Exhibit R-2, RDT&E Budget Item Justification: FY 2018 Navy											Date: May 2017	
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 2016**	**FY 2017**	**FY 2018 Base**	**FY 2018 OCO**	**FY 2018 Total**	**FY 2019**	**FY 2020**	**FY 2021**	**FY 2022**	**Cost To Complete**	**Total Cost**
Total Program Element	172.243	23.443	36.655	29.953	-	29.953	22.596	21.546	21.074	21.490	Continuing	Continuing
2471: *Integrated Power Systems (IPS)*	172.243	23.443	36.655	29.953	-	29.953	22.596	21.546	21.074	21.490	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 as well as development of Cybersecurity Boundary Defense Capabilities for HM&E systems. This PE is managed by PMS 320, the Electric Ships Office, located organizationally within PEO SHIPS, responsible for developing Naval Power and Energy Systems that focus power system integration of Directed Energy (DE) and other high powered mission systems as well as platform integration and improving energy efficiency 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, focus Navy and industry investments, and reduce total ownership cost.

This PE serves as 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. This PE also includes HM&E cybersecurity Boundary Defense Capability (BDC) development. The HM&E systems to be protected from cyber-attack by BDC include Machinery Control Systems, Electric Power Systems, Damage Control and Firefighting, Auxiliary Machinery and Fluid Systems, Engines and Power Transmission Systems, Gas Turbine Systems, Video Systems, as well as other HM&E systems. Cybersecurity BDC will allow the ship to better protect, detect, respond, and recover from a cyber attack.

B. Program Change Summary ($ in Millions)	**FY 2016**	**FY 2017**	**FY 2018 Base**	**FY 2018 OCO**	**FY 2018 Total**
Previous President's Budget	24.143	36.655	30.114	-	30.114
Current President's Budget	23.443	36.655	29.953	-	29.953
Total Adjustments	-0.700	0.000	-0.161	-	-0.161
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.700	0.000			
• Program Adjustments	0.000	0.000	-0.123	-	-0.123
• Rate/Misc Adjustments	0.000	0.000	-0.038	-	-0.038

Exhibit R-2, RDT&E Budget Item Justification: FY 2018 Navy	Date: May 2017
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*

Change Summary Explanation

FY 2016 funding request reflects a reduction of $0.700 million to account for SBIR/STTR Transfer.

FY 2018 funding request reflects a reduction of $0.161 million to account for program adjustments of (-$0.123 million), and (-$0.38 million) for other rate / miscellaneous adjustments.

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy			Date: May 2017
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 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
2471: *Integrated Power Systems (IPS)*	172.243	23.443	36.655	29.953	-	29.953	22.596	21.546	21.074	21.490	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project supports the development and transition of Naval Power and Energy 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 DDG1000 class), hybrid electric propulsion (such as LHD 8 and LHA(R) class), as well as legacy mechanical propulsion ships (such as DDG51 class). This project supports optimized integration of Directed Energy (DE) and other high powered mission systems, appropriate component and system controls, integration of components and systems into future and current ships, and providing power and energy system solution alternatives to new and existing platforms.

Project developments are aligned with the Navy's 30 year shipbuilding plan via the Naval Power and Energy Systems Technology Development Roadmap (TDR), 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 electrically integrate and provide power to mission systems, integrates those components and systems into ship platforms, increases energy efficiency, and provides cybersecurity capabilities for current in-service Hull, Mechanical and Electrical (HM&E) systems as well as future systems.

Power and Energy Systems combines previously shown Energy Efficiency and Mission Power R2A Accomplishments and Plans to reflect the focus on providing power and energy solutions for warfighting capability. Energy efficiency is but one of several requirements levied upon these systems and the distinction between mission power and energy efficiency is very difficult to divide out. The systems developed by this Project are by their very nature the foundation of the ships kill chain, and are developed with efficiency requirements as part of total life cycle cost minimization. Efforts within Power and Energy Systems are to design, develop, test and integrate 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.

