



# *NDCEE*

National Defense Center for Energy and Environment

## Driving Innovation for Sustainability Using Strategic Technology Opportunity Analysis



**DoD Executive Agent**

Office of the  
Assistant Secretary  
of the Army  
(Installations and  
Environment)

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**Technology Transition – Supporting DoD Readiness, Sustainability, and the Warfighter**

# Report Documentation Page

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# Presentation Overview

- Task Objectives
- Define Technology Opportunity Analysis (TOA) Approach
- Discuss TOA Demonstration
- Application to Requirements Process
- Conclusions

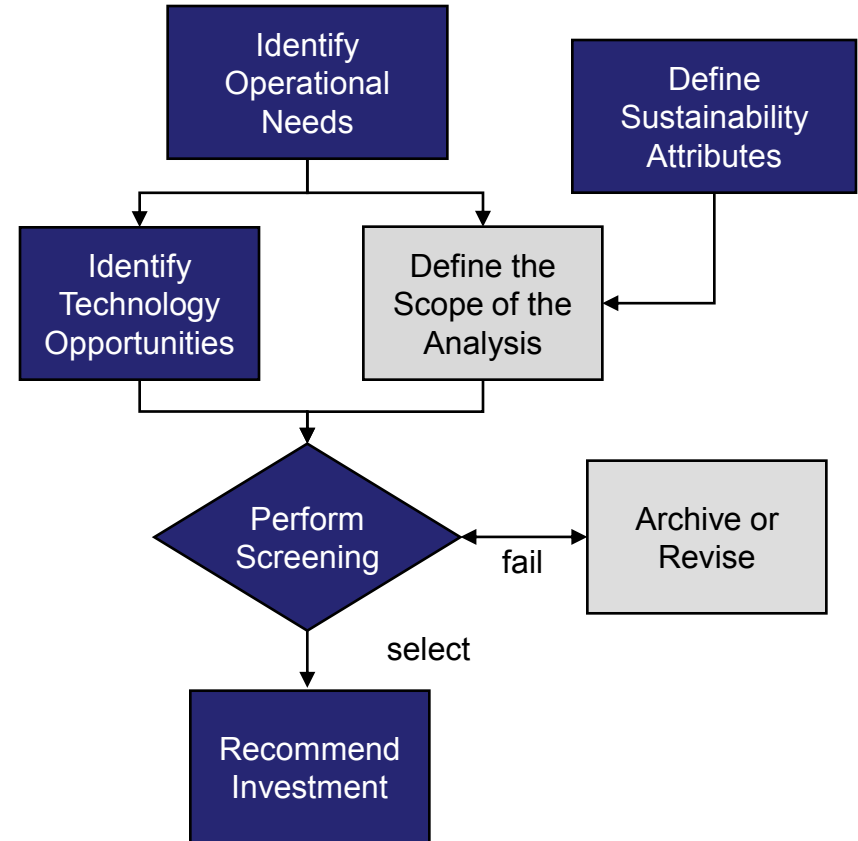
# Task Objectives

Purpose: *Drive Innovation* applying TOA in the requirements development process

- Demonstrate the methodology on illustrative case study
  - Define Requirement
  - Identify Technology Opportunities
  - Evaluate Opportunities
  - Make Investment Recommendations
  
- Define application within existing Army institutions

# TOA Approach

- Identify Operational Need
- ID Opportunities
- Define Sustainability Performance Attributes
- Screen Opportunities
- Recommendations for investment



*Goal:* Identify and evaluate technology opportunities to provide requirements developers with the technical information and sustainability performance attributes needed to develop requirements documents

# TOA Approach

- Methodical Technology Mining
  - VantagePoint- Bibliometric analysis tool
  - Predecessor “Tech Oasis” is proprietary to the Army
    - Developed under DARPA STTR/SBIR and TACOM funding
- Methodology to scan thousands of sources to identify several innovative concepts relevant to the capability gap
- Develop and incorporate performance attributes for sustainability in addition mission attributes early in the acquisition process

