

TECHNOLOGY TRANSITION OBSERVATIONS MEMO

DoD Standardized Platform to Guide Rapid and Repeatable
Modeling and Design of Secure and Resilient Microgrids
(Rapid-Resilient-Microgrid)

ESTCP Project EW20-5271

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Introduction and summary

The goal of this project is to demonstrate the usability of the XENDEE platform for DoD purposes. To achieve this goal, the XENDEE platform has been upgraded with new features as well as demonstrated at three DoD locations (Naval Base San Diego, Naval Submarine Base Kings Bay, and USAG Bavaria). A goal of this project, as well as all ESTCP technology demonstrations, is to explore wider usage of the technology within the DoD to support their missions and goals. In part to achieve this goal, the project team outlined a full Microgrid design process (see also Milestone 4), which identifies the steps and stakeholders involved in a DoD Microgrid design, identifying possible connection points and offices that will benefit from a streamlined Microgrid design tool. Furthermore, our team including Arizona State University (ASU) and California Polytechnic State University (Cal Poly) have designed a Microgrid and XENDEE training program to support DoD staff on Microgrid and Distributed Energy Resources (DER) project related issues. More than 50 staff members have been trained in multiple sessions (see also Milestone 5). To further support these efforts, our team has also participated in several DoD focused presentations, webinars, and working groups, to better understand the space, and create avenues of technology diffusion.

This memo summarizes the observations from these efforts to transfer the demonstrated XENDEE technology to the DoD at large. This memo acts as a starting point and outlines the impetus for a dedicated study of optimal diffusion of software technologies into the DoD procurement space.

Stakeholders

As determined through our experience, there are many stakeholders in the DoD Microgrid process, including at the installation, regional, national, and international levels. Stakeholders on the installation level include the Energy Manager, the Director of Public Works, and the base commander. Many installations also have a Resource Efficiency Manager, an Engineering Chief, and perhaps a lead electrician. An external stakeholder, typically at the regional level, is likely to be recruited from the service's engineering organization, listed in Table 1.

Table 1: Engineering branches of the DoD services plus the Coast Guard (DHS).

Service	Engineering branch
Army	Army Corps of Engineers (USACE)
Navy	Naval Facilities Engineering Systems Command (NAVFAC)
Air & Space Forces	Air Force Civil Engineer Center (AFCEC)
Coast Guard	Engineering and Logistics Directorate (CG-4)

Within these engineering branches, there are different districts organizations with varying functions such as the Construction Engineering Research Facility (CERL) and Engineering and Support Center, Huntsville (HNC). Other stakeholders could include the secretary of the Army, Navy, and Airforce and the associated staff such as the policy makers determining the energy budget, resilience and emissions goals, and the critical missions of

the DoD at large. No clear picture of all relevant offices and organizations exists that could benefit from a Microgrid design tool. See org chart in the next section.

Outside of DoD, several stakeholders exist as well. The local power grid operator should be made aware of the project concept and should delegate a representative to participate in initial deliberations. If a decision is made to explore a Microgrid solution, an analyst competent to conduct a feasibility assessment will be needed. This will often be an external consultant group. Local government agents are typically also involved, as environmental requests are coordinated with them. Once a Microgrid is determined as feasible, Engineering Procurement, and Construction teams, which are composed of an approved list of vendors by the DoD are also needed. See also https://dodsoco.ogc.osd.mil/Portals/102/contractor_list_1.pdf for a complete 2019 DoD vendor list for contracts above \$25 000. Examples are:

- AECOM
- ABB
- Black and Veach
- General Electric Company
- Siemens.

So far, all XENDEE related projects are based on champions (e.g., Director of Public Works) at a certain base or on personal relationships within DoD. No cohesive approach exists that would benefit the entire DoD, and there is no clear picture of all the teams within a branch that could benefit from our solution.

Challenges and Observations

Based on this ESTPC project and projects that the team has been doing for other DoD clients it is becoming clear that multiple challenges exist that prevent general software tools, like XENDEE, from getting to the members of the DoD who could benefit from them the most.

