

***TAKING A SYSTEMS ENGINEERING APPROACH TO IDENTIFYING T&E
ISSUES WITH THE INTEGRATION OF NEW POWER AND ENERGY
TECHNOLOGIES INTO WARFIGHTING SYSTEMS***



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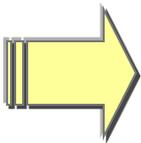
Agenda

- Background
 - Test Resource Management Center (TRMC)
 - Strategic Plan for DoD T&E Resources
 - Focus Areas
 - Introduction of Power & Energy as an area of interest
- Power & Energy Developments
 - Army, Navy, Air Force
- The Strategic Planning “V”
 - Identifying T&E issues through the Strategic Planning Systems Engineering approach
- Strengthening the linkage between T&E and S&T
- Closing Remarks



TRMC Establishment

- The 2003 NDAA, directed The SecDef to establish a DoD-level Resource Management Organization
- DoD Directive (DoDD) 5105.71 established the TRMC as a DoD Field Activity under the authority, direction, and control of the USD(AT&L) to:
 - Review And Provide Oversight Of Proposed DoD Budgets And Expenditures For T&E Facilities And Resources
 - **Develop A Biennial Strategic Plan Reflecting The Needs Of DoD With Respect To T&E Facilities And Resources**
 - Review The Services' Proposed T&E Budgets For Adequacy And Certify That They Are In Compliance With The Strategic Plan
 - Administer CTEIP And The Test And Evaluation/Science And Technology Program





Strategic Plan Law and Guidance

U.S. Code

Title 10, Section 196 (d)

“...**The strategic plan shall be based on a comprehensive review of the test and evaluation requirements** of the Department and the adequacy of the test and evaluation facilities and resources of the Department to meet those requirements....”

Six statutory requirements:

- (1) An assessment of the T&E requirements of the Department for the period covered by the plan.
- (2) An identification of performance measures associated with the successful achievement of T&E objectives for the period covered by the plan.
- (3) An assessment of the T&E facilities and resources that will be needed to meet such requirements and satisfy such performance measures.
- (4) An assessment of the current state of the T&E facilities and resources of the Department.
- (5) An itemization of acquisitions, upgrades, and improvements necessary to ensure that the T&E facilities and resources of the Department are adequate to meet such requirements and satisfy such performance measures.
- (6) An assessment of the budgetary resources necessary to implement such acquisitions, upgrades, and improvements.



Focus Areas and Areas of Interest

- **Focus Areas and Areas of Interest**
 - Artificial Intelligence
 - Biometrics
 - Chem-Bio Warfare
 - Directed Energy
 - EW/Anti-Access
 - Hypersonics
 - Nuclear Weapons Effects
 - Spectrum Efficient Technology
 - Testing in Joint, Net-Centric, and Distributed Test Environments
 - Targets and Threats
 - Unmanned and Autonomous Systems
 - **Power and Energy**
 - S&T
 - Data to Decisions
- **Warfighting Domains**
 - Air
 - Land
 - Sea
 - Space and Strategic Warfare
 - Cyber





Power & Energy Area of Interest

- Initial interest to assess for inclusion in the Strategic Plan was based on:
 - Power & Energy is one of the 54 S&T priorities as reported in the S&T EXCOM S&T priorities meeting (DASD(R&E) - Mr. Al Shaffer)
 - The establishment of Task Forces, Working Groups and offices within the Military Departments to address power and energy issues;
 - Army-Energy Initiatives Task Force for Large-scale Renewable Energy Projects
 - Navy - Task Force Energy and the Navy Energy Coordination Office
 - Air Force- Air Force Energy Plan