# Task Objectives

- Demonstrate the methodology on illustrative case study
  - Define Requirement
  - Identify Technology Opportunities
  - Evaluate Opportunities
  - Make Investment Recommendations

# Operational Requirement

- Source Documents
  - Army Strategy for the Environment
  - Defense Science Board Report 02 Feb 2008
    - “More Fight, Less Fuel”
  
- Stakeholder driven
  - Defined by Kurt Kinnevan (AES-MANSCEN/CERL)
  - Lead- Integrated Capabilities Development Team for Forward Operating Bases
  - Developing Requirements Documents for FOBs

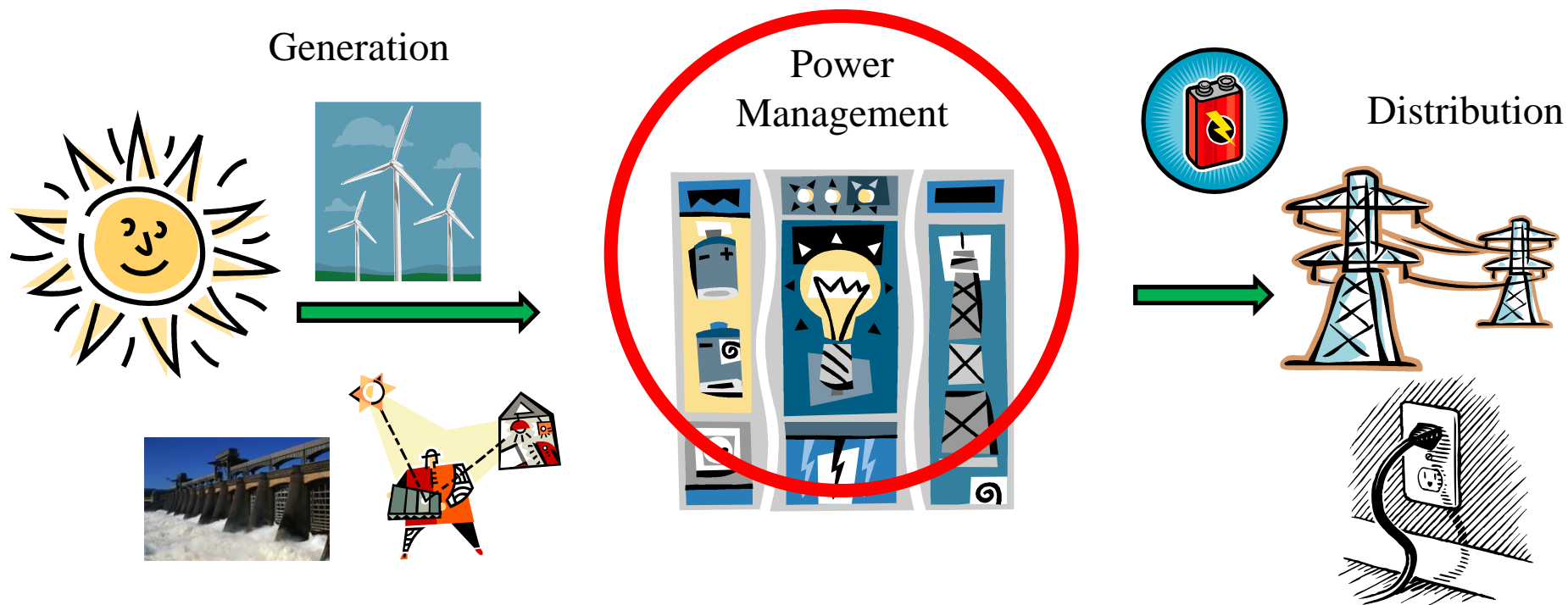
Reduce the Logistics Tail for Deployed Power Generation



# Identifying Opportunities

- Use the requirement as the framework for data collection and analysis
- Define Search Strategy
  - Iterative process among stakeholders to search and refine dataset to be analyzed using VantagePoint
  - IEEE and Scirus databases

