SON Number: WPSON-20-C5 **25 October2018**

Strategic Environmental Research and Development Program (SERDP)

FY 2020 STATEMENT OF NEED

Weapons Systems and Platforms (WP) Program Area

DEVELOPMENT OF NEW APPROACHES FOR DEMILITARIZATION OF CONVENTIONAL MILITARY MUNITIONS

1. Objective of Proposed Work

The objective of this Statement of Need (SON) is to develop new, innovative and environmentally friendly approaches for demilitarization of a variety of excess, obsolete, or unserviceable munitions that currently do not have an identified demilitarization capability or that rely on open burn (OB) and open detonation (OD) disposal methods.

The goal is to develop cost effective and environmentally sustainable processing techniques that address all components of a munitions item for the purpose of eliminating military usefulness while minimizing processing waste and reducing environmental impact. Production of energy or other value added products that improves cost effectiveness or results in other significant advantages could provide a secondary benefit.

Proposals are specifically requested for:

- whole item solution (disassembly and disposal) for mixed munition types (omnivorous treatment),
- disposition of bulk insensitive melt pour explosives from munitions,
- facilitated removal and disposal of cast cured explosives,
- demilitarization of pyrotechnic and illumination rounds, countermeasure flares, riot control agents, smoke producing munitions and munitions containing hexachloroethane (HC) as the primary fill (as well as bulk HC).

Proposals that offer modest extension of existing and fielded technologies are not appropriate for this SON. Recycling and reuse of energetic components of munitions for military purposes is outside the scope of this SON.

Proposals must include a go/no go task for an initial assessment of the human health and environmental impacts of proposed ingredients, formulations, and byproducts. In addition, proposals should include a task to establish a baseline lifecycle framework and identify the elements of a lifecycle inventory that are already known, those that will be investigated during the course of the project, and those that are beyond the scope of the proposed work.

2. Expected Benefits of Proposed Work

Demilitarization of excess, obsolete, or unserviceable munitions is expected to irreversibly remove the functional capabilities of military munitions to prevent items from being used for their intended purpose. This end-of-life phase of the munitions lifecycle includes environmentally compliant disposal of demilitarized by-products.

There are currently over 7,600 unique items and a total mass of about 400,000 tons of munitions awaiting demilitarization in what is tracked as a "demil stockpile." Research for this SON is expected to help reduce the size of the demil stockpile by filling capability gaps, increasing processing efficiencies, and reducing costs while also reducing the use of OB and OD disposal solutions.

3. Background

The U.S. Army has significantly invested in demilitarization technologies of conventional ammunition for the purpose of reducing the size of the demil stockpile. Conventional ammunition is defined in DoDD 5160.65 as an end item, complete round or materiel component charged with explosives, propellants, pyrotechnics, or initiating composition. It does not include chemical, biological, or nuclear munitions.

The demil stockpile contains approximately 400,000 tons of ammunition and about 27,000 tons of missiles. The focus of demil technology development has recently been on the top 400 items that combined, represent approximately 85% by weight of the total stockpile.

Demil technologies designed for single types of munitions present in large quantities are generally cost effective when evaluated on a cost per ton basis. This is not the case, however, for munitions present in small quantities. Unfortunately, most of the demil stockpile (by quantity) is represented by relatively small amounts of a wide variety of munitions. A single "omnivorous" system for a variety of whole munitions is needed to provide a cost effective, environmentally friendly alternative to OB and OD of these items. Whole item demilitarization traditionally includes unpacking the munitions (and disposal of dunnage), fuze removal (if present), disassembly to separate metal, explosives and propellant followed by disposal or recycling of components. Static detonation chambers and incinerators have been used for omnivorous disposal; however, throughput can be slow, resulting in high operating cost.

Future munitions containing insensitive high explosives (IHE), particularly those that are cast cured, is an emerging concern where an acceptable demil process does not currently exist. Current disposal methods for high explosives (HE) often rely on OD or recovery by melt-out and re-use as a donor charge material for OD. Historically, the U.S. military has preferred not to use recycled energetics in military weapons due to concerns over quality, stability of supply, and the cost and time to requalify the recovered energetic material. Insensitive high explosives, by design, are not good candidates for donor charges and reduced reliance on OB/OD projects a future capability gap for demilitarization. The explosive IMX 101, for example, is a qualified insensitive munition under NATO STANAG. The IMX formulation uses the melt cast ingredient 2,4-dinitroanisole (DNAN) together with nitroguanidine (NQ) and 3-nitro-1,2,4-triazol-5-one (NTO) as a substitute for TNT. Although studies have been conducted to evaluate physical, chemical and biological treatment of

soluble IMX constituents, innovative technologies for removal, collection and destruction of bulk quantities of IHE are needed for high throughput, cost effective destruction.

New explosive formulations that improve power and performance while maintaining insensitive characteristics are emerging for use in future weapons. These explosives may contain cast-cured polymers that can be extracted using high pressure washout techniques. However, these methods produce excessive amounts of wastewater and are not practical for small items. Novel approaches that predispose the weapon for explosive removal or whole system demilitarization, that utilize reversible cure chemistries to facilitate removal of explosives from small items and reduce waste water production, are needed to assure end-of-life technology options are available in the future.

Capability gaps exist for environmentally friendly, safe and cost effective demilitarization of pyrotechnics and illumination rounds, riot control agents, smoke producing munitions and munitions containing HC as bulk and primary fill. Omnivorous demilitarization in closed systems or platform technology that can be expanded or are designed to meet specific demil needs of each family of items do not currently exist. The family of riot control agents or munitions in the demil stockpile includes a variety of items that contain lacrimatory or irritating agents. Common fillers are tear gas, mace or pepper gas. Pyrotechnics, includes a variety of ammunition types used for illumination marking spotting, signaling, simulating or tracing. Typical items are ground, aircraft or marine illumination signal stars, photo flash cartridges, personnel distress kits, and air/ground burst simulators.

4. Cost and Duration of Proposed Work

The cost and time to meet the requirements of this SON are at the discretion of the proposer. Two options are available:

Standard Proposals: These proposals describe a complete research effort. The proposer should incorporate the appropriate time, schedule, and cost requirements to accomplish the scope of work proposed. SERDP projects normally run from two to five years in length and vary considerably in cost consistent with the scope of the effort. It is expected that most proposals will fall into this category.

Limited Scope Proposals: Proposers with innovative approaches to the SON that entail high technical risk or have minimal supporting data may submit a Limited Scope Proposal for funding up to $200,000 and approximately one year in duration. Such proposals may be eligible for follow-on funding if they result in a successful initial project. The objective of these proposals should be to acquire the data necessary to demonstrate proof-of-concept or reduction of risk that will lead to development of a future Standard Proposal. Proposers should submit Limited Scope Proposals in accordance with the SERDP Core Solicitation instructions and deadlines.

5. Point of Contact

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For Core proposal submission due dates, instructions, and additional solicitation information, visit the SERDP website.