Cybersecurity: Develops an approach to implement a cybersecurity Boundary Defense Capability (BDC) for HM&E control systems on surface ships. The HM&E systems to be protected from cyber-attack by BDC include machinery control systems, electric power systems, damage control and firefighting, auxiliary machinery and fluid systems, engines and power transmission systems, gas turbine systems, video systems, as well as other HM&E systems. Design and technical data packages for software and hardware solutions will be developed. Cybersecurity BDC will allow the ship to better protect, detect, respond, and recover from cyber-attack.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Title: Power and Energy Systems	22.011	19.399	16.024	0.000	16.024

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
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 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Articles:	-	-	-	-	-

FY 2016 Accomplishments:

Continued material procurement for the DDG51 Flight III 4.2MW AG9160RF Gas Turbine Generator (GTG) and commenced manufacture of AG9160RF GTG. Continued Test Planning. Prepared Test Plans and Procedures.

Continued planning for future gas turbine operational readiness and fuel efficiency upgrades.

Completed Production Readiness Review and exercised contract options to Manufacture two (2) DDG51 Flight III Air and Missile Defense Radar (AMDR) Power Conversion Modules (PCM) Low Rate Initial Production (LRIP) units. LRIP units will support DDG51 Flight III AMDR Developmental Testing (DT) at the Surface Combat System Center (SCSC) Wallops Island, VA. Commenced Factory Acceptance Test. Continued planning for DDG51 Flight III AMDR PCM LRIP Factory Acceptance Test (FAT) and Environmental Qualification Tests (EQT). Continued planning and commence site modifications for the Power Hardware in the Loop (PHIL) testing at Florida State University Center for Advanced Power Systems (FSU CAPS). Continued planning for electrical system validation testing at the NSWC Philadelphia, PA land based test site, and continued to support the ship building program office planning for PCM / AMDR combat system integration testing in support of AMDR Developmental Testing (DT) at Wallops Island, VA.

Continued developing the concept of a modular, scalable intermediate power and energy system made of common building blocks to support multiple mission systems on various ships. This concept is known as Energy Magazine (EM). The EM can be utilized in back fit and forward fit applications with existing ship power systems and is expected to incorporate building blocks common with the Energy Storage Module (ESM) prototype and ESM Stable Backup Power (SBP). Continued EM performance specification development and acquisition approach.

Completed design and begin manufacture of ESM prototype for mission system support. Prepared test plans and procedures for Factory Acceptance Testing (FAT) of ESM prototype. Continued qualification of ESM prototype battery sub-system in preparation for testing. Prepared Test Plans and Procedures for ESM prototype land based testing at Florida State University Center for Advanced Power Systems (FSU CAPS). (Note: ESM prototype will be tested at FSU CAPS and results will be exchanged with the United Kingdom (UK) Ministry of

