ARPA-e Energy Summit

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Video Played:
https://youtu.be/NTzi2kWLpGU

Where is the Navy going?

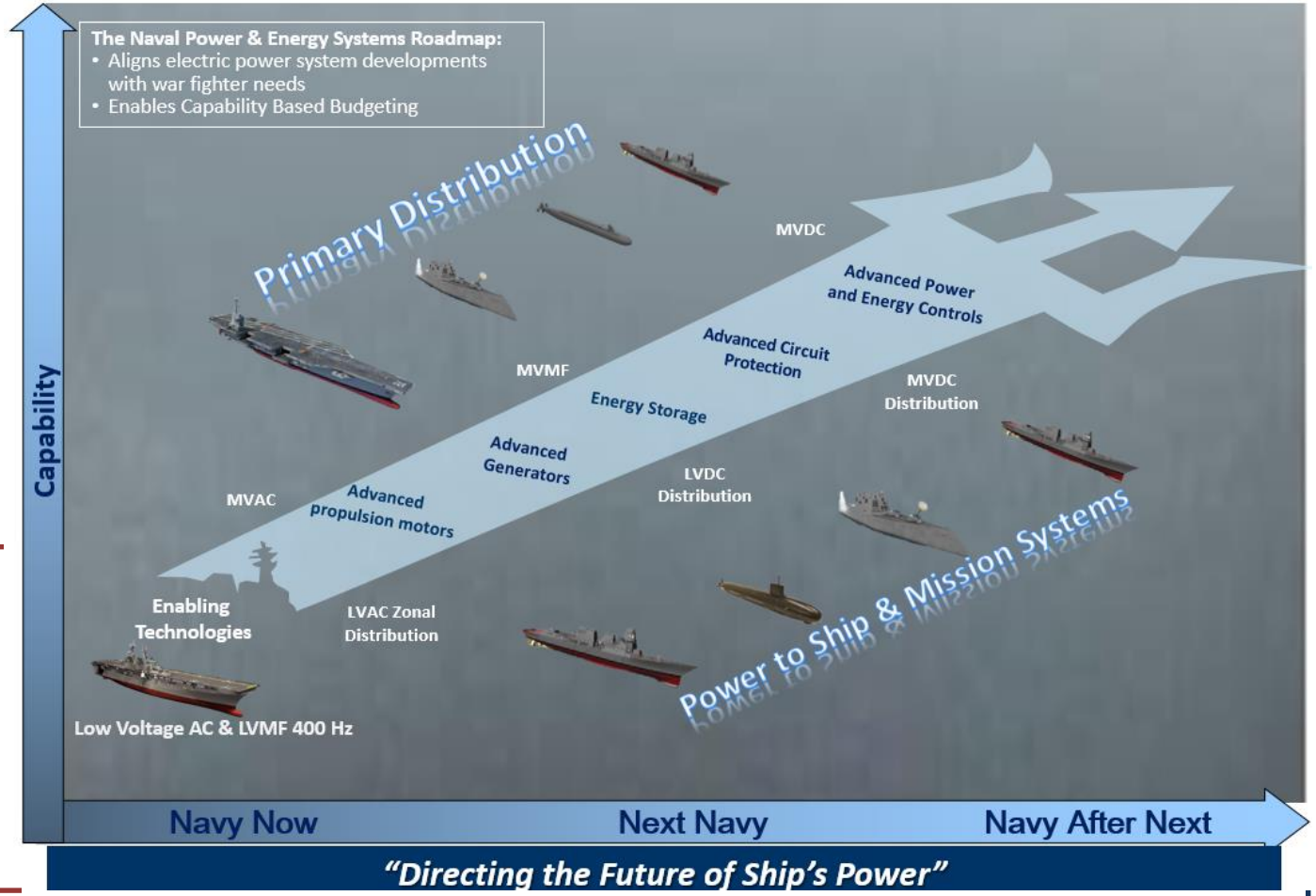
Directed Energy

Pulsed, high powered weapons and sensors required to pace technology, outpace adversaries, and maintain maritime dominance

- These are elastic by nature
- Some are stochastic
- All are DC
- Difficult problem to manage on AC systems with limited f response capability

