OPERATIONAL REQUIREMENTS DOCUMENT

Water Purification System

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1. General Description of Operational Capability

Water is a basic necessity for human life. In the event of a natural disaster or terrorist attack, the ability to quickly deliver potable water to communities is of critical importance.

With a cost-effective and ergonomic purification system on-site, government agencies, emergency management professionals and first responder teams can curb the all-too-often costly and polluting practice of trucking water into affected areas, not to mention eliminating or greatly reducing the burden of having to dispose of many thousands of discarded water bottles and other trash.

The operational capability described in this operational requirements document (ORD) will provide users with a self-contained, self-fueling water pumping and purification system that can be deployed and operated in less than thirty minutes after transport to a site by truck, helicopter or boat. Units shall be operated without specialized training wherever the need for potable water or water displacement arises. A proposed system shall provide an affordable, high-quality, easy-to-use option utilizing reliable technology at significant cost savings over the current methods providing potable water to users in need.

1.1. Capability Gap

The conventional method of providing potable water in the wake of a disaster is often costly and logistically complex. Normally, potable water is distributed to communities by trucking in bottled water or using diesel generator purification systems.

Any proposed system must eliminate many points of failure by presenting a stand-alone design allowing for flexible transport of the unit by air, land or water bringing a cost-effective, high-yield water purification capability to potential users incorporating a self-generating power source.

1.2. Overall Mission Area Description

The provision of potable water to communities affected either by natural disasters or terrorist events is understandably a top priority for first responders, emergency management authorities at all levels of government concerned with short and medium term disaster response and relief efforts.

Any proposed system shall provide a stand-alone potable water resource to federal, state, local and tribal preparedness and/or response teams and emergency management professionals. A proposed system shall be transportable using a variety of options (by air, land and/or water) even in the most adverse conditions. A proposed system shall be easy-to-deploy, easy-to-use, and shall produce potable water from even polluted sources.

Any proposed system shall be low cost, low maintenance, providing high quality and high yield output. A system shall primarily be used to pump and purify water for public consumption with ancillary benefits such as self-generating power to operate its pumps as well as provide DC and AC load centers into which other critical equipment could be plugged in and engaged. This is especially required in

areas that have been devastated by a natural disaster or terrorist event where infrastructure, electrical, transportation and water resources have been compromised.

1.3. Description of the Proposed Product or System

A proposed system shall be a self-contained, self powered water purification system contained in as small as possible foot-print. The system shall be deployed to any site where there is level ground using forklift, helicopter, truck or boat and shall easily fit into any shipping container. No special training shall be required to operate a proposed system, and a system shall be operable, pumping and purifying water and supplying electricity in less than 30 minutes after arrival on site. A proposed system shall eliminate particles and render biological pathogens inert. A multi-thousand gallon collapsible storage tank shall come standard with each unit, storing water so it is available when needed by first responders and community members. A proposed system shall contain an internal battery bank (or equivalent) so that the system can operate 24/7 and can also provide electricity to run generators, lights, tools or other command station equipment.

1.4. Supporting Analysis

Countless requests from members of the first responder community know that such kinds of systems have been used effectively in other applications in other venues.

1.5. Mission the Proposed System Will Accomplish

Any proposed system shall provide readily-deployable, high quality, high yield water purification to disaster-affected communities at a low cost. Any proposed system shall eliminate any and all problems associated with bottled water or more cumbersome fuel alternatives often used to provide potable water. The proposed system shall be easily deployable and operational in a self-contained, self-generating powered platform eliminating the need to supply additional fuel. With the capability of 24/7 operation, potable water needs to be readily available at a site, when and where it is most needed, at a low cost with no pollution. Ancillary power available to operate lights, computers, satellite communications modules and other equipment is also required.

1.6. Operational and Support Concept

1.6.1. Concept of Operations

A proposed system may be deployed after a disaster event to affected areas to purify contaminated water sources or may be transported to a site where it is likely to be needed before the occurrence of a natural event. For instance, if it is likely a hurricane will make landfall in a particular area, a proposed system shall possess the ability to be pre-positioned. A proposed system shall be able to withstand commonly occurring weather conditions without additional hardening or protection. A system safety plan shall be provided for necessary precautions to protect a proposed system from weather disasters such as tornados, hurricanes, etc.

Emergency response teams making use of the system shall identify areas requiring water purification based on local procedures, emergency response plans and readiness of a water source, including identification of specific deployment locations. Water test kits shall be provided with each unit, and additional kits shall be made available at a low price from the vendor to test pre- and post-filtration water quality.

Operation roles in the field will be determined by local procedures and emergency response plans. A comprehensive, easy-to-understand training manual shall be included with each unit describing the procedures to deploy and operate a system. In the event a more in-depth training session is required, a provider shall host tailored training sessions. A system provider shall provide telephone, email and on-site assistance plans, as necessary.

Any proposed system shall be capable of utilizing other power sources such as grid or generator, when available, as a “back up” to its self-generating power. Power generated by the unit is used to pump and purify water and can also be used to power ancillary tools, lights and communication systems.