Power & Energy Within the Services

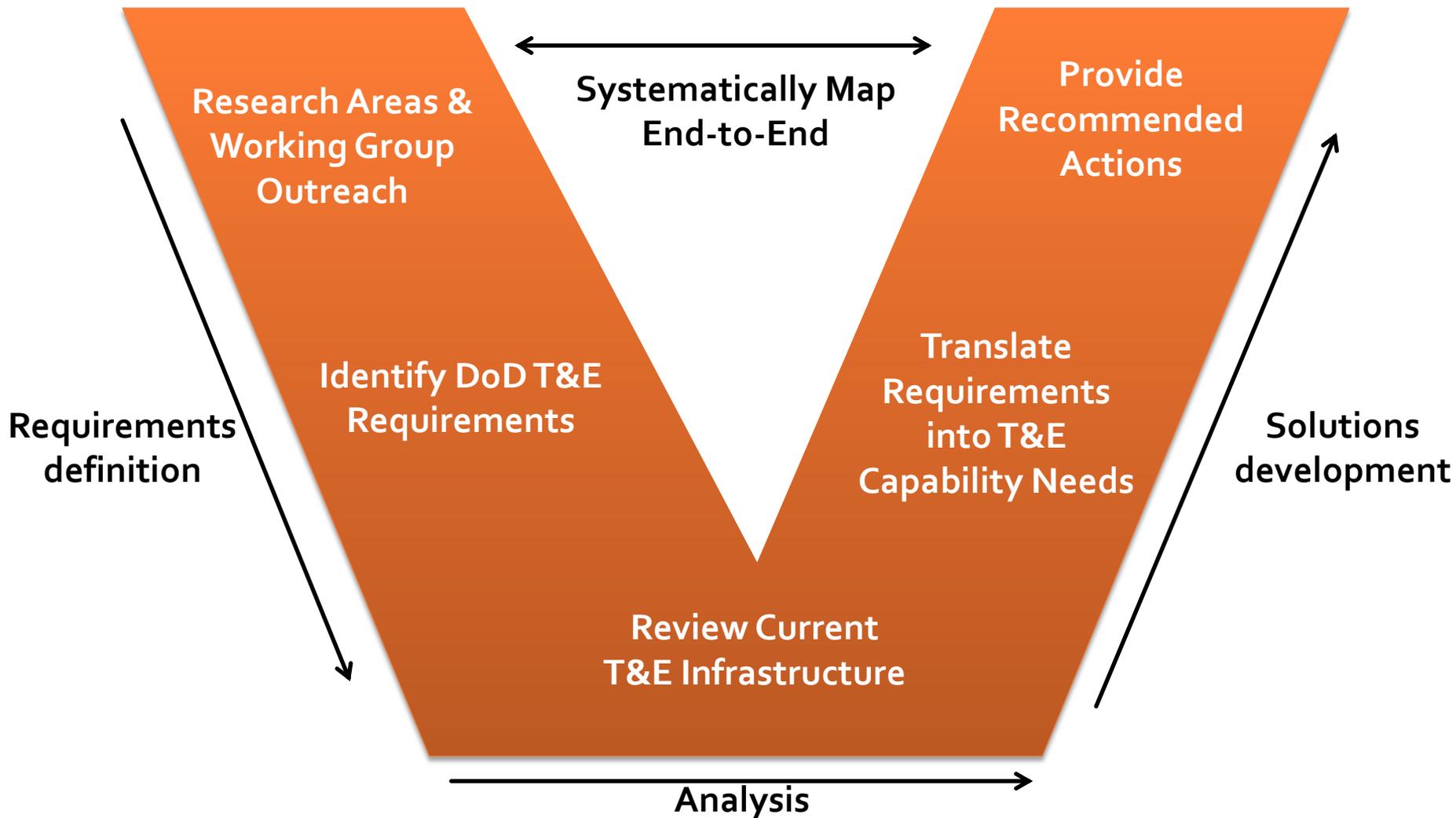
- Army
 - Soldier Power, Vehicle Power, and Basing Power
- Navy
 - Energy Security, Efficient Power and Energy Systems, High Power Systems
- Air Force
 - Renewable Energy, Propulsion Power Systems



Advances in Power and Energy technologies together with the desire of warfighters to quickly field systems with improved capabilities are challenging both the engineering development and T&E communities



