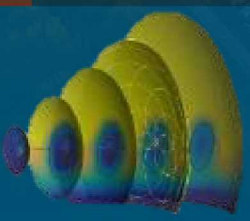
SAND2020-2391C

Sandia National Laboratories

Defense & Disaster Deployable Turbine (D3T)

DWEA Conference, February 27, 2020



PRESENTED BY

Brian Naughton

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U.S. DEPARTMENT OF ENERGY NNSA

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Project Objectives

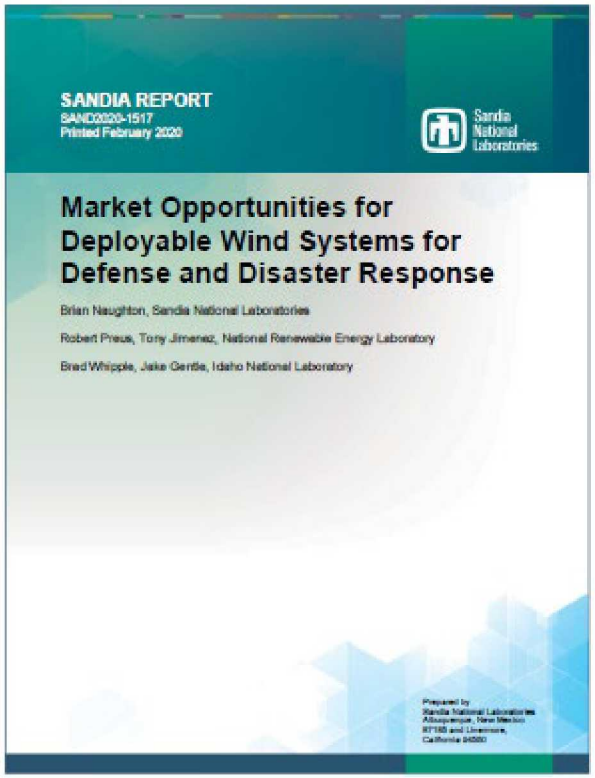
- Identify markets for a deployable wind system
- Develop design guidelines to increase value of deployed wind systems
- Facilitate engagement between industry and military stakeholder to test and deploy solutions

Photo courtesy of US Army

Market Assessment

Market Opportunities for Deployable Wind Systems for Defense and Disaster Response

- Information gathered from recent military energy conferences, direct interviews with key military and industry stakeholders, and published documents
- Deployable wind market opportunities:
  - U.S. Army and Marine Corps dismounted warfighter systems ~1-3 kW range
  - U.S. Army systems to support contingency basing needs ~10-30 kW units also for use in domestic and international disaster response
- Strategically, the U.S. Military is shifting from the sort of longer-term base networks in the Middle East fighting insurgent adversaries to smaller, dispersed, more resilient units to defend against "near-peer" adversaries especially in the Pacific.
- Developing high-value deployable wind systems will need to consider metrics relevant to the types of military missions



https://energy.sandia.gov/download/45834/

Industry Stakeholder Engagement

- Over 20 interviews have been conducted with wind energy industry members regarding current products and concepts and interest in deployable wind systems
- A handful of companies have active discussions and a couple of funded efforts with the military to develop deployable wind systems, all in early stages
- We will continue to engage interested industry members in the development of the deployable wind design guidelines that we hope to release later this year
- We are also working to identify pathways to funded industry research, development and testing opportunities within the Defense Department
- If we haven't contacted you and you would like to discuss deployable wind systems for military and disaster response, please reach out.

Military and Disaster Response Stakeholder Engagement

Interest and need for deployable wind system varied widely across the military depending on the mission and strategic focus. Primary stakeholders are:

- U.S. Army Project Manager, Expeditionary Energy & Sustainment Systems (E2S2)
- U.S. Marine Corps Expeditionary Energy Office (E2O)

Most common feedback regarding wind energy includes:

- Signature concerns (radar, noise, visual)
- Variability & predictability of wind resource
- Simplicity of setup and operation
- Use comparative logistics metrics vs alternatives in the context of the mission
- Military is looking for energy system solutions, not independent technologies
- Military is moving towards open-protocol, interoperable microgrids (but still isn't there)

Good and bad experiences with wind energy were provided (more bad than good). It's important to learn from these experiences to understand what worked and what didn't so we don't repeat them.

Design Guideline Development

Commercial Systems

LCOE as primary objective

Single deployment for 20+ years

Military & Disaster Response Applications

Deployable systems with logistics requirements

Compatible with base energy systems (microgrid)

Mission focused (resiliency, operational reach)

Richard Rice / Wind Turbine / CC BY-SA 2.0

Forward Operating Base Hammer, Iraq. Credit: USAF

Technology Development Opportunities

Defense TechConnect Innovation Summit & Expo (November 17-19 2020)

- Concept pitch opportunities to relevant DOD staff
- Presentations from DOD offices regarding current interests and opportunities and resources for small businesses
- Exposition floor and networking time with military and other industry member
- Pre-conference workshop for technology innovators on navigating DOD

Defense Department Small Business Programs

- Small Business Innovative Research (SBIR) program
- Rapid Innovation Fund (RIF) program
- Army small business resources https://osbp.army.mil/

Partnering with system integrators for military and disaster response applications

- Seasame solar
- Solar Stik
- Go Electric

Distributed Wind Competitiveness Improvement Project

Deployable Advanced Renewable Power System (DARPS)
Microgrid Technology Demonstrator

- 31 kW Wind
- 25-40 kW Inverter, grid-following or grid-forming
- 64-80 kWh Battery (2nd Life EV Battery Packs)
- Ships as 40’ CFS
- Set-up in < 4 hours
- 3-Phase 240/480 VAC
- Wind: 70-170 kWh/day
- Integrates with AMMPS generators
- Cost Target: $300K
- LCOE Target: 60¢/kWh
- Partners/Advisors: INL, Sandia, Cummins Power Sys.

BERGEY WINDPOWER
Norman, OK
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Vision of Success

Near-term:

Report quantifying the market opportunity for deployable wind systems

Identify the design space and technology gaps for optimized deployable wind systems.

Longer term:

Facilitate opportunities between DOD & industry to effectively develop technology solutions

Ultimate Vision:

US distributed wind energy industry is providing technology solutions for our deployed forces to meet their missions, safely and effectively

Project Team

National Laboratory R&D Partners

Brian Naughton, Sandia National Laboratories – Project lead, system modeling and design, data integration, reporting.

Jake Gentle, Idaho National Laboratory – DOD engagement, technology evaluation

Robert Preus, National Renewable Energy Laboratory – Industry engagement, technology evaluation

Stakeholders

15+ Military offices involved with planning, testing, and procuring energy systems for bases.

20+ Distributed wind industry members with concepts and existing systems that could be adapted to military and disaster relief applications.