A system shall be self-contained and self-powered.

1.6.2. Support Concept

Any system shall support easy installation and maintenance without the general need for specialized training. Maintenance requirements shall be minimal.

Maintenance and operation roles in the field will be conducted by personnel using local procedures and emergency response plans. A comprehensive operations manual shall be provided with each unit describing when routine maintenance is required and the procedures required to maintain a given system. In the event a more in-depth training session is requested, the vendor hosts regular training sessions. Any supplier shall provide on-site assistance plans as well as telephone and email troubleshooting assistance.

Any system consumables shall be available for up to seven years after original system purchase.

2. Threat

Contaminated water poses a significant health risk to exposed individuals. Exposure to contaminated water can result in sickness and death.

Water infrastructure represents a potential terrorist target. Having in place a system ready to deploy to an affected area a high yield (≥ 30,000 gallons from freshwater sources) of purified water is critical to necessary preparation for providing potable water to communities.

Additionally, water sources are often contaminated during a natural disaster. Hurricane events along the U.S. Gulf Coast, including Hurricane Katrina (2005) and Hurricane Gustav (2008) regularly impact water resources adversely, leaving communities without access to sanitary water. Other natural disasters have caused similar devastation to communities by contaminating water supplies including the 2004 Indian Ocean Tsunami and the earthquake in Sichuan, China (2008).

3. Existing System Shortfalls

The current methods of providing potable water in the wake of a disaster can be both costly and logistically complex. Current methods of distributing potable water to communities is trucking in bottled water or using diesel generator purification systems. The shortfalls in these approaches can include the high cost and logistical considerations of buying and transporting fuel and buying and transporting bottled water, as well as disposal costs of used bottles. These traditional approaches require roads and bridges to be passable in order to transport the goods, and also require ongoing monetary outlay to purchase fuel, transport the goods and personnel to oversee and fuel generators. A proposed system shall utilize technology to significantly reduce logistical considerations inherent in the provision of potable water where clean water is unavailable and also offer significant cost savings.

For example, hurricane, tornado, earthquake and other disaster response plans have typically provided bottled water to affected communities with potential ongoing difficulties, including:

- sourcing water vendors.
- costly contracts to purchase bottled water and transportation services.
- fluctuating cost of fuel, making budget planning difficult.
- diluted distribution system which can be difficult to oversee and ensure quality of service delivery.
- unreliable roads and other infrastructure needed to deliver the bottled water.
- unreliable delivery dates presenting the possibility of no potable water to distribute.
- costly disposal of discarded water bottles and the resulting increase of waste diverted to landfills and/or costs associated with the recycling of discarded bottles.

Diesel-only generator purification systems can present similar difficulties in terms of high cost, the necessity of having a readily available and cheap source of fuel and an easy, cost effective means of regularly transporting the fuel to an affected site.

In summary, conventional methods of delivering potable water after a disaster rely on three uncontrollable factors:

(1) the identification and ability of a source to supply bottled water or generator fuel,
(2) the availability of fuel to transport goods,
(3) an intact transportation infrastructure network to get the goods to an affected site.

These three points of potential failure in more typical approaches are present throughout the duration of a disaster response. Any proposed system shall eliminate these potential points of failure by presenting a stand-alone design allowing for flexible transport of the unit by air, land and/or water bringing high-yield water purification to an affected site and using self-generating power capabilities thus eliminating the need for only external fuel sources for operation.

Current methods present a threat of interrupted service when any one of these factors fails at anytime during the short and medium term of disaster response, leaving communities without life-saving water for undefined periods of time. Current methods rely on functional transportation networks to move bottled water or diesel generator fuel to the site. The transport of these goods can be costly as is often the purchase of goods (i.e. the bottled waters). Costs associated with the disposal of bottled water containers is another potential shortcoming of this type of approach.

Capabilities needed to address this gap include utilization of a stand-alone water purification system on-site that does not require external fuel sources alone. It is also important that the technology be initially transportable to the site using a variety of transportation methods in order to mitigate impassable roads and bridges. This ensures that potable water is being delivered to affected communities without interruption of service.

4. Capabilities Required

4.1. Operational Performance Parameters (T: Threshold/ O: Objective)

- Each system unit will weigh no more than 8,000 pounds (T) and ≤ 5,000 pounds (O).
- Stowed, the units are no more than 10x10x10 foot cube (T), 5x5x5 foot cube (O).
- Each unit will have a total capacity of ≥ 3000 watts (T), ≥ 4,000 watts (O) when fully operational.
- Grid power connection to allow for trickle charging during long-term indoor storage (T)/(O).
- Ability to run additional equipment from 120VAC and 12 VDC plugs (T), 120VAC or 220VAC and 12 VDC plugs (O).
- A system shall pump and purify an average of ≥ 20 gallons per minute (GPM) (T), ≥ 30 gallons per minute (O) from freshwater surface or shallow well sources when fully operational. Capabilities to purify saltwater and brackish water sources shall also be available.