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
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 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Defence (MOD) via the Advanced Electrical Power and Propulsion Project (AEP3) Project Arrangement and the Coalition Warfare Program (CWP) Directed Energy Power Systems (DEPS) project.)					
FY 2017 Plans: Complete manufacture of the DDG51 Flight III 4.2MW AG9160RF Gas Turbine Generator (GTG), conduct Factory Acceptance Testing (FAT), and prepare for delivery to DDG51 Flight III electrical integration testing at the Naval Surface Warfare Center (NSWC) - Philadelphia, PA. Continue planning for future gas turbine operational readiness and fuel efficiency upgrades. Conduct Test Readiness Review, Factory Acceptance Test (FAT) and Environmental Qualification Test (EQT) on DDG51 Flight III Air and Missile Defense Radar (AMDR) Power Conversion Modules (PCM) Low Rate Initial Production (LRIP) units. Conduct Power Hardware in the Loop (PHIL) testing at FSU CAPS. Continue to support the ship building program office planning for PCM / AMDR combat system integration testing in support of AMDR Developmental Testing (DT) at Wallops Island, VA, and planning for electrical system validation testing at the NSWC Philadelphia, PA land based test site. Following successful completion of FAT, EQT, and PHIL testing, prepare LRIP units for delivery to DDG51 Flight III AMDR Developmental Testing (DT) at the Surface Combat System Center (SCSC) Wallops Island, VA. Validate mission system power interfaces within existing ship designs with ESM prototype testing. Begin preparation for simulations of advanced power system architectures for fully integrated power and energy systems (IPES) for potential future surface combatants. Begin developing specifications and acquisition documentation in order to demonstrate at full scale a modular, scalable Energy Magazine to be incorporated into existing platform designs and satisfying the needs of multiple mission systems ready for ship installations. Complete Factory Acceptance Testing (FAT) and deliver ESM prototype to FSU CAPS. Complete Test Plans and Procedures and begin Controller Hardware In the Loop (CHIL) testing in preparation for Power Hardware In the Loop (PHIL) testing. Continue design of ESM SBP system. (Note: ESM prototype will be tested at FSU CAPS and results will be exchanged with the United Kingdom (UK) Ministry of Defence (MOD) via the Advanced Electrical Power and Propulsion Project (AEP3) Project Arrangement and the Coalition Warfare Program (CWP) Directed Energy Power Systems (DEPS) project.)					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
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 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Conduct feasibility studies, Cost Based Assessments, and begin developing technical and performance specifications for a power dense Advanced Power Generation Module (APGM) in support of Future Surface Combatant power generation requirements. APGM gas turbine powered generator sets may have superior fuel savings over predecessor units. Continue to refine IPES notional architectures through studies and industry engagement.					
FY 2018 Base Plans: Deliver the 4.2MW AG9160RF Gas Turbine Generator (GTG) to the Naval Surface Warfare Center (NSWC) - Philadelphia, PA for DDG51 Flight III electrical integration testing. The AG9160RF Gas Turbine Generator (GTG) 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. Deliver Air and Missile Defense Radar (AMDR) Power Conversion Modules (PCM) units to the Surface Combat System Center (SCSC) Wallops Island, VA for DDG51 Flight III AMDR Developmental Testing (DT). Continue to provide support for AMDR PCM units during PCM / AMDR combat system integration testing and electrical system validation testing at the DDG 51 Flight III test sites. AMDR PCM provides power conversion from ship's 4160 VAC distribution systems to 1000 VDC to support the AMDR on DDG 51 Flight III Class Ships. Continue planning for future gas turbine operational readiness and fuel efficiency upgrades. In order to obtain early insight into the effects of high power and energy mission systems on ships electric power systems, evaluate shipboard power and energy systems, and evaluate power system performance at lower cost than full-scale hardware system testing, simulated electrical system integration testing using power and energy system components will be conducted at the Center for Advanced Power System at Florida State University (FSU CAPS). This low-cost approach to testing is referred to as Power Hardware In the Loop (PHIL). PHIL includes development of component computer models that simulate and emulate actual operating machinery components and shipboard power and energy systems. PHIL testing replaces component models with hardware once hardware development is complete. PHIL testing costs less than full-scale hardware system testing, shortens development time, and affords the opportunity to identify and mitigate risks in a deliberate fashion from specification development to computer model development to hardware development resulting in a more affordable and robust end product.					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
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 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Receive, install, check-out, and integrate the Energy Storage Module (ESM) prototype into the test site at FSU CAPS. Conduct PHIL testing of the ESM prototype to demonstrate Energy Magazine (EM). Energy Magazine (EM) serves as the energy resource to enable the introduction of pulsed high power and energy weapons and sensor systems by providing a buffered interface between legacy power systems and new generation weapons and sensors. (Note: The ESM prototype will be tested at FSU CAPS and results will be exchanged with the United Kingdom (UK) Ministry of Defence (MOD) via the Advanced Electrical Power and Propulsion Project (AEP3) Project Arrangement and the OSD Coalition Warfare Program (CWP) Directed Energy Power Systems (DEPS) project.) Conduct PHIL testing of high powered weapons and sensors into ships electrical systems at FSU CAPS. Complete simulated electrical system integration testing of multiple pulsed mission systems integrated into a single branch of a ship's power system in stressing scenarios requiring controlled power flow. Complete simulated electrical system integration testing of multiple pulsed mission systems along with a large sensor load integrated into a new notional Medium Voltage Direct Current (MVDC) Integrated Power & Energy System (IPES) architecture, focused on demonstrating fault detection and isolation utilizing new MVDC circuit breakers developed by ONR and transitioning to PMS 320. IPES adds distributed EM functionality and advanced cyber safe controls to the Integrated Power System of ships such as DDG1000 for enhanced survivability, efficient sharing of power and energy resources between ship propulsion, mission systems and ship service loads. Conduct design review of the ESM prototype for use in Stable Backup Power (SBP) applications, identify necessary modifications required and appropriate test configurations. Evaluate ESM prototype for use in providing shipboard energy storage to reduce individual component Uninterruptible Power Supply (UPS) systems. Continue to refine real time simulation model of various ship classes at FSU CAPS to reflect learning and state of ongoing development of power and energy system components and pulsed, high power and energy weapons and sensor systems (i.e. Directed Energy Weapons, e.g. laser). Complete data analysis and issue reports for testing completed.					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
