Department of Defense Sustainability Efforts and Sustainable Technology Evaluation and Demonstration Program

2022 NDIA Systems & Mission Engineering Conference

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Agenda

- **Department of Defense (DoD) Sustainability**
  - Executive Order (E.O.) 14057 Goals
  - Sustainability Plan and Initiatives
- **DoD Adaptive Acquisition Framework (AAF)**
  - ESOH in Acquisition and Sustainability
  - Chemical Regulatory Management
  - Energy
- **DoD Sustainable Technology Evaluation & Demonstration (STED) Program**
  - Outreach and Communications
  - DoD Industry Sustainability Collaboration

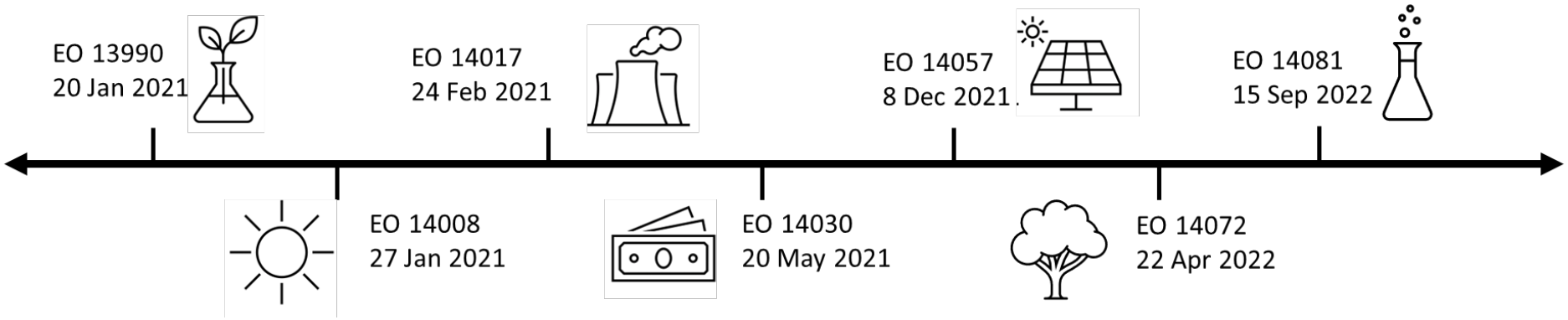
DoD Sustainability

- To successfully execute the DoD mission, our Military Departments must have the energy, land, air, and water resources necessary to train and operate in a world where there is increasing competition for resources.
- The Department pursues sustainability opportunities based on data that make the most compelling case in terms of mission, productivity, and long-term cost performance.

DoD's Sustainability Vision

To maintain the ability to operate into the future without decline either in mission or in the natural and man-made systems that support it.

Sustainability Requirements Span EOs



EO 13990

- Incorporate Social Cost of Greenhouse Gases (SC-GHG) in areas of decision-making, budgeting, and procurement.
- Limit exposure to dangerous chemicals and pesticides;, including to low-income and communities of color.

EO 14008

- Orders climate considerations to be an essential element of United States national security policy.
- Climate crisis requires significant short-term GHG reductions and net-zero emissions by mid-century or before.

EO 14030

- Requires suppliers to (1) disclose greenhouse gas emissions and (2) disclose climate-related financial risk and (3) set science-based reduction targets.
- Orders agencies to consider the SC-GHG in procurement decisions and, where appropriate and feasible, give preference to bids and proposals from suppliers with a lower SC-GHG.

EO 14017

- Agencies required to assess climate risks to the availability, production, or transportation of critical/essential goods.

