lowest overall cost. Systems engineering in IPS is focused on increasing the commonality of components used across ship types and in developing modules which will be integral to standardization, zonal system architectures, and generic shipbuilding strategies. The purpose of increased commonality is to reduce the total cost of ship ownership by using common modules composed of standard components and/or standard interfaces.

IPS addresses ship platform program goals through: reduced ship acquisition cost through integration of propulsion and ship's service prime movers; lower ship operational costs resulting from more flexible operating characteristics and more efficient components; reduced ship construction costs by allowing more extensive modular construction of power generation, distribution, and loads; improved ship survivability and reduced vulnerability through increased arrangement flexibility and improved electrical system survivability; reduced manning through improved power management systems and reduced on-board maintenance requirements; improved ship signature characteristics; improved design adaptability to meet future requirements of multiple ship types or missions; integrating power management and protection by fully utilizing the power electronics in the system to perform fault protection as well as power conversion and load management functions; simplified technology insertion which allows new technologies to be installed within IPS much less expensively than presently possible; and, reduced machinery system acquisition costs through utilization of commercially shared technologies and components.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2011	FY 2012	FY 2013
Title: Component & System Development	2.198	12.649	16.952
Articles:	0	0	0
FY 2011 Accomplishments:			

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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2011	FY 2012	FY 2013
Component & System Development: Continue to conduct detailed design and prototype fabrication of power conversion equipment for advanced architecture. Continue to improve baseline power system performance by performing analysis, modeling and simulation, life cycle cost analysis, producibility studies, module development, ship integration, architecture design, ship electric architectures and high power weapons systems requirements, and related efforts. Continue to evaluate emerging technologies for ship applications to determine future feasibility and development requirements. Emerging technologies include fuel cells, high-energy weapons, high power radars, and advanced power electronics.			
FY 2012 Plans: Component & System Development: * Continue assessments of Next Generation Integrated Power System (NGIPS) alternate architectures to best meet emerging ship requirements. * Develop technical and operational concepts for improving shipboard energy management utilizing energy storage modules. * Continue to improve baseline power system performance by performing analysis, modeling and simulation, life cycle cost analysis, producibility studies, module development, and ship integration studies and planning. * Continue to evaluate emerging technologies for ship applications to determine future feasibility and development requirements. Emerging technologies include high-energy weapons including rail guns, high power radars including Air and Missile Defense Radar (AMDR), and advanced power electronics. * Analyze alternatives for supplying power to advanced radars, combat systems, and electric weapons power demands and potential interfaces to develop optimum alternative solutions. * Determine alternatives for energy management and fuel efficiency improvement, and power system upgrade options for ships in service. * Continue to develop / modify IPS ship configuration documentation including concepts of operations, system level descriptions, and module performance specifications as necessary to support power system requirements. * Continue to upgrade ship power system smart product model to support cost / performance tradeoffs of alternative IPS ship configurations and evaluation of emerging electric power system and component technologies. ** Task Force Energy Initiative: Complete source selection and award contract(s) for design, build, and test of an Energy Storage Module (ESM). ** Task Force Energy Initiative: Complete source selection and award contract(s) for design, build, and test of an Advanced Power Generation Module. ** Task Force Energy Initiative: Perform improvement validation studies and preliminary design concepts for Gas Turbine (GT) Specific Fuel Consumption (SFC) improvement initiatives. The projects include, but are not limited to: Cooling and bleed air modulation systems (High Pressure Compressor (HPC) and High Pressure Turbine (HPT)), HPT blade material improvements, optimized fuel schedule, active turbine rotor clearance controls and inlet/exhaust flow optimization.			

Exhibit R-2A, RDT&E Project Justification: PB 2013 Navy		DATE: February 2012
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2011	FY 2012	FY 2013
** Of the FY12 $12.5M Task Force Energy Initiative budget, $12.5M is included in Component & System Development in FY12 ***FY 2013 Plans:*** Component & System Development * Continue assessments of NGIPS alternate architectures to best meet emerging ship requirements * Develop technical and operational concepts for improving shipboard energy management utilizing energy storage modules. * Continue to improve baseline power system performance by performing analysis, modeling and simulation, life cycle cost analysis, producibility studies, module development, and ship integration studies and planning. * Continue to evaluate emerging technologies for ship applications to determine future feasibility and development requirements. Emerging technologies include high-energy weapons including rail guns, high power radars including Air and Missile Defense Radar (AMDR), and advanced power electronics. * Analyze alternatives for supplying power to advanced radars, combat systems, and electric weapons power demands and potential interfaces to develop optimum alternative solutions. * Determine alternatives for energy management and fuel efficiency improvement, and power system upgrade options for ships in service. * Continue to develop / modify IPS ship configuration documentation including concepts of operations, system level descriptions, and module performance specifications as necessary to support power system requirements. * Continue to upgrade ship power system smart product model to support cost / performance tradeoffs of alternative IPS ship configurations and evaluation of emerging electric power system and component technologies. * Develop DDG-51 Flight III AMDR power interface requirements and open architecture including: ship / radar electrical interface development, specification and solicitation development, interface definition and concept design. Develop and build Functional Equivalent Modules (FEM) in support of DDG-51 Flight III AMDR Power Conversion Modules (PCM). ** Task Force Energy Initiative: Continue efforts to design, build, and test an ESM. ** Task Force Energy Initiative: Continue efforts to design, build, and test an Advanced Power Generation Module. ** Task Force Energy Initiative: Continue design concepts for each specific fuel consumption initiative. (Cooling and bleed air modulation systems, HPT blade material improvements, optimized fuel schedule, active turbine rotor clearance controls and inlet/ exhaust flow optimization). Manufacture prototype hardware required for implementation and testing. Test fit hardware on Navy LM2500 engine for configuration validation. ** Of the FY13 $19.659M Task Force Energy Initiative budget, $12.359M is included in Component & System Development in FY13.			
Title: Component & System Test	2.947	2.990	9.844

