Exhibit R-2, RDT&E Budget Item Justification: PB 2015 Navy											Date: March 2014	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 0603573N *I Advanced Surface Machinery Sys*							
COST ($ in Millions)	**Prior Years**	**FY 2013**	**FY 2014**	**FY 2015 Base**	**FY 2015 OCO #**	**FY 2015 Total**	**FY 2016**	**FY 2017**	**FY 2018**	**FY 2019**	**Cost To Complete**	**Total Cost**
Total Program Element	82.619	26.642	18.144	21.026	-	21.026	26.384	23.262	18.209	18.573	Continuing	Continuing
2471: *Integrated Power Systems (IPS)*	82.619	26.642	18.144	21.026	-	21.026	26.384	23.262	18.209	18.573	Continuing	Continuing

The FY 2015 OCO Request will be submitted at a later date.

A. Mission Description and Budget Item Justification

This PE includes the development of advanced surface ship hull, mechanical, and electrical (HM&E) components and systems for all future ships and back-fit ships where appropriate. This PE is managed by PMS-320, the Electric Ships Office, located organizationally within PEO SHIPS, with responsibility for developing Naval Power Systems that focus on energy efficiency, providing power to mission systems, and platform integration of those components and systems. The mission of PMS 320 is to develop and provide smaller, simpler, more affordable and more capable electric power systems for all Navy platforms and focus Navy and industry investments.

This PE is the bridge between Science and Technology (S&T) and ship platform and mission systems acquisition programs by identifying prospective applications for S&T research, advanced development, and performing additional product development and qualification when necessary to meet platform or mission system requirements.

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. PMS-320 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.

Exhibit R-2, RDT&E Budget Item Justification: PB 2015 Navy					Date: March 2014
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*			R-1 Program Element (Number/Name) PE 0603573N *I Advanced Surface Machinery Sys*		
B. Program Change Summary ($ in Millions)	**FY 2013**	**FY 2014**	**FY 2015 Base**	**FY 2015 OCO**	**FY 2015 Total**
Previous President's Budget	29.897	27.154	29.167	-	29.167
Current President's Budget	26.642	18.144	21.026	-	21.026
Total Adjustments	-3.255	-9.010	-8.141	-	-8.141
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-9.010			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.822	-			
• Rate/Misc Adjustments	-	-	-8.141	-	-8.141
• Congressional General Reductions Adjustments	-2.433	-	-	-	-

Change Summary Explanation

FY 2013 reductions reflect Congressionally mandated sequestration and general reductions.

FY 2014 reflects Congressional reductions.

FY 2015 reductions reflect the Department's decision to reduce contracted services.
FY 2015 program was also adjusted to properly phase program requirements with expenditures.

Exhibit R-2A, RDT&E Project Justification: PB 2015 Navy			Date: March 2014
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603573N / *Advanced Surface Machinery Sys*	Project (Number/Name) 2471 / *Integrated Power Systems (IPS)*	

COST ($ in Millions)	Prior Years	FY 2013	FY 2014	FY 2015 Base	FY 2015 OCO #	FY 2015 Total	FY 2016	FY 2017	FY 2018	FY 2019	Cost To Complete	Total Cost
2471: *Integrated Power Systems (IPS)*	82.619	26.642	18.144	21.026	-	21.026	26.384	23.262	18.209	18.573	Continuing	Continuing
Quantity of RDT&E Articles	0.000	-	-	-	-	-	-	-	-	-		

The FY 2015 OCO Request will be submitted at a later date.

A. Mission Description and Budget Item Justification

This project supports the development and transition strategy of Navy Power and Propulsion Systems including power generation, power conversion, power distribution, energy storage, power utilization and automation and control functions for fully integrated electric propulsion (such as T-AKE -1 class or DDG 1000 class), hybrid electric propulsion (such as LHD 8 and LHA(R) class), as well as legacy mechanical propulsion ships (such as DDG 51 class). This project supports optimized integration of mission systems, appropriate component and system controls, integration of components and systems into future and current ships, and providing power system solution alternatives to new and existing platforms.

Project developments are aligned with the Navy's 30 year shipbuilding plan via the Naval Power Systems Technology Development Roadmap, which outlines the way ahead for future developments and provides a basis for coordinated planning and investment by the Navy and private industry.

This project develops and transitions products that increase energy efficiency (and thereby create fewer greenhouse gas emissions and reduce dependence upon foreign petroleum sources), provide additional power to mission systems, and integrates those components and systems into ship platforms.

DON Energy Initiatives - Energy Storage Module (ESM) Increment 1, Advanced Power Generation Module (APGM), and Gas Turbine (GT) Efficiency Upgrades: This project supports the DON Energy Initiative designed to reduce ship energy consumption and increase mission effectiveness through longer time on station. The ESM will achieve fuel savings by de-risking single generator operations. APGM will provide increased power to meet DDG51 Flight III requirements for advanced sensors and future weapons with reduction in life cycle costs through increased fuel efficiency over legacy gas turbine generator sets. GT Efficiency Upgrades will provide fuel efficiency improvements to existing gas turbine engines for both backfit and new construction ships.