EO 14057

- Federal Government to lead by example in order to achieve a carbon pollution-free electricity sector by 2035 and net-zero emissions economy-wide by no later than 2050.
- Secure a transition to clean, zero-emission technologies and transform procurement and operations

EO 14072

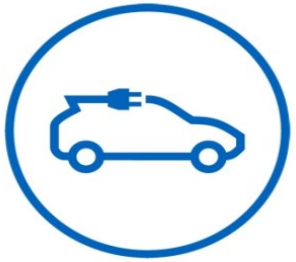
- Develop policies to institutionalize climate-smart management and conservation strategies of forests on Federal lands

EO 14081

- Harness Biotechnology and Biomanufacturing R&D sustainably and increased biobased procurement

EO 14057 Goals

100% Carbon Pollution-Free Electricity by 2030, including 50% on a 24/7 basis



100% Zero-Emission Vehicle Acquisitions by 2035, including 100% light-duty acquisitions by 2027

Net-Zero Emissions Buildings by 2045, including a 50% reduction by 2032

Net-Zero Emissions Procurement by 2050

Net-Zero Emissions Operations by 2050, including a 65% reduction by 2030

Climate Resilient Infrastructure and Operations

Develop a Climate- and Sustainability-Focused Workforce

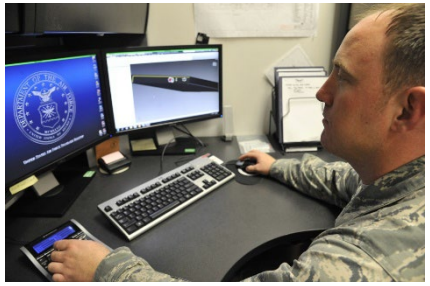
Advance Environmental Justice and Equity-Focused Operations

Accelerate Progress through Domestic and International Partnerships

DoD Sustainability Initiatives

- **Greenhouse Reduction Planning**
  - DoD GHG Reduction Plan
  - Request for Information (RFI) and Sources Sought for DoD acquiring support for DoD Greenhouse Gas (GHG) accounting of emissions disclosures
- **Carbon Pollution-Free Electricity (CFE)**
  - Implementation Pilot Projects
  - CFE Strategic Plan
- **Sustainable Acquisitions**
  - Adaptive Acquisition Framework
  - Update to Sustainability Analysis Guide (SAG)
- **Zero Emission Vehicles (ZEV)**
  - ZEV Strategic Plan
  - Infrastructure led capacity planning
- **Net-Zero Installations**
  - Sustainable Installation Strategic Plan
  - Update Unified Facilities Criteria (UFCs)
- **Net-Zero Procurement**
  - 2 Federal Acquisition Regulations (FAR) Cases:
  - Disclosure of Greenhouse Gas Emissions and Climate-Related Financial Risk
  - Minimizing the Risk of Climate Change in Federal Acquisitions
- **Climate Resilient Infrastructure**
  - Climate Adaptation Plan
- **Environmental Justice**
  - Department-Wide Environmental Justice Strategy

DoD AAF



*The AAF process encompasses the **design, engineering, testing, deployment, sustainment, and disposal** of weapon systems.*

