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Exhibit R-2, RDT&E Budget Item Justification: PB 2016 Navy										Date: February 2015		
Appropriation/Budget Activity 1319: Research, Development, Test & Evaluation, Navy / BA 4: Advanced Component Development & Prototypes (ACD&P)					R-1 Program Element (Number/Name) PE 0603573N / Advanced Surface Machinery Sys							
COST (\$ in Millions)	Prior Years	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total	FY 2017	FY 2018	FY 2019	FY 2020	Cost To Complete	Total Cost
Total Program Element	109.261	17.551	21.026	25.904	-	25.904	23.221	18.135	18.421	18.814	Continuing	Continuing
2471: Integrated Power Systems (IPS)	109.261	17.551	21.026	25.904	-	25.904	23.221	18.135	18.421	18.814	Continuing	Continuing

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.

B. Program Change Summary (\$ in Millions)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
Previous President's Budget	18.144	21.026	26.384	-	26.384
Current President's Budget	17.551	21.026	25.904	-	25.904
Total Adjustments	-0.593	-	-0.480	-	-0.480
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-0.032	-			
• SBIR/STTR Transfer	-0.561	-			
• Rate/Misc Adjustments	-	-	-0.480	-	-0.480

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<u>Change Summary Explanation</u> The FY 2016 funding request was reduced by \$0.280 million to account for the availability of prior year execution balances and \$0.200 million to account for other rate/misc adjustments. FY 2014 reduction reflect SBIR/STTR Transfer.		

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Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0603573N / <i>Advanced Surface Machinery Sys</i>				Project (Number/Name) 2471 / <i>Integrated Power Systems (IPS)</i>			
COST (\$ in Millions)	Prior Years	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total	FY 2017	FY 2018	FY 2019	FY 2020	Cost To Complete	Total Cost
2471: <i>Integrated Power Systems (IPS)</i>	109.261	17.551	21.026	25.904	-	25.904	23.221	18.135	18.421	18.814	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

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) Stable Backup Power (SBP), 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 provide stable backup power to enable DDG51 Class single genertor operations (and significant fuel savings) when tactical situations to tactical situations permit. The APGM is an upgrade to the DDG1000 auxiliary gas turbine and 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 to support AMDR Radar.

The growth in Advanced Surface Machinery Sys from FY15 to FY16 is driven by the number of Air Missile Defense Radar (AMDR) Power Conversion Modules (PCM) planned to be built in FY16. Specifically, Mission Power FY16 Plans include building three (3) units vs. the FY15 Plan to build one (1) unit. Building 3 units vs. 1 in addition to ordering Long Lead Time Material (LLTM) for two (2) units, conducting factory acceptance testing, and the continuance of test planning efforts directly resulted in an increase cost in FY16 planned budget vs. FY15.

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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 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
Title: Energy Efficiency	10.200	8.931	9.600	-	9.600
	Articles: -	-	-	-	-
FY 2014 Accomplishments: Commenced design of ESM SBP system. Ordered portions of Long Lead Time Material (LLTM) for ESM SBP First Article Unit (FAU). Continued ESM SBP test planning and test site modification planning. Commenced qualification testing of ESM SBP battery sub-system. Completed Land Based ESM Proof Of Concept (POC) testing. ESM POC is a candidate to support Solid State Laser (SSL) At-Sea testing aboard the Self Defense Test Ship (SDTS) notionally scheduled for FY16. Continued design and began procurement of the Advanced Power Generation Module (APGM) High Efficiency Plus (HE+) gas turbine engine. Commenced design of APGM Generator Set. Commenced APGM land based test planning. Continued development of Gas Turbine (GT) Efficiency Upgrades. Transitioned management of LM2500 Efficiency Upgrades to Naval Systems Engineering Directorate (NAVSEA 05). Evaluated other opportunities for Gas Turbine Efficiency Upgrades.					
FY 2015 Plans: Complete design of ESM Stable Backup Power (SBP) system. Order remaining LLTM for ESM SBP First Article Unit (FAU). Commence build of ESM FAU. Continue ESM SBP land based test planning and commence land based test site modifications. Continue qualification testing of ESM SBP battery sub-system. Complete design of Advanced Power Generation Module (APGM) High Efficiency Plus (HE+) gas turbine engine and Generator Set. Procure material required for build of APGM Generator Set. Continue test planning for APGM electric system testing. Continue planning for future gas turbine efficiency upgrades.					
FY 2016 Base Plans: Complete build and Factory Acceptance Testing (FAT) of ESM Stable Backup Power (SBP) First Article Unit (FAU). Complete ESM SBP test planning and test site modifications. Complete qualification of ESM SBP battery sub-system. Prepare Test Plans and Procedures for ESM SBP Land based testing at the Naval Surface Warfare Center Carderock Division - Ship Systems Engineering Station located in Philadelphia, PA.					