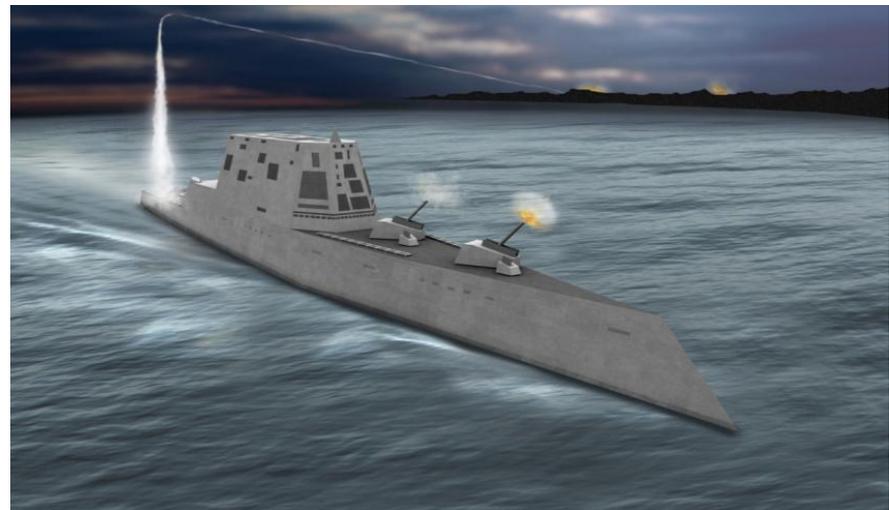
The Strategic Planning "V"





Research and Outreach

- Site Visits to Government Laboratories, and Defense Agencies among others
 - Example: ONR Next-Generation Integrated Power system (NGIPS)
 - It takes electric propulsion technology and combines it with other energy efficient power systems throughout a ship





Identify DoD T&E Requirements

- Within an area of interest, once the drivers are identified, the implications to T&E will also be exposed
- Drivers:
 - Electric Ship Office
Integrated Power
Systems (IPS) program
ACD&P
- Source of requirement:
 - Strategic Guidance
 - COCOMS IPLs
 - MDAPS
 - S&T
 - DOT&E Oversight
 - TEMPS
 - User Requirements



Assess Current State of T&E Infrastructure

- Implications to T&E
 - Current T&E can perform land-based testing of individual modules and at-sea demonstrations of components
 - No capability to test integrated power system as a whole
 - Limited higher frequency power test capability/infrastructure



Identify and Validate T&E Capability Needs

- T&E capability needs must come from the requirement to test warfighter systems that speak to an operational need
 - Ability to perform integration testing on all components of electric ship power systems.



Recommended Actions

- Provide recommendations to address the issues identified
 - Work with Services, Program Offices, and Defense Agencies to address T&E Issues
 - Insert T&E capability need into Capabilities Development Document (CDD), Test and Evaluation Master Plan, etc...



What We Found...

- The laboratories are doing extraordinary research and developing groundbreaking technologies but there is a big gap between this community and the T&E community
- More often than not, researchers at the lab do not know what happens to their S&T projects once they “throw them over the fence”
- There needs to be stronger interactions between technology developers, program offices, and testers in order to deliver efficient capabilities to the warfighter in a timely and cost effective manner



Strengthening the linkage between T&E and S&T

- The integration of innovative Power & Energy technologies into new and legacy warfighting systems will be more successful if T&E capabilities evolve in-parallel with technology developments
 - Increase and strengthen interactions between the S&T and T&E communities
 - Provide more opportunities for the tester to be involved in the development of new technologies
 - Likewise, provide technology developers with validated T&E tools to use when they are doing their own testing

Having the test community involved sooner rather than later can help reduce the cost of fixing problems that can be detected early through T&E.



Closing Remarks

- The Strategic Plan Systems Engineering approach provides a comprehensive understanding of new technologies and their implications to T&E capabilities
- The integration of innovative Power & Energy technologies into new and legacy warfighting systems will be more successful if T&E capabilities evolve in-parallel with technology developments
- Areas of interest such as Power and Energy provide an opportunity for technology developers and testers to work closely together



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Questions?