



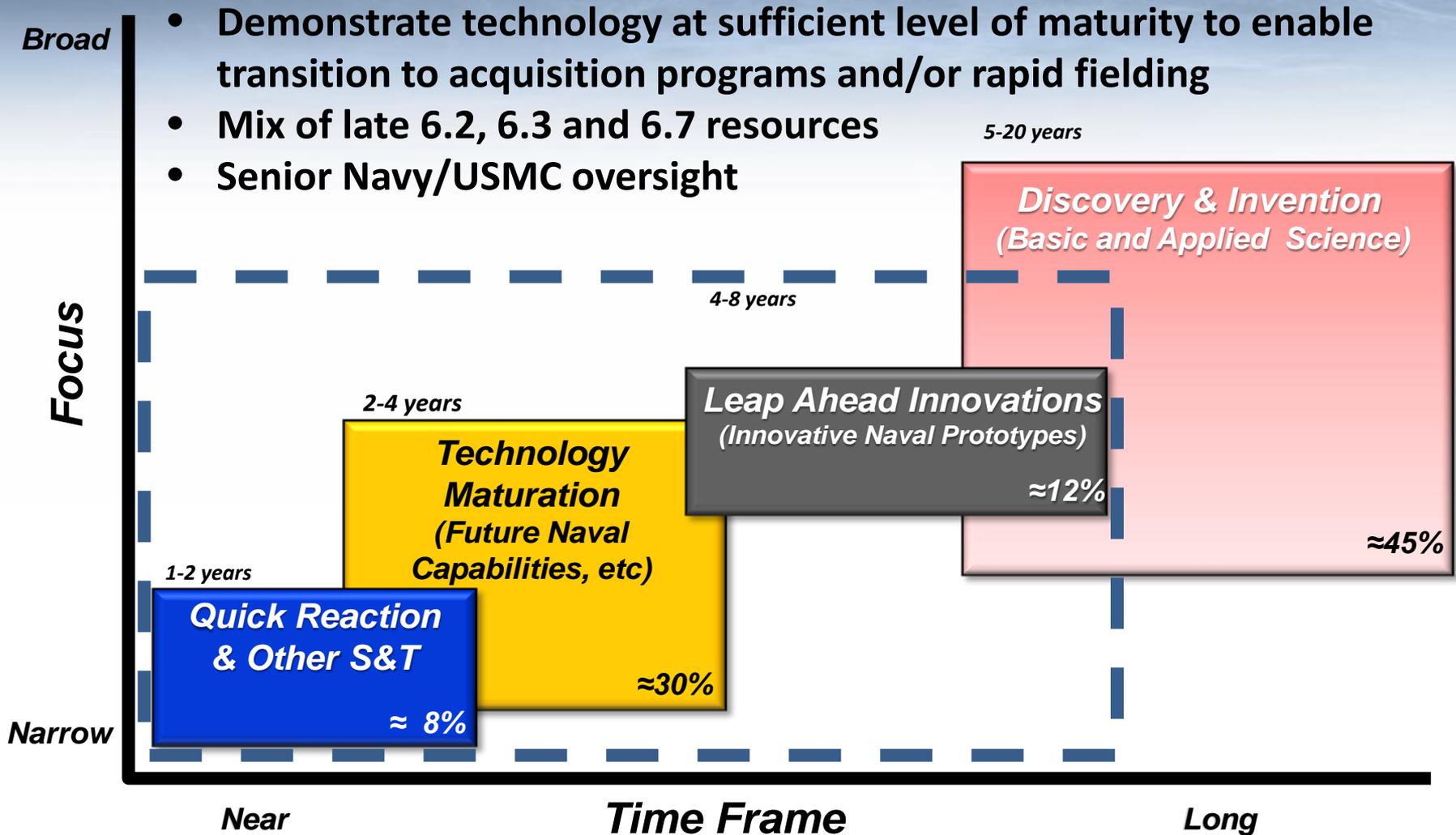
*Platform P&E Science and
Technology Challenges
Power & Energy ONR Focus Area Forum*

*Dr. Thomas Killion
Director of Technology*

29 October 2015

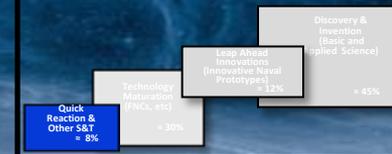


Director of Technology Focus





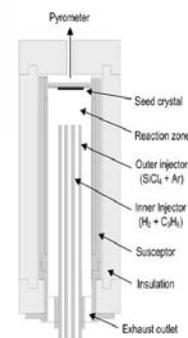
Quick Reaction S&T – P&E



Off-the-shelf technology projects with a 12-24 month time horizon

ONR Experimentation explores the feasibility of new and advanced technologies as applied to the Fleet/Force with a emphasis on Fleet/Force Commander's current or emerging needs.

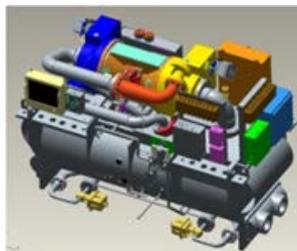
- **Hydro-Reactive Propulsion** - Design, build and test a hydro-reactive propulsion system, propelling an in-water vehicle to 85 and 120 kts.
- **High Performance, High Reliability WBG Semiconductors for High Power Navy Applications**
- A technology demonstration, based on Penn State's unique halide chemical vapor deposition (HCVD) process, will be used to fabricate high reliability high voltage power devices (5kV). The effect of process conditions will be evaluated against current COTs device for reliability and performance.