Mission Power: Designs, develops, tests and integrates shipboard power systems to incorporate advanced sensors, Directed Energy and other advanced weapons. Design and testing includes Modeling and Simulation, as well as land based testing, to reduce risk and demonstrate readiness for shipboard use. AMDR PCM provides power conversion from ship's 4160 VAC distribution systems to 1000 VDC at 1.4MW to support ship installation of AMDR Radar.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2013	FY 2014	FY 2015
Title: Energy Efficiency	20.341	10.200	8.931
Articles:	-	-	-
FY 2013 Accomplishments:			

Exhibit R-2A, RDT&E Project Justification: PB 2015 Navy		Date: March 2014
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2013	FY 2014	FY 2015
Completed testing of the Energy Storage Module (ESM) Proof Of Concept (POC) which was developed by the Office of Naval Research (ONR). PMS-320 leveraged ONR's development investment and conducted land based testing of this unit. PMS-320 incorporated lessons learned into the ESM Increment 1 specification. Awarded contracts and commenced design for Gas Turbine (GT) Efficiency Upgrades Phases I-II and ESM Increment 1. GT Efficiency Upgrades and ESM increment 1 directly support the Navy's Energy Efficiency Initiatives and are projected to save approx. 8,390 barrels (352,380 gallons) of fuel per ship per year. Commenced design of the Advanced Power Generation Module (APGM) High Efficiency (HE)+ engine which directly supports the Navy's Energy Efficiency Initiatives. APGM provides reduced fuel consumption, increased time on station, and higher installed power (Single Shaft) for advanced sensors and future weapons. Initiated ESM Increment 1 test planning. Continued to improve baseline power system energy efficiency performance by performing analysis, modeling and simulation, life cycle cost analysis, producibility studies, module development, and ship integration studies and planning. Continued to determine alternatives for energy management and fuel efficiency improvement options. ***FY 2014 Plans:*** Complete design of ESM Increment 1 system. Order portions of Long Lead Time Material (LLTM) for ESM Increment 1 First Article Unit (FAU). Continue ESM Increment 1 test planning and commence land based test site modifications. Continue design and begin procurement of the APGM HE+ gas turbine engine. Commence design of APGM Generator Set. Commence APGM land based test planning. Continue development of Gas Turbine (GT) Efficiency Upgrades. ***FY 2015 Plans:*** Order remaining LLTM for ESM Increment 1 FAU. Commence build of ESM Increment 1 FAU. Continue ESM Increment 1 land based test planning and land based test site modifications. Complete design of APGM HE+ gas turbine engine and Generator Set. Procure material required for build of APGM Generator Set. Continue test planning for DDG51 Flight III electric system testing. The APGM is an upgrade to the DDG1000 auxiliary gas turbine. The APGM will meet DDG51 Flight III power requirements and reduce life cycle costs through increased fuel efficiency over legacy gas turbine generator sets.			