Purpose of Environment, Safety, and Occupational Health (ESOH) in Acquisition

Prevent loss of life or serious injury to personnel

Avoid damage to equipment or facilities

Support the warfighter and DoD's mission

Prevent harm to the environment and surrounding community

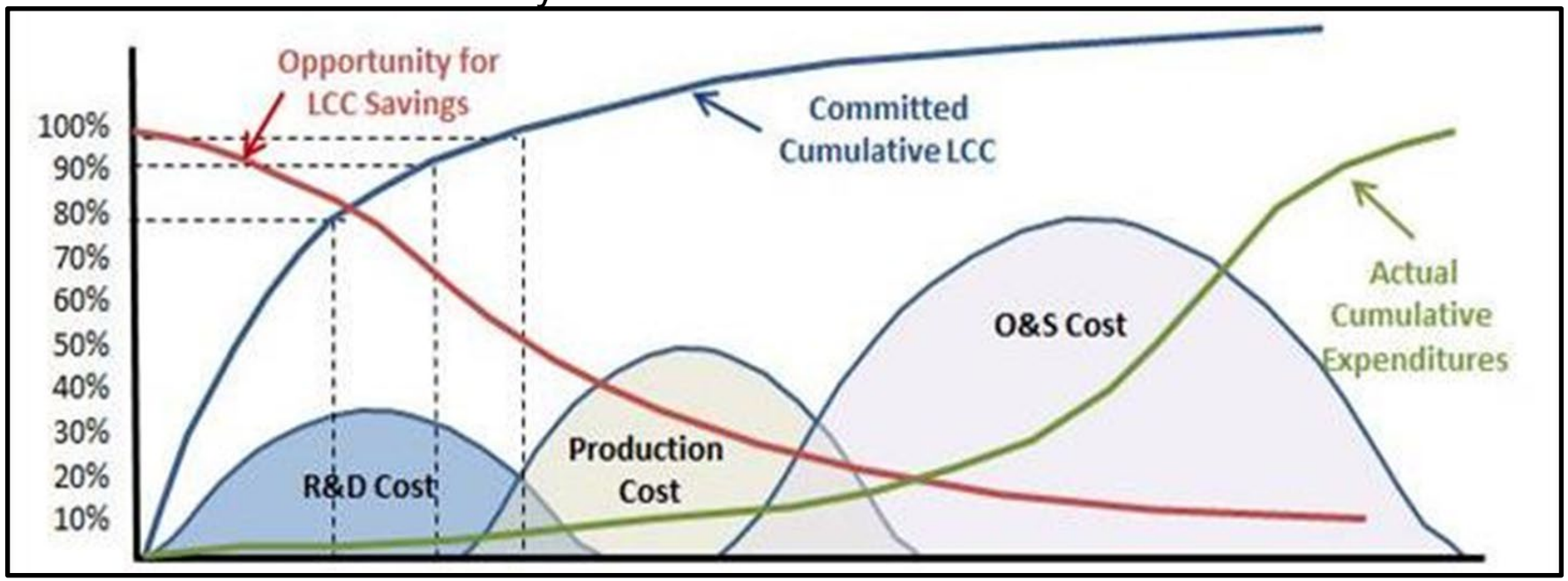
Avoid system failures & malfunctions (mishaps), which impact mission readiness

ESOH and Sustainability Inherent in AAF Process

- **ESOH risk and requirements management and sustainability is integral in systems/specialty engineering and product support processes for the life cycle of the weapon system.**
  - Engineering analyses inform on ESOH and supportability analyses and risk mitigation strategies.
  - A successful program meets sustainment performance requirements and continues to seek cost reductions.
- **SAG provides a full description of how to incorporate sustainability considerations in support of acquisition requirements.**
- **SAG includes traditional "internal" life cycle costs in addition to often-overlooked "external" costs.**
  - Includes the SC-GHG
- **An update to the SAG is in process to align with new DoD policies.**

ESOH and Sustainability Inherent in AAF Process

- This graphic reflects the percentage of the total life cycle costs captured as a function of acquisition phases.
- Smart design choices achieve cost savings, as well as less ESOH statutory compliance and operational/mission/sustainability readiness constraints.



Life Cycle Costs (LCC):
- 80-90% of LCC committed during Research and Development R&D)
- 60-80% of LCC incurred during Operations and Support (O&S)14