# Identifying Opportunities

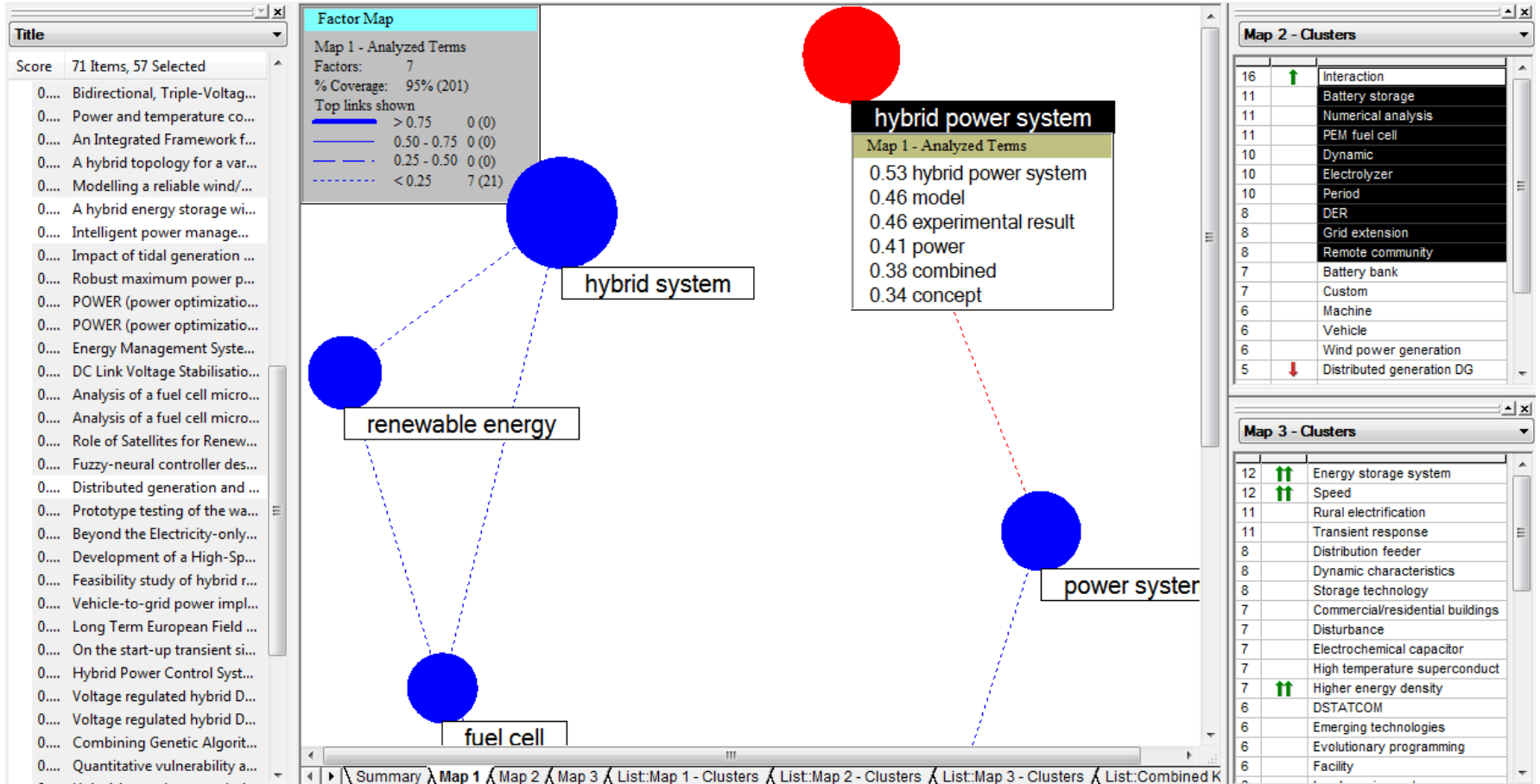


# Identifying Opportunities

- Initial search strategy yielded 286 articles related to distributed generation, management and distribution
- After iterations of refining and expanding final dataset captured 212 quality articles related to power mgt.
- Delivered data to Library Scientists for filtering
  - Reduced 212 to ~75 articles of interest
- Used VantagePoint to identify articles and discriminate between articles