Exhibit R-2A, RDT&E Project Justification: PB 2015 Navy		Date: March 2014
Appropriation/Budget Activity 1319 / 4	**R-1 Program Element (Number/Name)** PE 0603573N / *Advanced Surface Machinery Sys*	**Project (Number/Name)** 2471 / *Integrated Power Systems (IPS)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2013	FY 2014	FY 2015
Continue development of Gas Turbine (GT) Efficiency Upgrades.			
Title: Mission Power	4.049	5.200	9.900
Articles:	-	-	-
FY 2013 Accomplishments: Developed DDG 51 Flight III AMDR power interface requirements for ship / radar electrical interface. Completed specification and initiated AMDR PCM acquisition. Continued developing, building, and commenced testing of Functional Equivalent Modules (FEMs) in support of DDG 51 Flight III AMDR land based testing. Support testing of the ONR developed Solid State Power Substation (SSPS) 4160 VAC to 1000 VDC power converter. ***FY 2014 Plans:*** Conduct Source Selection, award contract, and commence design of DDG 51 Flight III AMDR PCM. Transition ONR developed compact power components, (Bi-directional Power Converter, Multi-Function Power Converter, and Power Management Controller) per the signed Technology Transition Agreements (TTAs). Commence validation testing of compact power Multi - Function Power Converter. Complete testing of FEMs in support of DDG 51 Flight III AMDR land based testing. ***FY 2015 Plans:*** Complete design of DDG51 Flight III AMDR PCM shipboard units. Commence planning DDG51 Flight III AMDR PCM LRIP Factory Acceptance Test (FAT) and Environmental Qualification Tests(EQT). Continue planning for LBES test and initiate planning for AMDR / PCM integration testing and Developmental Testing (DT). Order LLTM for LRIP units 1,2,3,and 4. Begin transition to manufacture and begin build of the first 2 LRIP units which will support development testing of the DDG51 FLight III AMDR / PCM integration testing at the Surface Combat System Center (SCSC) wallops Island, VA.			
Title: Naval Power Technology Development / Platform Integration & Transition	2.252	2.744	2.195
Articles:	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2015 Navy		Date: March 2014
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2013	FY 2014	FY 2015
FY 2013 Accomplishments: Continued to execute the The Advanced Electric Power and Propulsion Project, Project Arrangement (short title AEP3 PA or PA) ref DoD-MOD-N-12-0001 which is an agreement between the US and UK Governments to cooperate on a scope of work associated with characterising, developing, modelling and de-risking electrical power and propulsion system architectures and equipment for future surface and submarine platforms to meet the needs of both Navies. Continued to develop power and propulsion system configurations in support of future surface ship acquisition programs. Developed alternative power and propulsion solutions for future surface combatants and amphibious ships. Continued 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. Continued to conduct land based testing in order to increase energy efficiency and fuel savings, improve survivability, and enable advanced sensors and weapons (i.e., AMDR, Directed Energy Weapons). Continued to analyze alternatives for supplying power to advanced radars, combat systems, and electric weapons power demands and potential interfaces to develop optimum alternative solutions. Continued assessments of Naval Power System alternate architectures to best meet emerging ship requirements. Completed writing and issued the Naval Power Systems Technology Development Roadmap. Led Platform Integration Integrated Product Team (IPT) for DoN's Directed Energy Roadmap. Initiated studies to determine appropriate Energy Magazine (EM) (previously referred to as ESM Increment 3) design requirements to support advanced weapons and sensors. Commenced design of compact militarized Vacuum Circuit Breakers (VCB) for transition to LHA-8 and DDG 51 Flight III.			
FY 2014 Plans: Continue to execute the The Advanced Electric Power and Propulsion Project, Project Arrangement (short title AEP3 PA or PA) ref DoD-MOD-N-12-0001 which is an agreement between the US and UK Governments to cooperate on a scope of work associated with characterising, developing, modelling and de-risking electrical power and propulsion system architectures and equipment for future surface and submarine platforms to meet the needs of both Navies. Continue to develop power and propulsion system configurations in support of future surface ship acquisition programs. Develop alternative power and propulsion solutions for future surface combatants and amphibious ships. 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 conduct land based testing in order to increase energy efficiency and fuel savings, improve survivability, and enable advanced sensors and weapons (i.e., AMDR, Directed Energy			

Exhibit R-2A, RDT&E Project Justification: PB 2015 Navy		Date: March 2014
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B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2013	FY 2014	FY 2015
Weapons). Continue to analyze alternatives for supplying power to advanced radars, combat systems, and electric weapons power demands and potential interfaces to develop optimum alternative solutions. Continue assessments of Naval Power System alternate architectures to best meet emerging ship requirements. Commence bi-annual update of the Naval Power Systems Technology Development Roadmap. Continue studies to determine appropriate Energy Magazine (EM) (previously referred to as ESM Increment 3) design requirements to support advanced weapons and sensors in conjunction with Laser and Railgun ONR efforts. Determine appropriate top level requirements and begin EM specification development. Complete design and commence manufacture and test VCB for compliance with required specifications. ***FY 2015 Plans:*** Continue to execute the The Advanced Electric Power and Propulsion Project, Project Arrangement (short title AEP3 PA or PA) ref DoD-MOD-N-12-0001 which is an agreement between the US and UK Governments to cooperate on a scope of work associated with characterising, developing, modelling, and de-risking electrical power and propulsion system architectures and equipment for future surface and submarine platforms to meet the needs of both Navies. Continue to develop power and propulsion system configurations in support of future surface ship acquisition programs. Develop alternative power and propulsion solutions for future surface combatants and amphibious ships. 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 analyze alternatives for supplying power to advanced radars, combat systems, and electric weapons power demands and potential interfaces to develop optimum alternative solutions. Continue assessments of Naval Power System alternate architectures to best meet emerging ship requirements. Complete bi-annual update of the Naval Power Systems Technology Development Roadmap. Continue Energy Magazine (EM), previously referred to as ESM Increment 3, specification development and begin acquisition documentation.			
Accomplishments/Planned Programs Subtotals	26.642	18.144	21.026

C. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2015 Navy		Date: March 2014
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C. Other Program Funding Summary ($ in Millions)

Remarks

D. Acquisition Strategy

This program develops and transitions higher performance and more affordable electric power and propulsion systems to both new construction and back fit ship applications using an evolutionary acquisition approach. Full and open competition is utilized to the maximum extent possible to provide maximum benefit to the Navy at the lowest possible cost to the taxpayer. When able to meet Navy requirements, Commercial technology is leveraged to further minimize cost to the Navy.

E. Performance Metrics

This project 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 up to 10% Specific Fuel Consumption (SFC) improvement for Advanced Power Generation Module; mature technology to Technology Readiness Level (TRL) 6 by milestone decisions for ship acquisition programs; and, realize up to a 3% improvement in existing gas turbine engine SFC over engine operating profile.