- Fragmented DoD structure with no centralized organization supporting Microgrid or DER projects. Currently, every base is on its own when it comes to Microgrid projects and initiates them on an individual level and tries to define the project. The general structure of the DoD engineering facilities are unknown to personnel outside of the DoD.
- it is important that there is a Microgrid champion on the installation who can work with ta third-party consultants or service entity. This person is critical to coordinating assets and personnel on the installation, providing a guiding direction in the design process, managing data security, and ensuring all regulations and site goals are met.
- However, most energy managers are not provided training on novel technologies such as Microgrids, and thus have limited knowledge to execute a Microgrid project.

This results in issues with modelling and misunderstanding on what software tools can do and should do.

- Overworked base management. In most cases, there is interest in a more structured approach to the design process and support tools. However, it became clear that modelling of projects is not the core responsibility of onsite engineers and base management. They are overwhelmed with other tasks and even receiving data from the base can be a challenging task due to the time constraints and because of not easily available data. It was observed multiple times that base staff was interested in Microgrid topics and XENDEE, but then had no time to participate in the training provided within this project.
- Outsourcing the conceptual design and engineering of the Microgrid is the norm. However, this alleviates only part of this problem and introduces other issues. For example, the consultant is unlikely to be familiar with the chain of command at the installation, the local and regional standards, or the master plan around which the system must be implemented.
- Determining the correct point of contact in regional and engineering offices that would provide the engineering services, to discuss the XENDEE solution with, is very murky and a challenge. For example, we could not identify a specific person within the Army Corp who could support a tech transfer strategy even though XENDEE has multiple contracts with the Army (managed by the Army Corp).
- Procuring a software tool can be a lengthy process within DoD. It can take months (in an observed case more than 6 months) to purchase a software license, and this is not a sustainable process if each base or service entity within DoD must do that. This suggests that a central purchasing approach for the different DoD branches could be helpful.
- To get a clearer picture, we identified Office of the Secretary of Defense (OSD) Senior Leadership and reached out to the Office of the Deputy Assistant Secretary of Defense, but after initial interest and engagement no tech transfer strategy could be designed since the communication stalled. It looks like an endorsement for a specific tool is seen very critical and not as something which should be done/supported within DoD.
- We also observed resistance for one Microgrid project by the local German support staff.
- Outside of the DoD, we are finding resistance with DoD subcontractors. For example, we contacted a major DoD subcontractor supporting DoD Microgrids and they are not that convinced that a faster modelling process is helping them since they are quite comfortable that projects can take a long time (5 years or more) and that those projects are complex. This is obviously not beneficial for the DoDs goals.
- We see the same trends from the perspective of the DoD personnel as well, based on a webinar we participated in. This included several energy managers within the MERC Cohort. From their perspective, they feel very fragmented from installations even just a few miles away, other installations in their branch, and installation in other branches. Generally, they are not easily made aware of solutions, such as

XENDEE, that are available to them, despite being ahead of the curve by working with MERC.

- This points out that the need for a connecting entity is useful for both vendors outside DoD and energy managers and engineers within the DoD to accelerate the DoDs Microgrid goals.

Org Chart

As a part of the technology transfer process, understanding the potential end-users of the software is key to understand how to best diffuse the technology. The idea is to identify the correct points of contact for who would use XENDEE and benefit from the streamlined process and Microgrid training.

However, through research we have found that a concrete structure of the Army Microgrid engineering teams is unclear, even when speaking with experts. The chart below highlights what we have found as a rough set of teams who operate in the DoD Microgrid space. However, the connections between these teams, and the organization within teams is very unclear. Based on research in other DoD branches, we see the same level of disorganization in terms of decision makers and engineering supports.