# Identifying Opportunities

- VantagePoint screen-shot:

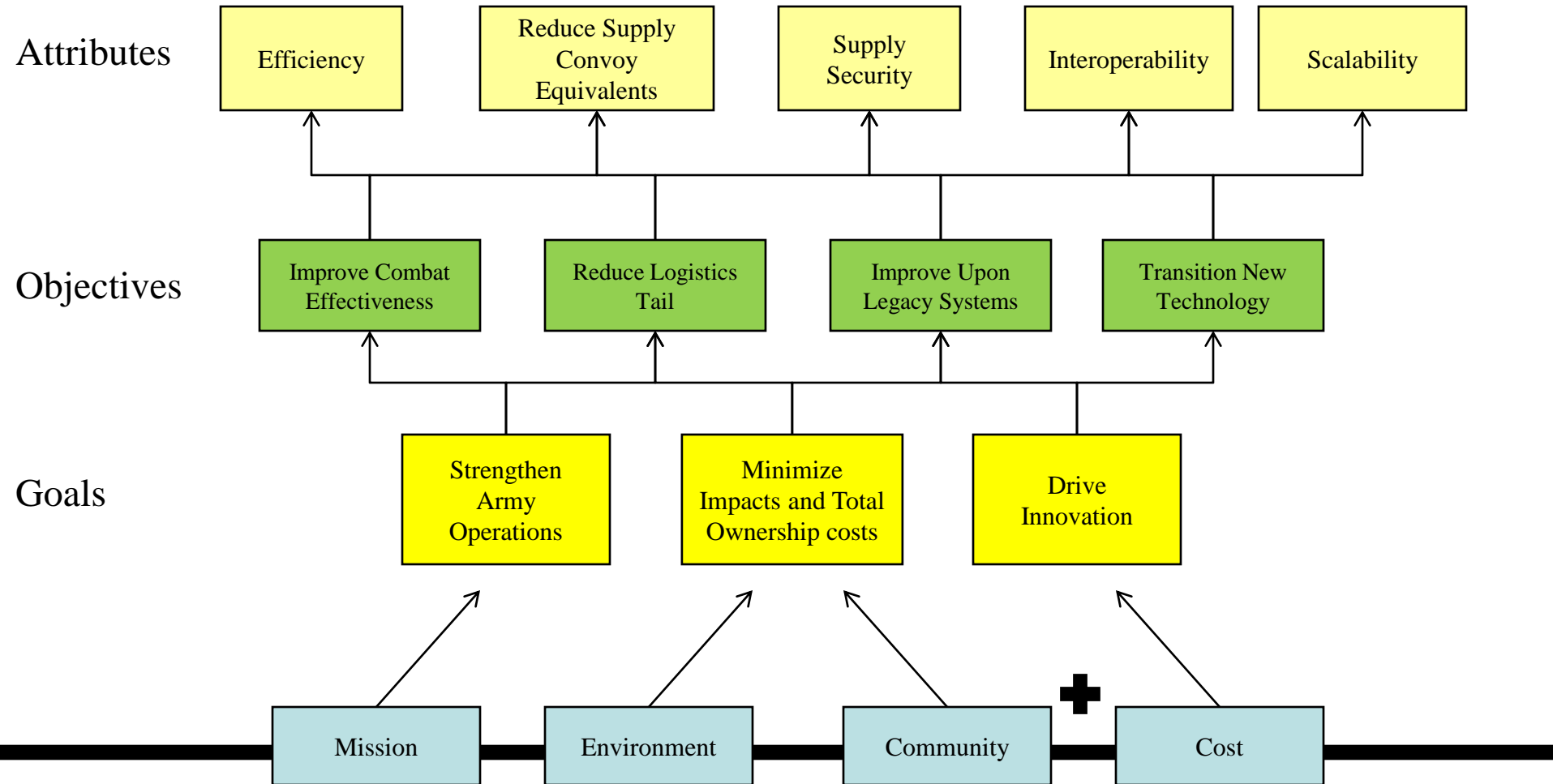


# Identifying Opportunities

- Technology Mining process using concepts mapping yields innovative energy concepts
  - Quickly captures the state of science