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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2011	FY 2012	FY 2013
Articles:	0	0	0

FY 2011 Accomplishments:

Component & System Test: Continued to conduct land based testing of power conversion equipment at NSWCCD, Philadelphia, PA to mitigate potential risks associated with a fielded IPS system and reduce ship's signature, improve survivability and efficiency by fabricating components, inserting into the IPS test site or an appropriate test platform. Continued to conduct demonstrations to maintain and develop the critical engineering capability and capacity to insert future high power weapon systems (radars, lasers and electromagnetic launch weapons) into DDG-1000, future flights of the DDG 51 class, future amphibious ships, and other ship classes. Continued to conduct demonstrations to show improved performance and potential to reduce combat system costs.

FY 2012 Plans:

Component & System Test:

* Continue to conduct land based testing of NGIPS modules in order to increase energy efficiency and fuel savings, improve survivability and enable advanced sensors and weapons (i.e., AMDR, Railgun).
* Complete land based testing of a Functional Equivalent (FE) Energy Storage Module (ESM). FE ESM will validate interface requirements, employ an open architecture, and utilize components from multiple sources.
* Participate in the At-Sea demonstration of the ESM onboard the Green Fleet demonstration ship in conjunction with the Fleet Readiness Research and Development program.
* Take delivery of the ONR developed compact power components, (Bi-direction Power Converter and Multi-Functional Power Converter, and Power Management Controller). Conduct land based testing of compact power components and transition into platform applications per the signed Technology Transition Agreements (TTAs) between ONR and PMS-320.

** Of the FY12 $12.5M Task Force Energy Initiative budget, $0M is included in Component & System Test in FY12.

FY 2013 Plans:

Component & System Test

* Continue to conduct land based testing of NGIPS modules in order to increase energy efficiency and fuel savings, improve survivability and enable advanced sensors and weapons (i.e., AMDR, Railgun).
* Continue efforts associated with ONR developed compact power components, (Bi-direction Power Converter, Multi-Functional Power Converter, and Power Management Controller) per the signed Technology Transition Agreements (TTAs) between ONR and PMS-320.

** Task Force Energy Initiative: Conduct full scale engine testing of each prototype hardware system individually and as a complete system to quantify improvement validation. Perform SFC validation testing at Navy test facility at NAVAIR North Island. Acquire test data to assess performance improvement associated with each initiative. Evaluate prototype hardware under test

Exhibit R-2A, RDT&E Project Justification: PB 2013 Navy		DATE: February 2012
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2011	FY 2012	FY 2013
conditions to assess longevity and serviceability. Determine whether component redesign is required to optimize efficiency gains. Define actual measured SFC benefits versus original projections. ** Task Force Energy Initiative: Commence test planning for energy storage module. Of the FY13 $19.659M Task Force Energy Initiative budget, $7.3M is included in Component & System Test in FY13.			
Title: Platform Integration & Transition	0.150	2.600	3.101
Articles:	0	0	0
FY 2011 Accomplishments: Platform Integration & Transition: Continued to develop IPS configurations in support of all future ship programs. Continued to develop / modify IPS ship configuration documentation including concepts of operations, System Level description / Requirements, and module performance specifications as necessary to support power system requirements for the DDG-51 and other future ships. Continued to improve ship power system smart product model to support cost / performance tradeoffs of alternative IPS ship configurations and evaluation of emerging electric power system and component technologies.			
FY 2012 Plans: Platform Integration & Transition: * Continue to develop IPS configurations in support of future surface ship acquisition programs. * Develop alternative power and propulsion solutions for future flights of the DDG 51 Class and near term large amphibious ships. * Develop alternative solutions to decrease shipboard energy usage and improve fuel efficiency. Of the FY12 $12.5M Task Force Energy Initiative budget, $0M is included in Platform Integration & Transition in FY12.			
FY 2013 Plans: Platform Integration & Transition: * Continue to develop configurations in support of future surface ship acquisition programs. * Develop alternative power and propulsion solutions for future flights of the DDG 51 Class and near term large amphibious ships. * Develop alternative solutions to decrease shipboard energy usage and improve fuel efficiency. * Conduct efforts to transition compact power components into platform applications. Of the FY13 $19.659M Task Force Energy Initiative budget, $0M is included in Platform Integration & Transition in FY13.			
Accomplishments/Planned Programs Subtotals	5.295	18.239	29.897

Exhibit R-2A, RDT&E Project Justification: PB 2013 Navy		DATE: February 2012
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C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

This program develops and transitions higher performance and more affordable electric power systems to both new construction and back fit ship applications using an evolutionary acquisition approach. IPS is included in the DDG 1000 and is a candidate for all other future surface ships.