Near Term: MVAC Distribution Systems

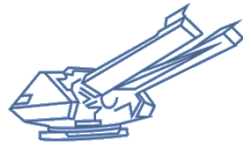
- Build in flexibility to rapidly introduce new mission systems/power gen & distribution
- Incorporate federated Energy Storage as Buffer
- Develop knowledge base for MVDC



"Directing the Future of Ship's Power"

Next: MVDC Distribution Systems

- Integrated & Distributed Energy Storage
- Increased Efficiency & System/Power Density

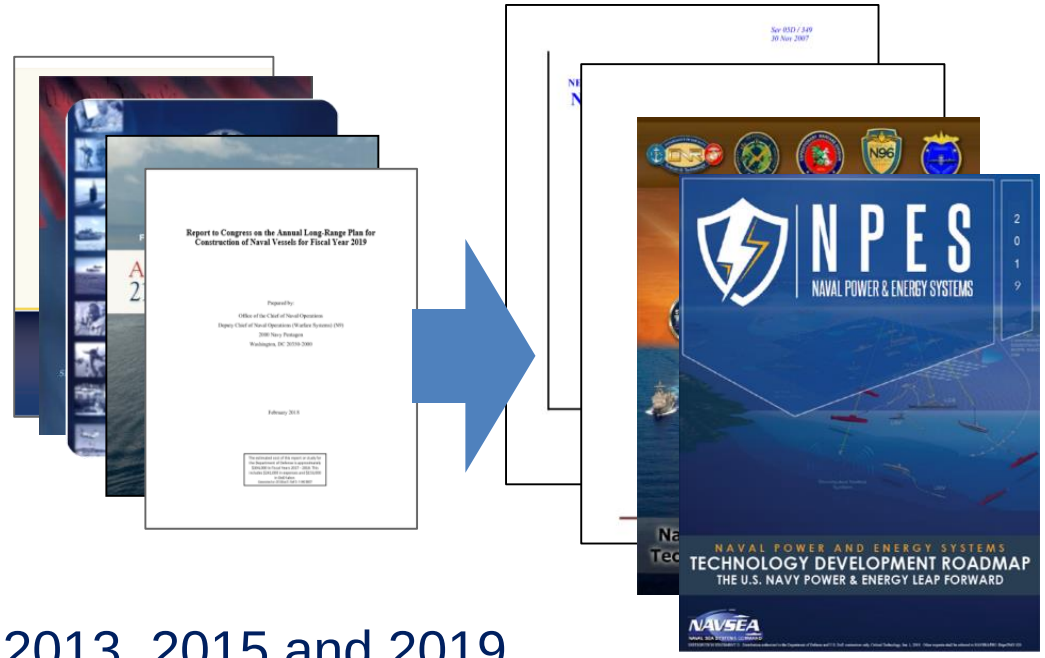


Key to Disruptive Technology is an Agile Power System…

Guidebook: Naval Power and Energy Systems Technology Development Roadmap

- Aligned to the Navy's 30 year shipbuilding plan and Surface Capability Evolution Plan (SCEP)
- Serves as a guide for future investment by Navy, DoD, Industry, and Academia
- Includes all major product areas for Naval Power Systems

  - Prime Movers
  - Generators
  - Energy Storage
  - Electric Motors
  - Distribution Systems
  - Power Converters
  - Controls
  - Thermal Management



- Originally issued in 2007, updated and re-issued in 2013, 2015 and 2019

- NPES BAA Announcement N00024-19R-4145 Available on Fed Biz Ops

2019 NPES TDR at: http://www.navsea.navy.mil/resources/npes-tech-development-roadmap/

Electric Ships Office

PMS 320

Directing the Future of Ships Power

OVERVIEW

In 2007, ASN(RDA) established PMS 320, the Electric Ships Office (ESO) within PEO SHIPS to facilitate the high degree of technical integration with ship platforms and power systems, scope future technology development, and support critical concept decisions.