Power Management Feature	Concept
Control System Topography	Agent-Based Control:  Central and Distributed Control, Single and Multi-Agent, Supply-side and Load-side control
Control Algorithms	Communication, Control, and Optimization Algorithms
Control Interfaces	Power Conditioning:  Digital Signal Processing for Inverters, Voltage and Frequency control, Bi-directional inversion, Direct Current(DC)/DC converter, Hybrid inversion with Maximum Power Point Tracking
System Security	Artificial Intelligence for Preventive Control Measures

# Sustainability Attributes



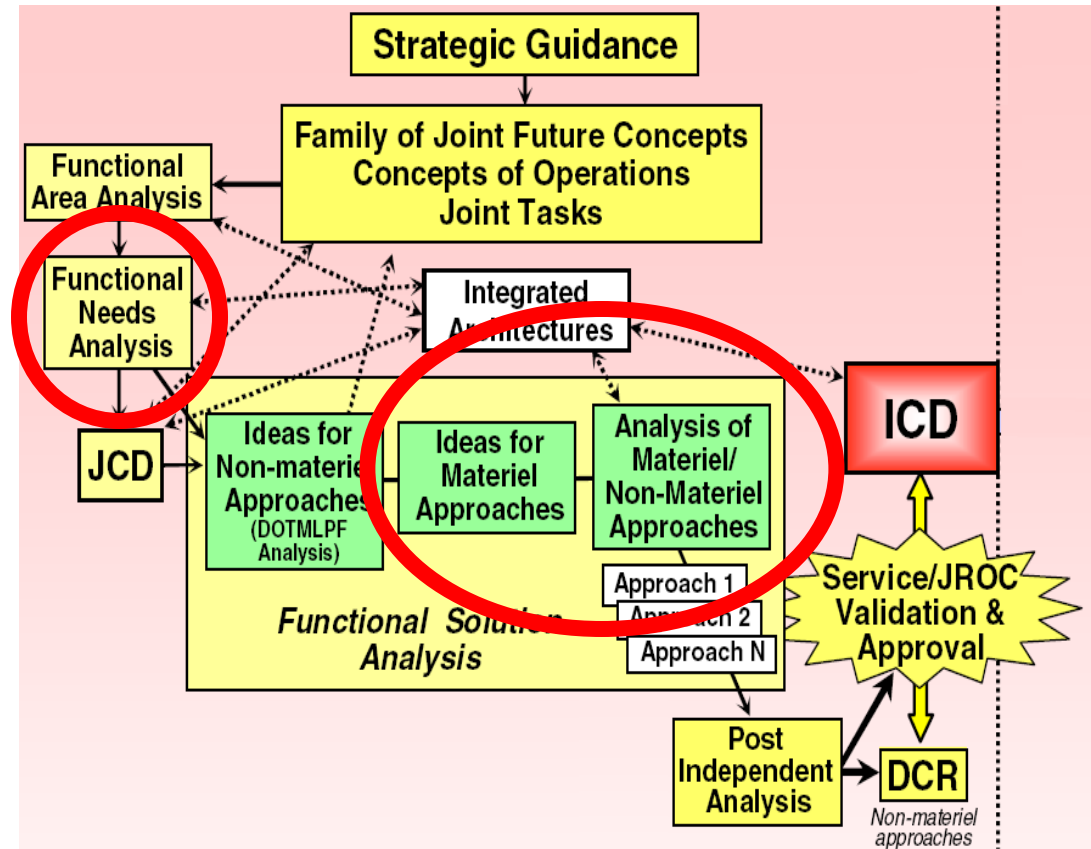
# Investment Strategy

- Work JCIDS process for technology pull
  - Develop Joint Capabilities Document and Initial Capabilities Document
  - Solicit ESOH involvement