4.2. Key Performance Parameters (KPPs)

- Easily transportable to the site using truck (and trailer,) international shipping container, boat, helicopter and/or forklift (T)/(O).
- Easy to use with limited training (T), after review of operation manual (O).
- Each unit is self-powered (T)/(O).
- A system shall pump and purify an average of ≥ 20 gallons per minute (GPM) (T), ≥ 30 gallons per minute (O) from freshwater surface or shallow well

sources when fully operational. Capabilities to purify saltwater and brackish water sources shall also be available.
- Filtration process without using chemicals to purify water (T), providing redundancy for safety and uninterrupted water purification output, without using chemicals to purify water (O).
- Water filtered by a system must meet the standards for Drinking Water Quality set forth by the Environmental Protection Agency (EPA), and provisions of the Safe Drinking Water Act of 1974 and all subsequent amendments (T)/(O).

4.3 System Performance.

4.3.1 Mission Scenarios

Any proposed system shall work in defined harsh environments and represent a tool for emergency management professionals and disaster relief teams. Any proposed system shall be self-contained, easily transportable and easy-to-use system that purifies contaminated water at the source, at a low cost while providing the added benefits of being self powered, and providing ancillary power to operate additional AC and DC machinery.

4.3.2 System Performance Parameters

- Each unit is self-powered (T)/(O).
- The system can pump and purify an average of ≥ 20 gallons per minute (GPM) (T), ≥ 30 gallons per minute (O) from freshwater surface or shallow well sources when fully operational. There are also capabilities to purify seawater and brackish water sources.
- Filtration process shall occur without using chemicals to purify water (T), providing redundancy for safety and uninterrupted water purification output, without using chemicals to purify water (O).

4.3.3 Interoperability

Any proposed system shall work independently, without relying solely on any external input. It generates its own electricity to power water pumps, water purification and other equipment. In order to provide the utmost flexibility to the end user, the system can also be tied in seamlessly to the grid (and use other forms of energy in “back-up” modes)

4.3.4 Human Interface Requirements

Operator safety is paramount. Safety features shall be incorporated into the unit. A system shall be deployed by no more than two people in ≤ 30 minutes using the easy-to-follow operation manual.

Any proposed system shall require minimal maintenance and oversight, while including safety mechanisms to ensure high quality of potable water output. It only requires periodic visual confirmation from an operator to ensure the system is running optimally, checking system indicators and flow of potable water coming out of the purification system.

4.3.5 Logistics and Readiness

Safety features shall be built into a system to ensure the highest quality water output.

Operators shall be easily alerted if any filters or other consumables must be changed or serviced.

4.3.6 Other System Characteristics

Any proposed system shall operate in harsh environments and operate in temperatures ranging from at least 32-degrees to above 120-degrees (F), high humidity, rainfall, high wind and dust-filled environments. Any system or unit shall have at least a 5-year guarantee of performance under stated, normal conditions.

5. System Support

5.1 Maintenance

Any proposed system shall be designed to require minimal maintenance and oversight, while including safety mechanisms to ensure high quality of potable water output. Periodic visual checks of a system's self diagnostic indicators will be conducted by operators or maintenance personnel to ensure the system is running optimally, checking potential gauges, LED light indicators and flow of potable water coming out of the purification system. Minimal training of personnel is required to ensure proper understanding of system self-diagnostic indicators.

An operation manual shall show the procedures required to maintain/change consumables and accomplish routine maintenance.

5.2 Supply

Operation and maintenance manual(s) shall be provided to an end user with each system. Manuals will include deployment procedures, information on diagnostics, a troubleshooting guide and consumable replacement procedures. Any supplier shall provides low-cost replacement packages for standard water purification consumables.

5.3 Support Equipment

No additional equipment shall be required for the operation of a system.

5.4 Training

A training manual shall be provided with each system describing when routine maintenance should be performed and procedures required to maintain a system. In the event a more in-depth training session is required, a supplier shall host customizable training session(s). On-site assistance plans, as well as telephone and email troubleshooting assistance shall be provided.

5.5 Transportation and Facilities

Any system shall be transported by truck, trailer, air, in international shipping containers, by boat, by helicopter suspended from installed lift points or by forklift using the skids built into the base of each system. A system shall be installed at a minimum on level ground or on a trailer bed near a water source.

6. Force Structure

Emergency Response teams at the state, local and/or tribal level are the typical customers. Any proposed system shall not require specialized knowledge or training to operate or maintain.

It is conservatively estimated that the potential available market for such a system is greater than 18,000 units for use by local municipalities, public water systems, water treatment facilities and emergency management agencies, for example.

7. Schedule

Units or systems shall be available for purchase in 12 months or less after signing SECURE Program agreement. Deployment of the units typically shall require less than thirty minutes after arriving on site. Units can be deployed without any specialized training.

8. System Affordability

Individual system price is not expected to exceed $100,000 at high volume production levels (T), ≤ $80,000 for a freshwater system (O).

Systems for the purification of brackish and/or seawater sources shall also be available in less than 18 months. Replacement consumable parts can be readily purchased from a supplier for at least five years after purchase.

Systems shall also be available to potential users on a lease or lease-to-buy payment scheme.