OUR MISSION

The mission of PMS 320 is to develop and provide affordable, capable Naval power and energy system integration solutions to meet evolving customer demands by:

- Defining common open architectures and interface standards,
- Developing common solutions,
- and Focusing Navy and informing Industry investments

OUR VISION

PMS 320 will work across the Navy's Research & Development Enterprise in partnership with industry to develop and introduce innovative technologies to enable the Navy's distributed lethality principles through efficient power & energy management.

PMS 320…

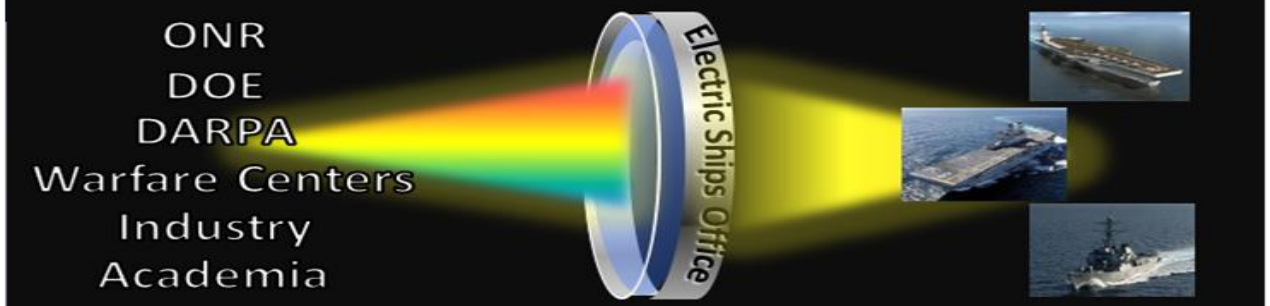
- Manages the Combat Power and Energy Systems OIPT
- Works with the S&T community to apply new technologies to solve fleet problems
- Works in conjunction with ONR, DARPA, Academia, Industry Professionals, and Warfare Centers
- Aligns developments with warfighter need
- Supports SECNAV and CNO initiatives to reduce energy use

WHAT WE PRODUCE

- Smaller, simpler, and more affordable ship power systems
- Power for pulsed high energy weapons and sensor systems
- Future Naval Power Systems and transition appropriate Science & Technology to the fleet
- Naval Power and Energy Systems Technology Development Roadmap (TDR)

NPES TDR: http://www.navsea.navy.mil/teamships/PEOS_ElectricShips/default.aspx

Providing Affordable, Integrated Power and Energy Solutions



- Combination of Real-Time physics-based models of key Integrated Power and Energy System (IPES) components, mission loads and real power equipment integrated via simulation/stimulation Control and Power Hardware in the Loop (CHIL/PHIL)

EM-L (DRS)

FESS (GKN/UK)

- De-risks SSL for all ships; creates modular building block for flexible commonality
- Facilitates integration of future weapon/sensor systems

Energy capacity: 71kw-hrs (256MJ)
Output Power: 660kw at 650Vdc

LPD Class
- Reduced life cycle costs
- Improved maintenance efficiencies
- Single Compartment Reduction: Reduces number of UPS' from 21 to 3

LPD 27 SSL-TM ESM
- Mod Repeat of ESM for Land Based Unit
- Same power electronics LRUs, same batteries
- Upgraded cabinets for shock/vibration
- Upgraded controls for single operator requirement

LSC IPES
- DDG 1000 IPS follow-on
- 12kVDC Architecture
- IPS + Shared Energy Storage + Advanced Controls

LSC Bus Node
- SiC based power converter
- 1/10th weight 1/3rd size
- Higher reliability

LSC APGM
- 25MW – reduced footprint
- Variable speed DC output

DDG 51 Flight III GTG
- Provide fuel efficient and affordable power to meet power requirements for advanced sensors and future weapons
- Reduction in weight and lower life cycle costs
- 4MW with 3.3% fuel efficiency improvement from DDG 1000 RR4500 3.85MW ATG

Flt III APGM (Rolls Royce)

DDG 51 Flight III AMDR PCM
- Provides power conversion from 4160 VAC distribution system to 1000VDC at 1.42 MW/unit output power
- The two PCM cabinets can be paralleled via auctioneering diodes and will share the AMDR load

AMDR PCM Power Converter