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
Complete material procurement for the Advanced Power Generation Module (APGM) Generator Set and commence assembly. Continue Test Planning. Prepare Test Plans and Procedures.						
Continue planning for future gas turbine efficiency upgrades.						
FY 2016 OCO Plans: N/A						
Title: Mission Power		5.100	9.900	14.500	-	14.500
Articles:		-	-	-	-	-
FY 2014 Accomplishments: Completed Source Selection, awarded contract, and commenced design of DDG 51 Flight III Air Missile Defense Radar (AMDR) Power Conversion Module (PCM).						
Transitioned ONR developed compact power components, (Bi-directional Power Converter, Multi-Function Power Converter, and Power Management Controller) per the signed Technology Transition Agreements (TTAs).						
Commenced validation testing of compact power Multi-Function Power Converter.						
FY 2015 Plans: Complete design of DDG51 Flight III AMDR PCM shipboard units and order LLTM for two (2) LRIP units. Commence build of one (1) LRIP unit which will support DDG51 Flight III AMDR Developmental Testing (DT) at the Surface Combat System Center (SCSC) Wallops Island, VA and DDG51 Flight III Integration Testing at the Naval Surface Warfare Center Carderock Division (NSWCCD) - Ship Systems Engineering Station (SSES).						
Commence planning DDG51 Flight III AMDR PCM LRIP Factory Acceptance Test (FAT) and Environmental Qualification Tests (EQT). Commence planning for the Power Hardware in the Loop (PHIL) testing at Florida State University. Commence planning for electrical system validation testing at the NSWCCD-SSES land based test site. Initiate planning for AMDR / PCM integration testing in support of AMDR Developmental Testing (DT).						
Continue Energy Magazine (EM) specification development and begin acquisition documentation.						
FY 2016 Base Plans:						

UNCLASSIFIED

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
Continue planning DDG51 Flight III AMDR PCM LRIP Factory Acceptance Test (FAT) and Environmental Qualification Tests(EQT). Continue planning for the Power Hardware in the Loop (PHIL) testing at Florida State University. Continue planning for electrical system validation testing at the NSWCCD-SSES land based test site, and continue to support planning for AMDR / PCM integration testing in support of AMDR Developmental Testing (DT).						
Complete manufacture and build of one (1) LRIP unit. Commence Factory Acceptance Test. Order LLTM for two (2) LRIP units. Commence manufacture and build of three (3) LRIP units.						
LRIP units will support DDG51 Flight III AMDR Developmental Testing (DT) at the Surface Combat System Center (SCSC) Wallops Island, VA and DDG51 Flight III Integration Testing at the Naval Surface Warfare Center Carderock Division (NSWCCD) - Ship Systems Engineering Station (SSES).						
Refine Energy Magazine (EM) specification and interface development, and develop acquisition documentation.						
FY 2016 OCO Plans: N/A						
Title: Naval Power Technology Development / Platform Integration & Transition		2.251	2.195	1.804	-	1.804
Articles:		-	-	-	-	-
FY 2014 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).						

UNCLASSIFIED

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
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.						
Commenced biennial update of the Naval Power Systems Technology Development Roadmap. Support maturation and transition of ONR Future Naval Capabilitites (FNC) products to meet TDR identified gaps.						
Continued studies to determine appropriate Energy Magazine (EM) design requirements to support advanced weapons and sensors in conjunction with Laser and Railgun ONR efforts. Studies included evaluation of ongoing Energy Storage Module (ESM) and its ability to meet need of EM to support high power and energy weapons and sensors. Determined appropriate top level requirements and begin EM specification development.						
Planned and stood up Combat Power and Energy System Overarching Integrated Product Team (OIPT)						
Completed design and commenced manufacture and test Vacuum Circuit Breakers (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.						