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 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Complete planning for FY 19 simulated electrical system integration testing using real time power hardware in the loop at the Center for Advanced Power System at Florida State University. Develop performance specification for next generation compact high power Advanced Power Generation Module (APGM). Develop computer component models and commence system level modeling and simulation efforts. Conduct feasibility studies, Cost Based Assessments, and begin developing performance and technical specifications. ***FY 2018 OCO Plans:*** N/A					
Title: Naval Power Technology Development / Platform Integration & Transition	1.432	1.104	1.104	0.000	1.104
Articles:	-	-	-	-	-
FY 2016 Accomplishments: Continued to execute 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 characterizing, developing, modeling, and de-risking electrical power and propulsion system architectures and equipment for future surface and submarine platforms to meet the needs of both Navies. Commenced execution of PA complimentary effort (Directed Energy Power Systems (DEPS)) under the Coalition Warfare Program (CWP). 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 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 and Energy System alternate architectures to best meet emerging ship requirements. Completed biennial update of the Naval Power and Energy Systems Technology Development Roadmap (TDR).					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
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 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Continued to support maturation and transition of ONR Future Naval Capabilities (FNC) products to meet TDR identified gaps. Continued Combat Power and Energy System Overarching Integrated Product Team (OIPT). Continued to generate strategy, technology development plan and resource requirements for future surface combatant integrated power and energy system. ***FY 2017 Plans:*** Continue to execute 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 characterizing, developing, modeling, 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 execution of PA complimentary effort (Directed Energy Power Systems (DEPS)) under the Coalition Warfare Program (CWP). 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 and Energy System alternate architectures to best meet emerging ship requirements. Commence biennial update of the Naval Power and Energy Systems Technology Development Roadmap. Support maturation and transition of ONR Future Naval Capabilities (FNC) products to meet TDR identified gaps. Continue to support maturation and transition of ONR Future Naval Capabilities (FNC) products to meet TDR identified gaps. Continue Combat Power and Energy System Overarching Integrated Product Team (OIPT).					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
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 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Continue to generate strategy, technology development plan and resource requirements for future surface combatant integrated power and energy system.					
FY 2018 Base Plans: Continue to execute 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 characterizing, developing, modeling, and de-risking electrical power and propulsion system architectures and equipment for future surface and submarine platforms to meet the needs of both Navies. Complete execution of PA complimentary effort (Directed Energy Power Systems (DEPS)) under the Coalition Warfare Program (CWP). 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 and Energy System alternate architectures to best meet emerging ship requirements. Complete biennial update of the Naval Power and Energy Systems Technology Development Roadmap. Support maturation and transition of ONR Future Naval Capabilities (FNC) products to meet TDR identified gaps. Continue to support maturation and transition of ONR Future Naval Capabilities (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 and energy system.					
FY 2018 OCO Plans:					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
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 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
N/A					
Title: Cybersecurity Boundary Defense Capability	0.000	16.152	12.825	0.000	12.825
Articles:	-	-	-	-	-
FY 2016 Accomplishments: Not Applicable					
FY 2017 Plans: Conduct the following studies: cybersecurity assessment of DDG 51 and CG 47 ship class Hull, Mechanical and Electrical (HM&E) systems; analysis of inter-enclave interfaces; enhanced firewall application analysis; and, Boundary Defense Capability. Plan for future studies on intra-HM&E enclave controls point, HM&E cyber situational awareness tools, message authentication, intrusion detection system, Host level protection, and intrusion prevention systems.					
FY 2018 Base Plans: FY 2018 plans will include the testing of the Cybersecurity Boundary Defense Capability (BDC) in Navy land based site laboratories and on combatants and amphibious ships as non-permanent changes. The intent of the testing is to demonstrate the overall approach to implement a cybersecurity boundary defense capability for Hull, Mechanical and Electrical (HM&E) control systems on surface ships as being an effective approach. HM&E systems to be protected will include Machinery Control Systems, Electric Power Systems, Damage Control and Firefighting, Auxiliary Machinery and Fluid systems, Engines and Power Transmission Systems, Gas Turbine Systems, Video Systems as well as other HM&E systems. Design and technical data packages for software and hardware solutions will be developed. The intent of the total boundary defense capability will be to allow the ship to better protect, detect, respond, and recover from potential cyber attacks on the HM&E enclave on surface ships					
FY 2018 OCO Plans: N/A					
Accomplishments/Planned Programs Subtotals	23.443	36.655	29.953	0.000	29.953