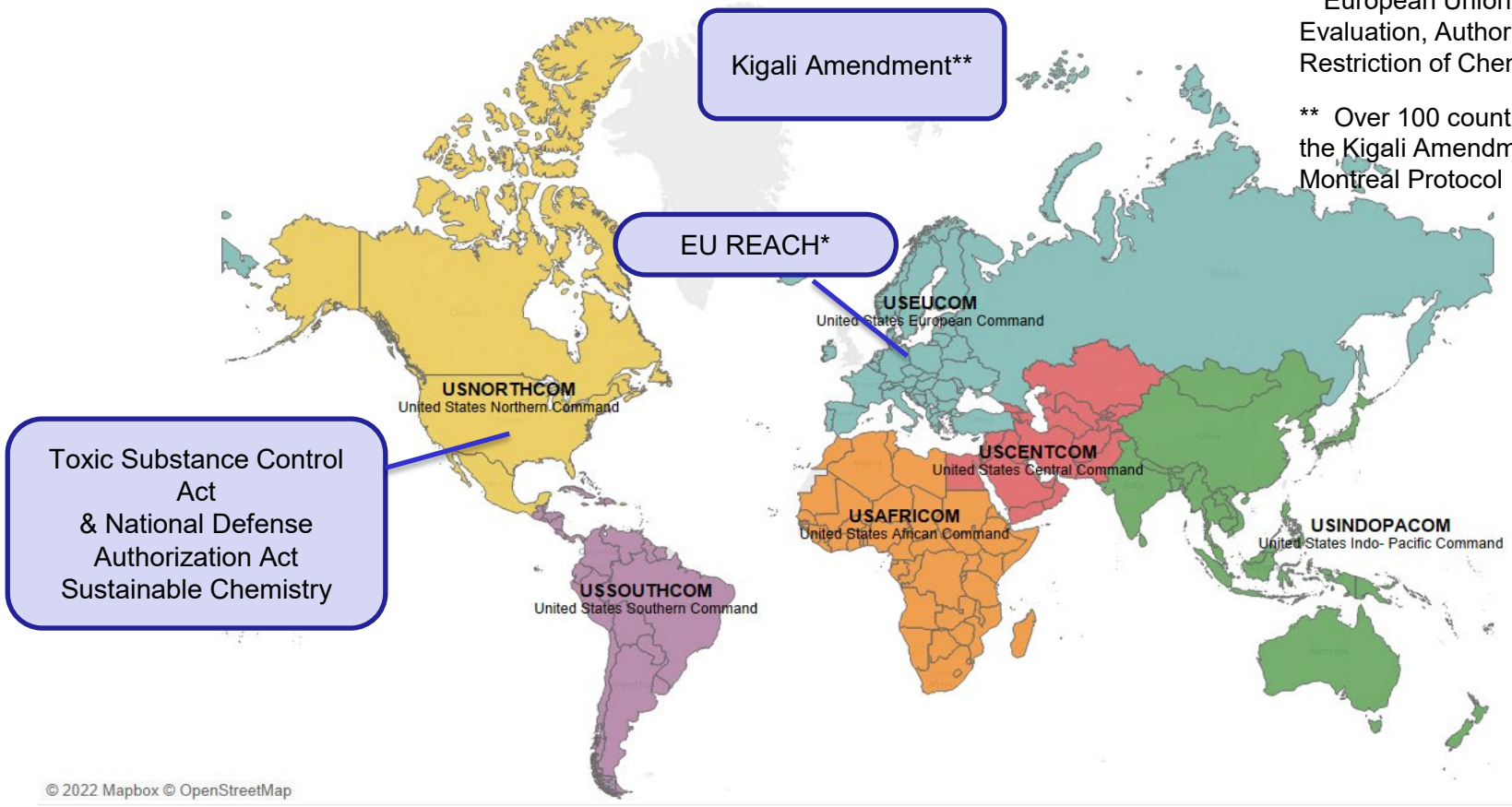
Note: Based on a National Aerospace and Safety Administration Study

Chemical Regulatory Management

Assure availability of natural and man-made resources to enable weapon system and platform capabilities that enhance warfighter lethality.

Availability of vital chemicals & materials needed for production, performance, and sustainment of weapon systems are increasingly at risk.

Global Chemical Management Regulations



* European Union Registration, Evaluation, Authorisation and Restriction of Chemicals

** Over 100 countries have ratified the Kigali Amendment to the Montreal Protocol

A sustainable approach is needed to address increasing regulations that limit DoD's ability to operate/maintain weapon systems globally from restricted access to mission critical chemicals.