# TOA Supports Acquisition Process

- TOA Methodology Supports Capabilities Based Analysis (CBA) portion of JCIDS Process

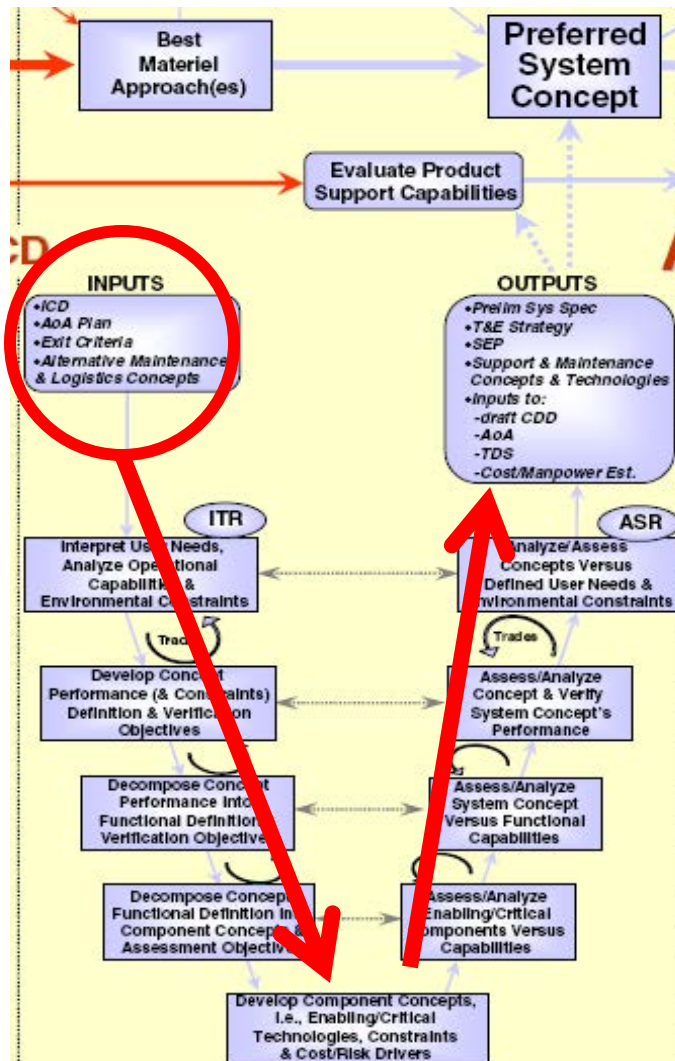
- Joint Capabilities Integration Development System (JCIDS)
- Results support Functional Needs Analysis (FNA) and Functional Solutions Analysis (FSA)
- Establish sustainability criteria early in the process



