

Topic 6: Environmentally Sustainable Energetic Materials and Manufacturing Processes

Objective

Demonstration projects are sought to address the current and future environmental and occupational health issues/liabilities associated with the manufacture and use of Department of Defense (DoD) weapons systems containing energetic materials. Proposals can address any aspect of energetic materials and manufacturing at any point in their lifecycle except demilitarization, and can include demonstration of alternative materials, or demonstration of alternative manufacturing processes for new or existing materials. Proposed projects must focus on modification of existing systems and processes to meet current requirements. Proposals that would require redesign of a munition or other end product will not be considered. A clear transition path must be identified and priority will be given to those proposals for which an end-user has endorsed the project and has committed to implementation upon completion.

Background

An assessment conducted by DoD in 2009 highlighted the need for demonstration projects to bring environmentally-focused energetics-related materials and processes developed under research and development projects to a high enough level of maturity such that implementation would be pursued by the acquisition community. The assessment highlighted several areas of concern in the use of hazardous materials, including the potential for contamination on ranges, and generation of waste in manufacturing. Specific materials and processes highlighted in the assessment include use of lead, lead compounds, cyclotrimethylenetrinitramine (RDX), ammonium & potassium perchlorate, and monomethyl hydrazine; and production processes for 2,4,6-trinitrotoluene (TNT), 2,4-dinitroanisole (DNAN), bis (2,2-dinitropropyl) acetal/formal (BDNPA/F) and nitrate esters. Demonstration projects can address any of these or other well known environmental issues associated with the production and use of energetic materials.

Proposals must state how, by the end of the project, a technology demonstration will have been performed on the system to prove that it can meet the performance requirements set for that specific system. For example, a gun propellant should be successfully demonstrated in the actual gun system using an optimized primer/ignition system, achieving the required muzzle velocity at acceptable pressures required for that gun system, and with predicted gun barrel wear and erosion no worse than what is currently used. In this case, barrel heat input and wear can be demonstrated by modeling using empirical heat and pressure data developed during the project.

In addition, for energetic materials to achieve the required level of maturity, they should have been tested after having been conditioned at hot, cold and ambient temperatures. Reaction of the munition to insensitive munitions tests should be the same or better than current systems (in some cases, subscale tests are acceptable) for slow and fast cook-off, and bullet and fragment impact threats. Interim Hazard Classification (IHC) tests should be completed and passed for the energetic material at a minimum, preferably for the entire system.

The demonstration of alternative manufacturing processes for energetic materials currently in production that would reduce or eliminate the release of hazardous emissions into the environment and/or reduce impacts on worker safety and occupational health would also be appropriate under this solicitation. Proof-of-principle and small-scale operation for the alternative processes should have already been achieved prior to start of the project.

By the end of the project, the alternative energetic material or process must have been produced or demonstrated in production-scale batches at a government or commercial manufacturing facility, and have been loaded and demonstrated in the relevant system. In some cases, such as primary explosives, they must be made in milligram quantities. For others, such as propellants, they must be made in quantities of hundreds of pounds. In the proposal, the anticipated manufacturing level of maturity to be achieved by the end of the project must be indicated and the criteria used for measuring the level of maturity must be described.

ESTCP has supported the development and demonstration of a number of technologies associated with energetic materials and munitions. Proposers should be familiar with completed and ongoing projects in order to avoid duplication of previous efforts. ESTCP project descriptions are available at: <http://www.serdp-estcp.org/Program-Areas/Weapons-Systems-and-Platforms/Energetic-Materials-and-Munitions>.

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