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)		FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
Complete biennial update of the Naval Power Systems Technology Development Roadmap. Support maturation and transition of ONR Future Naval Capabilitites (FNC) products to meet TDR identified gaps.						
Continue Combat Power and Energy System Overarching Integrated Product Team (OIPT).						
Generate strategy, technology development plan and resource requirements for future surface combatant integrated power system.						
FY 2016 Base 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.						
Commence biennial update of the Naval Power Systems Technology Development Roadmap.						
Continue to support maturation and transition of ONR Future Naval Capabilitites (FNC) products to meet TDR identified gaps.						
Continue Combat Power and Energy System Overarching Integrated Product Team (OIPT).						
Continue to generate strategy, technology development plan and resource requirements for future surface combatant integrated power system.						
FY 2016 OCO Plans:						

UNCLASSIFIED

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2014	FY 2015	FY 2016 Base	FY 2016 OCO	FY 2016 Total
N/A					
Accomplishments/Planned Programs Subtotals	17.551	21.026	25.904	-	25.904

C. Other Program Funding Summary (\$ in Millions)
N/A

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.

UNCLASSIFIED

Exhibit R-3, RDT&E Project Cost Analysis: PB 2016 Navy												Date: February 2015			
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)					
Product Development (\$ in Millions)				FY 2014		FY 2015		FY 2016 Base		FY 2016 OCO		FY 2016 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Development	C/FFP	DRS : DRS, Milwaukee WI	6.850	0.849	Mar 2014	3.700	Jan 2015	2.900	Oct 2015	-		2.900	Continuing	Continuing	Continuing
Product Development	SS/FFP	Rolls Royce : Walpole, MA	8.042	4.899	Jan 2014	2.845	Jan 2015	4.000	Nov 2015	-		4.000	Continuing	Continuing	Continuing
Product Development	SS/BOA	General Electric Company : Cincinatti, OH	3.560	-		-		-		-		-	Continuing	Continuing	Continuing
Product Development	C/FFP	DRS (AMDR PCM) : DRS, Milwaukee WI	0.000	2.378	Sep 2014	8.122	Feb 2015	11.375	Oct 2015	-		11.375	Continuing	Continuing	Continuing
Product Development	C/CPFF	Various : Various	28.205	3.838	Oct 2013	2.437	Oct 2014	2.688	Nov 2015	-		2.688	Continuing	Continuing	Continuing
Product Development	WR	NSWCCD-SSES : Phila, PA	36.985	4.535	Oct 2013	3.272	Oct 2014	4.141	Oct 2015	-		4.141	Continuing	Continuing	Continuing
Subtotal			83.642	16.499		20.376		25.104		-		25.104	-	-	-
Remarks															
The growth in Advanced Surface Machinery Sys from FY15 to FY16 is driven by the number of Air Missile Defense Radar (AMDR) Power Conversion Modules (PCM) planned to be built in FY16. Specifically, Mission Power FY16 Plans include building three (3) units vs. the FY15 Plan to build one (1) unit. Building 3 units vs. 1 in addition to ordering Long Lead Time Material (LLTM) for two (2) units, conducting factory acceptance testing, and the continuance of test planning efforts directly resulted in an increase cost in FY16 planned budget vs. FY15.															
Test and Evaluation (\$ in Millions)				FY 2014		FY 2015		FY 2016 Base		FY 2016 OCO		FY 2016 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Test and Evaluation	WR	NSWCCD-SSES : Phila, PA	24.540	0.414	Oct 2013	-		-		-		-	Continuing	Continuing	Continuing
Subtotal			24.540	0.414		-		-		-		-	-	-	-

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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)					
Management Services (\$ in Millions)				FY 2014		FY 2015		FY 2016 Base		FY 2016 OCO		FY 2016 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
Management	C/CPFF	Herren Associates : Alexandria, VA	1.079	0.638	Oct 2013	0.650	Oct 2014	0.800	Oct 2015	-		0.800	Continuing	Continuing	Continuing
Subtotal			1.079	0.638		0.650		0.800		-		0.800	-	-	-
			Prior Years	FY 2014		FY 2015		FY 2016 Base		FY 2016 OCO		FY 2016 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			109.261	17.551		21.026		25.904		-		25.904	-	-	-
Remarks															