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
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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. For new contract awards, 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. Cybersecurity efforts will maximize use of government field activity labs and already contracted HM&E equipment vendors.

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 program; and, complete HM&E cybersecurity studies and production of a boundary defense capability architecture and implementation approach for HM&E systems on surface ships in alignment with the Task Force Cyber Awareness (TFCA) goals.

Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy		Date: May 2017
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)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Development	SS/FFP	Rolls Royce : Walpole, MA	24.851	8.155	Nov 2015	4.822	Oct 2016	2.000	Oct 2017	-		2.000	Continuing	Continuing	Continuing
Product Development	SS/BOA	General Electric Company : Cincinatti, OH	3.560	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Product Development	C/FFP	DRS : DRS, Milwaukee WI	33.168	7.509	Oct 2015	7.700	Oct 2016	2.500	Oct 2017	-		2.500	Continuing	Continuing	Continuing
Product Development	C/CPFF	Various : Various	34.806	3.418	Oct 2015	3.121	Oct 2016	6.850	Oct 2017	-		6.850	Continuing	Continuing	Continuing
Product Development	WR	NSWCCD-SSES : Phila, PA	48.596	3.531	Oct 2015	4.060	Oct 2016	4.978	Oct 2017	-		4.978	Continuing	Continuing	Continuing
Cybersecurity BDC	WR	NSWCCD-SSES : Phila, PA	0.000	0.000		9.152	Feb 2017	7.075	Nov 2017	-		7.075	Continuing	Continuing	Continuing
Cybersecurity BDC	WR	NSWCDD : Dahlgren, VA	0.000	0.000		2.000	Dec 2016	0.000		-		0.000	Continuing	Continuing	Continuing
Cybersecurity BDC	C/CPIF	Boeing : Huntington Beach, CA	0.000	0.000		2.500	Mar 2017	1.000	Jan 2018	-		1.000	Continuing	Continuing	Continuing
Cybersecurity BDC	C/FP	Various HM&E Equipment Vendors : Various	0.000	0.000		2.000	Feb 2017	4.500	Feb 2018	-		4.500	Continuing	Continuing	Continuing
Cybersecurity BDC	C/CPIF	Various : Various	0.000	0.000		0.500	Feb 2017	0.250	Feb 2018	-		0.250	Continuing	Continuing	Continuing
		Subtotal	144.981	22.613		35.855		29.153		-		29.153	-	-	-

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Test and Evaluation	WR	NSWCCD-SSES : Phila, PA	24.954	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
		Subtotal	24.954	0.000		0.000		0.000		-		0.000	-	-	-

Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy		Date: May 2017
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Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Management	C/CPFF	Herren Associates : Alexandria, VA	2.308	0.830	Oct 2015	0.800	Oct 2016	0.800	Oct 2017	-		0.800	Continuing	Continuing	Continuing
		Subtotal	2.308	0.830		0.800		0.800		-		0.800	-	-	-