DoN Rapid Innovation Fund – P&E

Rapid Innovation Fund (RIF) – A technology transition program that accelerates fielding, enhances military capability, and saves acquisition program costs.



Navy HES-C Chiller Power Electronics Cooling - Created a highly reliable, compact, completely self-contained, self-regulated cooling system that requires no air filters and eliminates all maintenance.



Scalable Hybrid Intelligent Power System - will reduce fuel consumption and generator maintenance costs by efficiently controlling multiple energy sources. Also, enhances cross-system compatibility through a Common Generator Interface by controlling solar, battery, and generators.



Technology Maturation P&E

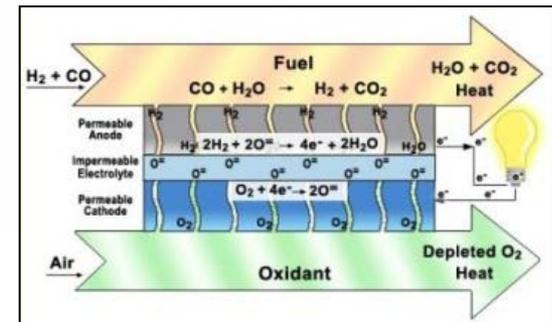


Matures S&T efforts into products in 2-4 years

Future Naval Capabilities (FNCs) - Demonstrates / Delivers prototype systems, components, knowledge products, and technology improvements in response to validated S&T Capability Gaps.

Power and Energy FNC Pillar - PB15 Investment \$24.7M (6 S&T Products):

- Energy security
- Efficient power and energy systems
- High energy
- Pulse power



P&E Examples (Transitioned to Acquisition):

- **Power Management Controller** - Directs power from shipboard sources to meet dynamic warfighting electric load demands while maintaining MIL-SPEC shipboard power quality.
- **Multifunction Motor Drive** - Scalable, efficient, high density power converter suitable for AC-DC, DC-DC and DC-AC operation
- **Bi-directional Power Control Module** - Scalable, efficient, high density power converter suitable for bi-directional power flow to provide a 2-3x increase in power density to enable new shipboard energy storage configurations.



Technology Maturation P&E Continued



Matures S&T efforts into products in 2-4 years

Manufacturing Technology Program (ManTech)

- Developing critical manufacturing and repair/sustainment solution
- Cost reduction is the primary benefit

Solid State Switch Assembly (SSSA) - Design, Qualify and deliver a Solid State Switch Assembly upgrade that meets the Navy's need for improved reliability and lowered cost for the AN SPY-1D/D(V) Radar on board the DDG-51 class Aegis Destroyers.

SiC High-Efficiency Power Switches Wafer Process Improvement

Manufacturing Technology Improvements of Epi-layer growth, device manufacturing technology is increase yield of high power switching devices





Technology Maturation P&E Continued



Matures S&T efforts into products in 2-4 years

Small Business Innovation Research (SBIR) /

Small Business Technology Transfer (STTR)

- Programs stimulate technological innovation and increase small business participation in federally funded research and development
- 20% of DON SBIR/STTR Topics focused on Fleet energy needs since 2009 – 33 in 2014 – for \$54.9M investment in Topics from all SYSCOMs
- Of 27 FY14 priority projects, 37% have Phase III mission funding (\$3M to \$9.4M)
- Focus on Power Generation, historically: 460 projects with 19 Phase III awards
- Broad inventory of SBIR/STTR priority projects – examples:

Walking Power From Suspended-Load Backpack

High Power, Thermally Stable Capacitors

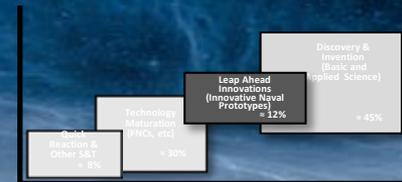
High Power High Frequency Acoustic Sensors

Low Power Swimmer Detection





Leap Ahead Innovations P&E



Innovative Naval Prototypes are:

- Game changing or disruptive technology
- Higher risk to produce higher warfighting payoff
- Typically 4-8 years

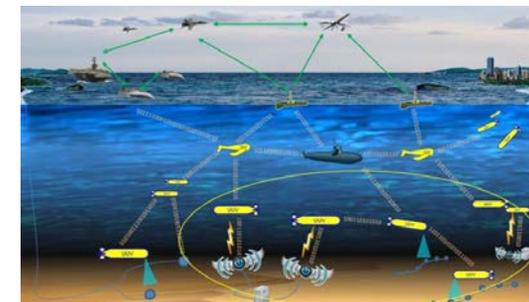
Electromagnetic Railgun (EMRG) is a revolutionary long range gun with multi-mission potential including long range land attack, anti-air and anti-surface warfare.



Large Displacement Unmanned Underwater Vehicle (LDUUV) will develop fully autonomous long endurance UUVs capable of 60+ days of operation in the littorals, extend and multiply the current Navy platform's capability.



Forward Deployed Energy & Communications Outpost (FDECO) will prototype an open, scalable and coordinated undersea energy, data, and communications infrastructure for multiple undersea vehicles and sensors.





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