Regulatory Example – TSCA/REACH

- **Impacts to F-35 Performance and Maintenance**
  - Chemicals in materials highly regulated under TSCA/REACH resulting in potential availability/usage impacts and need to find viable alternative materials.

Photo credit: Lockheed Martin Photo by Chad Bellay
https://www.f35.com/media/photos-detail/f-35-fires-first-aim-9x-missile

- **1-Methyl-2-pyrrolidone CAS 872-50-4**
  - Urethane Topcoat Coating Throughout Aircraft
  - Stripper on Radome
- **Dibutyl phthalate (DPB)**
  - Ejection Seat Cartridges
- **Formaldehyde (Methylene glycol) 50-00-0**
  - Hazardous Materials Management Program Restricted
  - Composite Structures: Adhesive, Film
  - Fuel Tank Sealant
  - Polysulfide Sealant Throughout Aircraft
  - Engine Residual From Dry Film Lubricant, Epoxy Compound
  - Found In Sixteen Safety Data Sheets Used By United States Air Force Maintainers

Source: F-35 EHS Lead, Materials and Processes Principal Engineer, Lockheed Martin Aerospace

Regulatory Example – American Innovation and Manufacturing (AIM) Act

- **AIM Act Overview:**
  - Enacted by Congress in 2020
  - Phases down Hydrofluorocarbon (HFC) consumption and production by 85% across the United States by 2036 based on global warming potential
  - Includes distribution of ‘allowances’ for production and consumption

HFC PHASEDOWN
American Innovation & Manufacturing (AIM) Act
A U.S. Environmental Protection Agency Program

- **Mission Critical Military End Use (MCMEU) Allowances**
  - DoD partnered with United States Environmental Protection Agency to distribute MCMEU allowances
  - DoD conducts an annual inventory of uses across the Department and the defense industrial base to determine/justify quantity of allowances

Energy in AAF Process

- **Energy is a key performance parameter that must be considered as part of the weapon system design and in sustainment.**
  - Demand is increasing for fuel and power by air, sea, and land forces.
  - Operational risks increasing with logistics/sustainment targeted by adversaries.
- **The Deputy Secretary of Defense directed DoD in April 2022 to increase energy supportability and reduce energy demand across all capability solutions.**
- **An initial review of energy demand and supportability conducted in Major Capability Acquisition, Middle Tier of Acquisition, and Technology Development programs.**
  - Evaluation of approximately 60 acquisition programs
  - Complete review by end of Calendar Year 2022

Energy in AAF Process (Cont.)

- **Initial Insights of Review to Date:**
  - Systemic approached needed
  - Difficulty in addressing energy in requirements and acquisition (e.g., demand and supportability not consistently assessed)
  - Life cycle approach needed (e.g., establish energy requirements and continue to shape downstream capabilities to include feedback loops across processes)
  - Embedding energy demand reduction and supportability analytics capability and capacity problematic
  - Revamp/adaptation of policies, guidance, and reporting needed

Energy performance is an important component in advancing capabilities to achieve the national defense mission and reducing emissions.