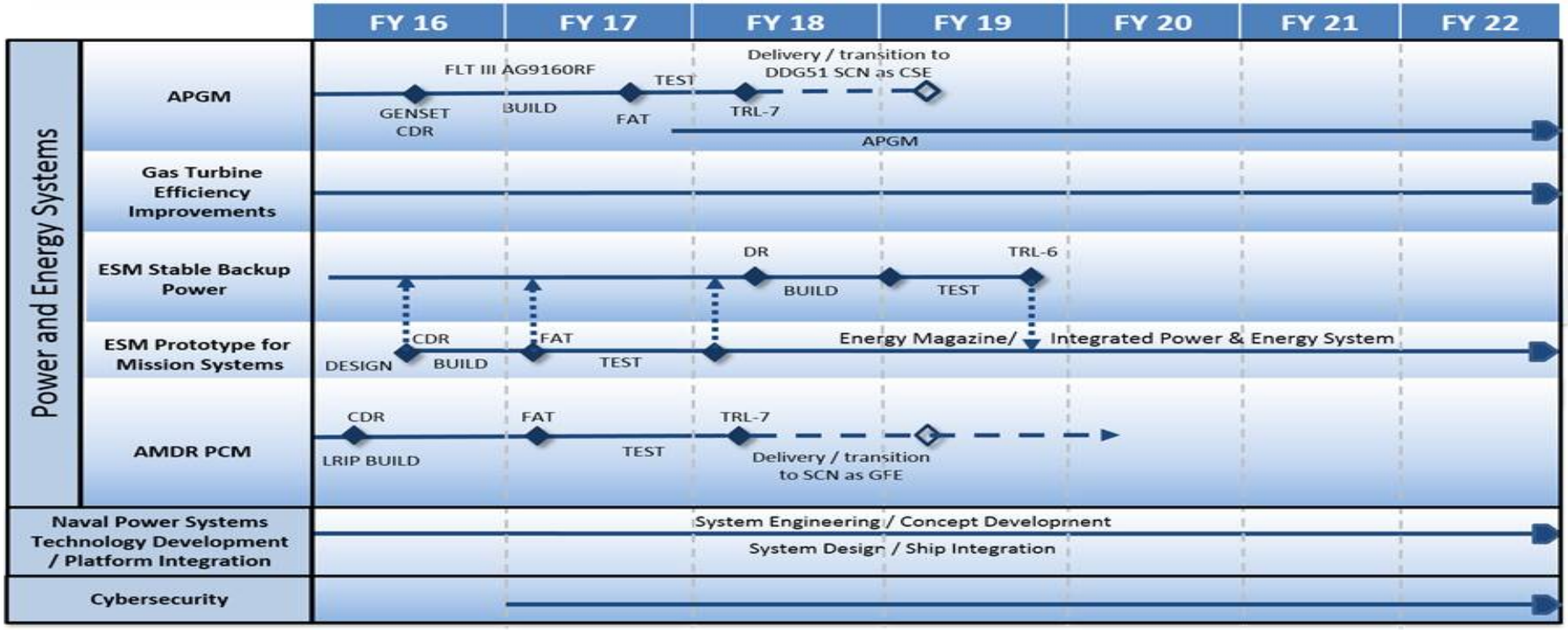
	Prior Years	FY 2016		FY 2017		FY 2018 Base		FY 2018 OCO		FY 2018 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	172.243	23.443		36.655		29.953		-		29.953	-	-	-

Remarks

Exhibit R-4, RDT&E Schedule Profile: FY 2018 Navy		Date: May 2017
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

Electric Ships Office PMS 320 Directing the Future of Ships Power



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Other requests shall be referred to PMS 320, Electric Ships Office Program Director.

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Exhibit R-4A, RDT&E Schedule Details: FY 2018 Navy		Date: May 2017
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)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 2471				
Power and Energy Systems	1	2016	4	2022
Naval Power Technology Development / Platforms Integration & transition	1	2016	4	2022
Cybersecurity BDC	1	2017	4	2021