E. Performance Metrics

The Integrated Power System (IPS) project within the Electric Ships Office (ESO) will: execute 100% of the signed Technology Transition Agreements with ONR; complete 100% of the advanced developments currently planned for the Energy Storage Module and Power Generation Module; achieve 10% Specific Fuel Cost (SFC) with 33% increased power for Advanced Power Generation module; mature technology to Technical Readiness Level (TRL) 6 by milestone decisions for ship acquisition programs; and, realize a 5% improvement in gas turbine engine fuel consumption over engine operating profile.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2013 Navy			DATE: February 2012
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Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Total Prior Years Cost	FY 2012 Cost	FY 2012 Award Date	FY 2013 Base Cost	FY 2013 Base Award Date	FY 2013 OCO Cost	FY 2013 OCO Award Date	FY 2013 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Primary HW Development	C/CPFF	Alion Science Corp:Fairfax VA	6.825	0.600	Oct 2011	0.700	Oct 2012	-		0.700	0.000	8.125	
Primary HW Development	C/CPFF	Curtiss-Wright EMD:Pittsburgh, PA	10.750	-	Oct 2011	-		-		-	0.000	10.750	
Primary HW Development	C/CPFF	Various:Various	0.500	1.000	Oct 2011	1.540	Oct 2012	-		1.540	6.700	9.740	
Primary HW Development	WR	NSWCCD-SSES:Phila, PA	28.828	1.249	Oct 2011	2.097	Oct 2012	-		2.097	0.000	32.174	
Primary HW Development	C/CPFF	Syntek:Arlington, VA	0.900	2.000	Oct 2011	2.510	Oct 2012	-		2.510	0.000	5.410	
Primary HW Development	C/CPFF	Bath Iron Works:Bath, ME	0.250	0.100	Oct 2011	0.100	Oct 2012	-		0.100	0.000	0.450	
Primary HW Development	C/CPFF	HII:Pascagoula, MS	0.250	0.100	Oct 2011	0.100	Oct 2012	-		0.100	0.000	0.450	
Primary HW Development	C/CPFF	ESM/ADV PGM TBD:Various	-	7.490	Mar 2012	10.000	Oct 2012	-		10.000	0.000	17.490	
Primary HW Development	C/BOA	GE:Cincinnati, OH	-	2.700	Oct 2011	2.550	Oct 2012	-		2.550	0.000	5.250	
		Subtotal	48.303	15.239		19.597		-		19.597	6.700	89.839	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Total Prior Years Cost	FY 2012 Cost	FY 2012 Award Date	FY 2013 Base Cost	FY 2013 Base Award Date	FY 2013 OCO Cost	FY 2013 OCO Award Date	FY 2013 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	WR	NSWCCD-SSES:Phila, PA	24.040	1.400	Oct 2011	2.800	Oct 2012	-		2.800	0.000	28.240	
Developmental Test & Evaluation	C/CPFF	Compact Power:TBD	-	1.600	Oct 2011	-		-		-	0.000	1.600	
Developmental Test & Evaluation	C/BOA	GE:Cincinnati, OH	-	-		7.000	Oct 2012	-		7.000	0.000	7.000	
		Subtotal	24.040	3.000		9.800		-		9.800	0.000	36.840	

Exhibit R-3, RDT&E Project Cost Analysis: PB 2013 Navy		DATE: February 2012
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Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Total Prior Years Cost	FY 2012 Cost	FY 2012 Award Date	FY 2013 Base Cost	FY 2013 Base Award Date	FY 2013 OCO Cost	FY 2013 OCO Award Date	FY 2013 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Management Services	C/CPFF	Various:Various	-	-		0.500	Oct 2012	-		0.500	0.000	0.500	
		Subtotal	-	-		0.500		-		0.500	0.000	0.500	

	Total Prior Years Cost	FY 2012		FY 2013 Base		FY 2013 OCO		FY 2013 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	72.343	18.239		29.897		-		29.897	6.700	127.179	

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2013 Navy		DATE: February 2012
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Exhibit R-4A, RDT&E Schedule Details: PB 2013 Navy		DATE: February 2012
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Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 2471				
System Engineering & Concept Development	1	2011	4	2017
System Design & Ship Integration	1	2011	4	2017
Advanced Power Generation	1	2011	4	2017
Energy Storage	1	2011	4	2016
Turbine Efficiency Upgrades	1	2012	4	2014
DDG51 Flight III Ship AMDR Electrical Interface	1	2013	4	2017