Source: DoD AT&L Acquisition Community Connection <https://acc.dau.mil/ICF>



# TOA Supports Acquisition Process



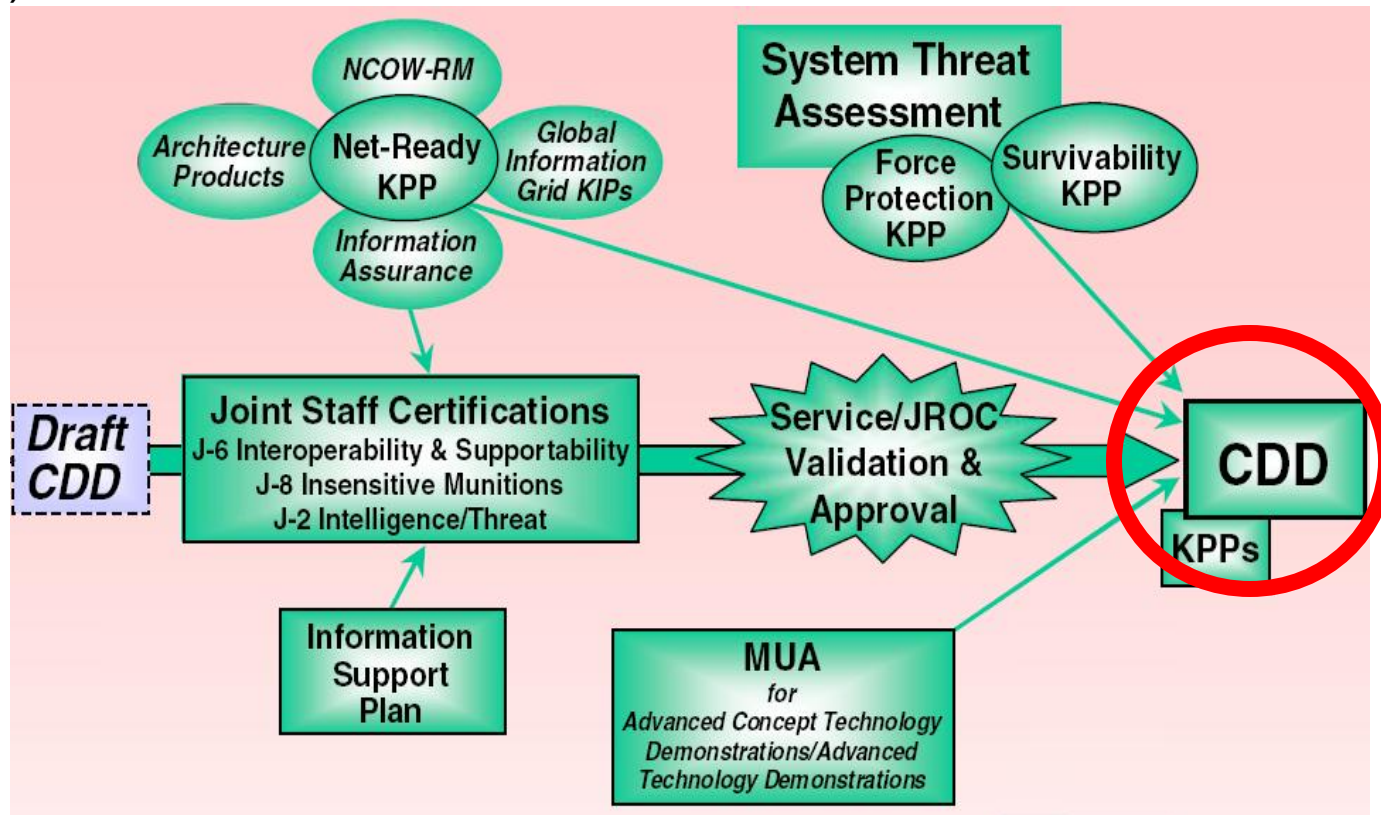
- Defense Acquisition System (DAS) Concept Systems Engineering

- Sustainability/Performance Attributes captured on the front-end of systems engineering process
- Sustainability concepts are inculcated in concept systems engineering

Source: DoD AT&L Acquisition Community Connection <https://acc.dau.mil/ICF>

# TOA Supports Acquisition Process

- The performance attributes of the ICD carry through the process into Capabilities Development Document (CDD) and Key Performance Parameters (KPP)



Source: DoD AT&L Acquisition Community Connection <https://acc.dau.mil/ICF>

# Driving Innovation for Sustainability

- Including sustainability attributes up front can drive innovation for combat systems with less environmental impact.
- Introduce Sustainability Performance Attributes in CBA to be rolled-up into KPPs
- Work within existing Army institutional framework without having to create additional institutional layers for sustainability
- Institutionalize enterprise-wide approach to operationalizing sustainability

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