DoD Sustainable Procurement

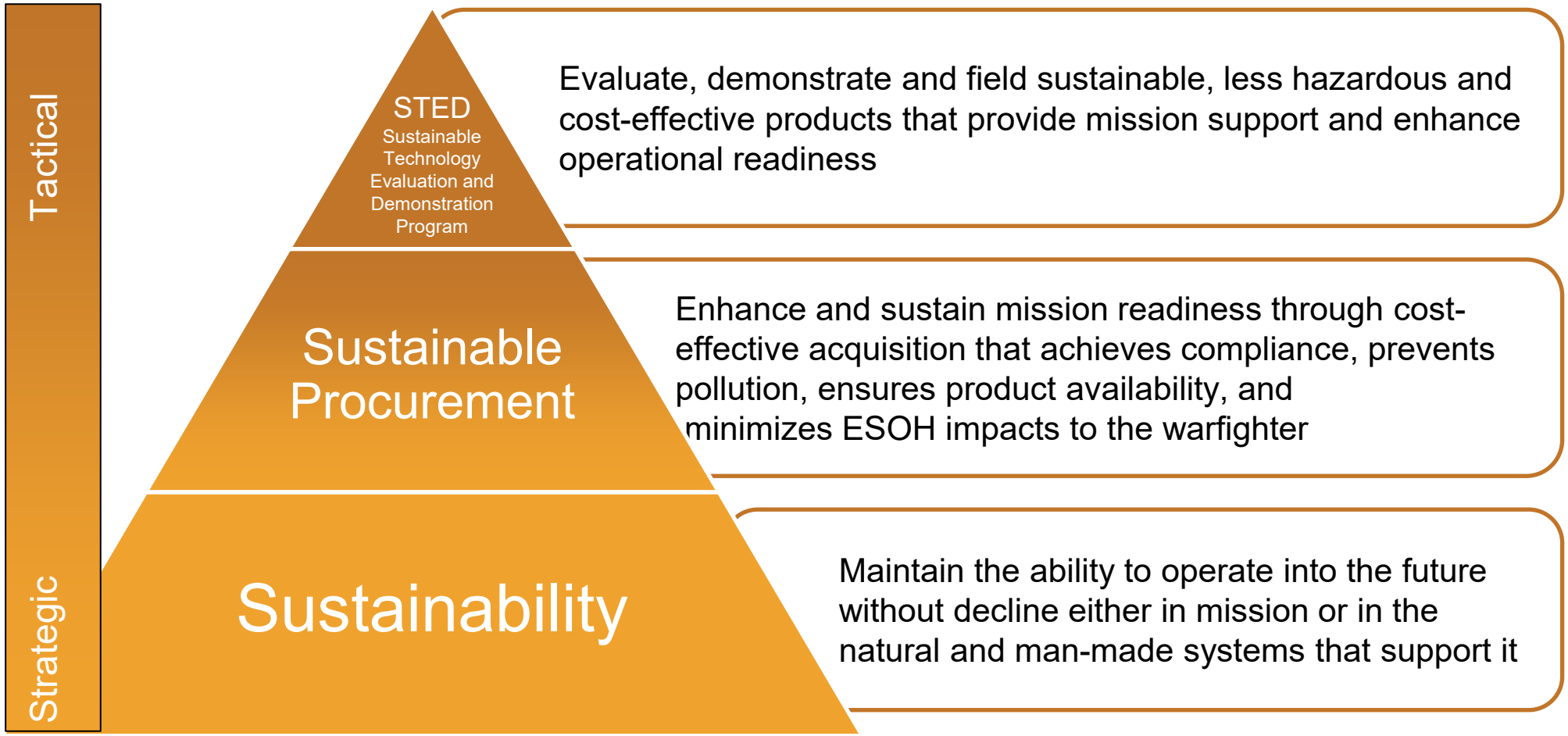
- DoD spends more than $439 billion (Fiscal Year 2020) on goods and services; the most of any Federal agency

- Both Congress and the President have directed Federal agencies to use their purchasing power to expand market offerings and standardize the use of sustainable products and services

- Can meet this requirement while also supporting and enhancing the mission

DoD Sustainable Procurement (Cont.)

- Initiatives include:



DoD STED Program

- **Established To:**
  - Identify and demonstrate sustainable alternatives to government requirements with end users at DoD installations
  - Validate performance and cost effectiveness
  - Increase awareness and use of sustainable alternatives across the Federal Government
- **Benefits:**
  - Mission performance
  - Price versus Cost over life cycle – better value
  - Material availability
  - Reduced health and environmental impacts