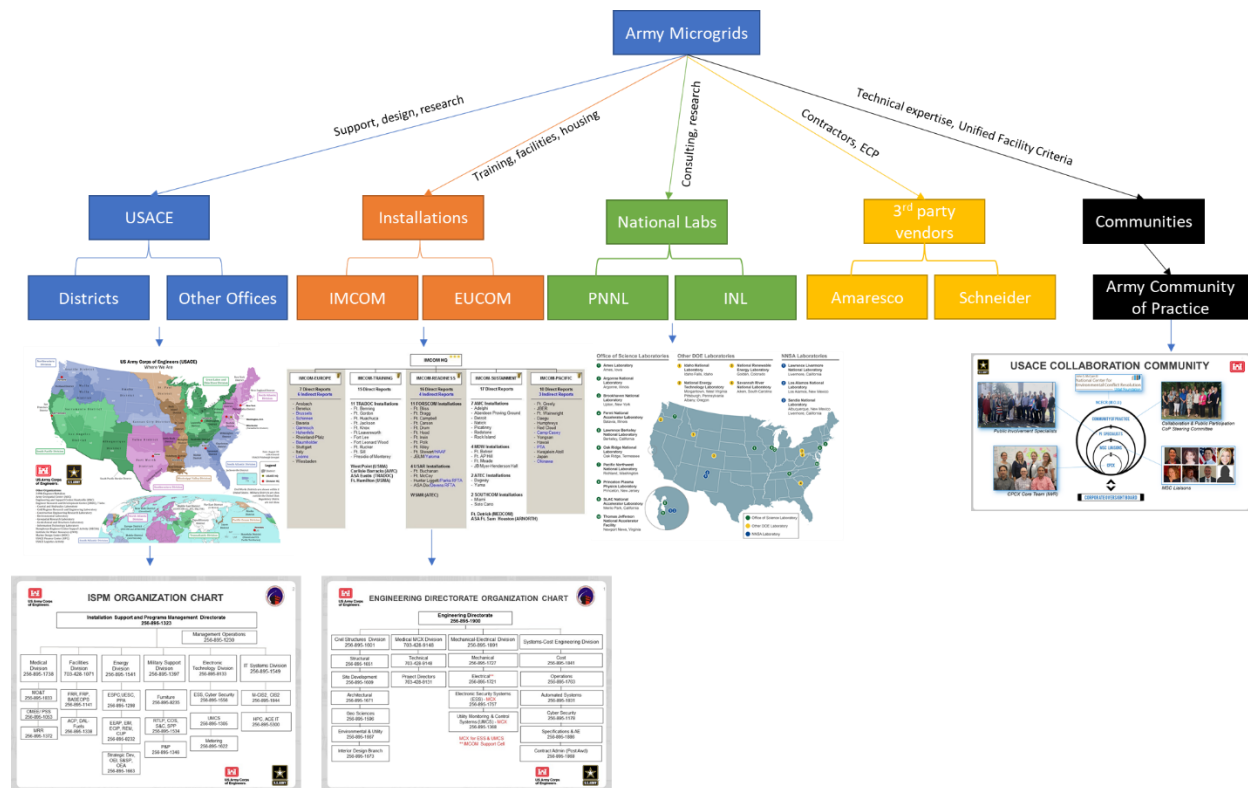


Figure 1: Draft Army Microgrid engineering teams. The picture is not intended to be complete and is work in progress.

Next steps suggested

Following steps could be carried it out in a follow-on project or task.

- Create a detailed Org Chart for each DoD branch, which outlines the major offices, their responsibilities, and their reach to be able to identify the right office/staff for a coordinated software support.
- Continue to build and deploy training sessions (such as task 5 with ASU) for DoD staff to build the proper knowledge.
- Create comprehensive list of DoD subcontractors and their roles (e.g., AECOM) which could benefit from a streamlined approach for modelling.
- Identify strategic dispersion vectors within the DoD such as companies like Converge Strategies LLC. And installation cohorts such as MERC to facilitate meetings and knowledge transfer.

Relevant links:

<https://www.usace.army.mil/locations.aspx>

<https://www.hnc.usace.army.mil/About/Organizational-Chart/>

https://www.army.mil/article/181181/imcom_transforms_regions_into_new_directorates

https://en.wikipedia.org/wiki/File:DOE_Laboratories_Map_2014_Hi-res.jpg