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Exhibit R-4, RDT&E Schedule Profile: PB 2016 Navy

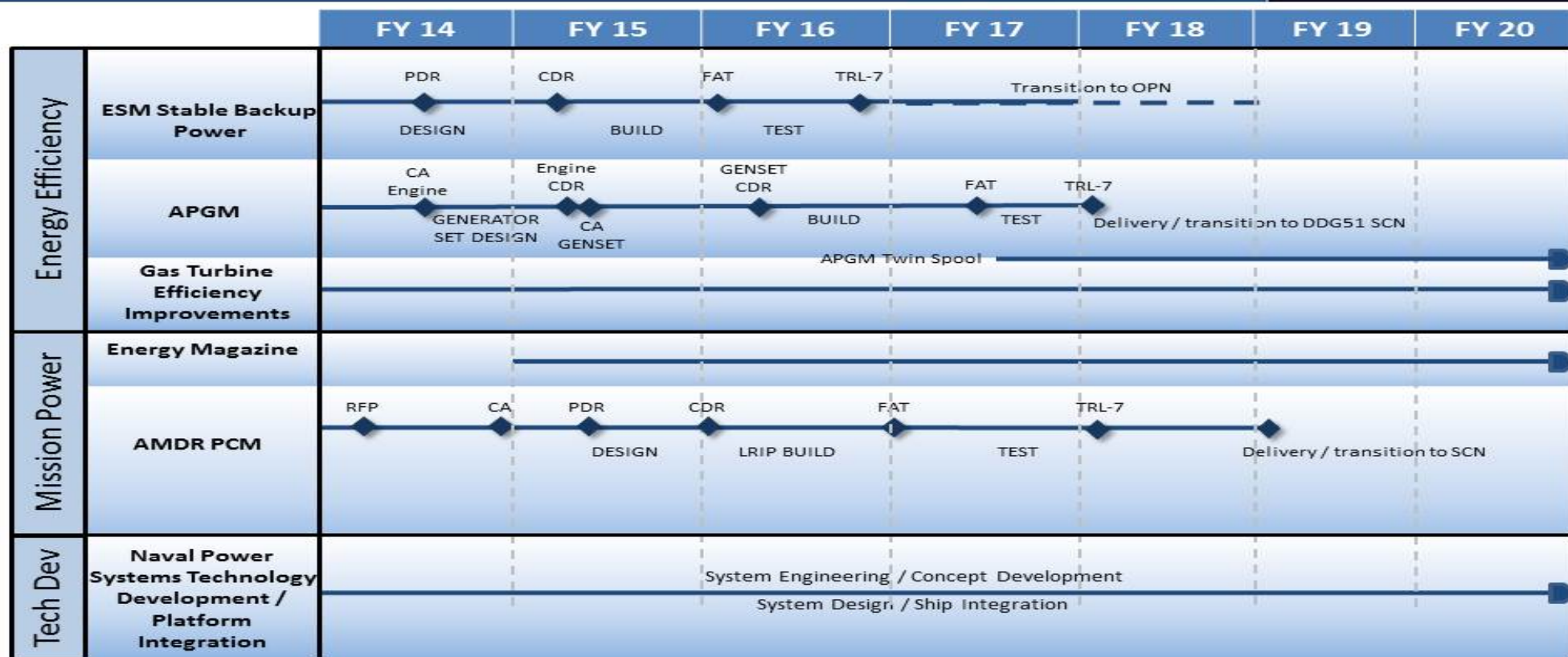
Date: February 2015

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)

PE 0603573N



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1

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Exhibit R-4A, RDT&E Schedule Details: PB 2016 Navy			Date: February 2015
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603573N / <i>Advanced Surface Machinery Sys</i>	Project (Number/Name) 2471 / <i>Integrated Power Systems (IPS)</i>	

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>Proj 2471</i>				
Energy Efficiency	1	2014	4	2020
Mission Power	1	2014	4	2020
Naval Power Technology Development / Platforms Integration & transition	1	2014	4	2020