Biobased Hydraulic Fluid Demonstration
MCMWTC

Biobased Sorbent Demonstration
MCAGCC 29 Palms

DoD STED Program Demonstrations

Ongoing Demonstrations

- Biobased Sorbents
- Biobased Cleaner, Lubricant and Preservative (CLP) for Weapons
- Biobased Rifle Bore Cleaners
- Biobased Brake Cleaners
- Biobased Multipurpose Lubricants
- Biobased Corrosion Inhibitors
- Hand-Held Laser Depainting
- Biobased Tires
- Biobased Dust Suppressants
- Portable On-Demand Hypochlorous Acid Disinfectant Cleaners
- Energy-Efficient Building Access Controls
- Energy Efficient Doors
- LED Chem Light Alternatives
- Safer Choice Sidewalk Deicers
- PFAS Free Disposable Food Service Ware

Completed Demonstrations

- Biobased Motor Oils
- Biobased Greases
- Biobased Traffic and Road Marking Paints

Biobased CLP Demonstration

Technology Description

Biobased Cleaner, Lubricant, and Preservative (CLP) for weapons and weapons systems qualified to MIL-PRF-63460 Type B and listed on Qualified Products List (QPL).

Potential Impact

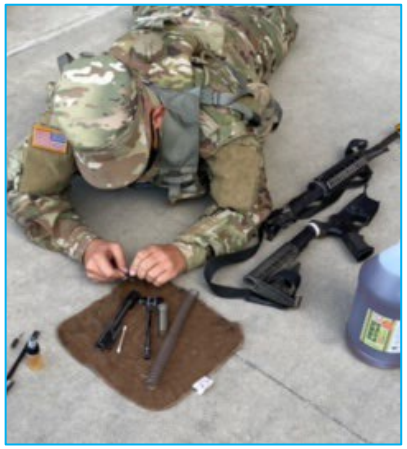
- Weapons stay lubricated longer and maintain rate of fire with less CLP required per application - reduces amount of CLP used and frequency of lubrication by 35%.
- Improve carbon removal and decrease buildup - reduces cleaning time by 30%.
- Reduce waste generation from cleaning processes by 30%.
- Reduce smoke – tactical advantage and operator health benefit.
- Low odor – improved cleaning room environment and operator health benefit.
- Increase confidence in weapon reliability.

Benefits

- Improves cleaning and operation.
- Replaces petroleum-based CLP currently used at installations.
- U.S. Department of Agriculture (USDA) BioPreferred Certified Product manufactured in USA.

Demonstration Sites

- Ft. Jackson
- Ft. Benning
- ANAD
- JBLM
- Edwards AFB
- NASA WSTF
- NASA AFRC



Ft. Jackson Basic Combat Training (BCT)

Outreach & Communications: Installation Sustainability Expos

- **Expos bring sustainable product manufacturers/vendors to Installations and educate stakeholders about the STED Program**
- **Benefits:**
  - Identify installation needs and requirements, expand relationships and stimulate future sustainable technology demonstrations
  - Connect installation personnel to sustainable technologies, unique to STED
  - Build partnerships with regional agencies and surrounding communities
  - Train installation personnel on sustainable procurement requirements and how sustainable products/services support the mission

Mojave Desert Region DoD Sustainability Expo and Workshop – July 2022

Summary

- **DoD sustainability initiatives strive to:**
  - Ensure resilience and mission capabilities
  - Improve operational performance
  - Enhance environmental security
- **ESOH and Sustainability in DoD acquisition process critical to:**
  - Reduce personnel exposure risks
  - Ensure availability of chemicals/materials to operate/maintain weapons systems
  - Meet energy demands in operational challenged environments
- **The DoD STED Program:**
  - Validates that sustainable technologies can meet DoD performance requirements in the field
  - Provides viable sustainable alternative opportunities to end users, increasing use across the Department and Federal Agencies
  - Supports Federal Acquisition Regulations, E.O.s, and high priority Administration goals

"When we operate more sustainably, we become more logistically agile and ready to respond to crises."

SECDEF Statement for the Leaders Summit on Climate, 22 April 2021

Contacts

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Questions?