

GUIDANCE DOCUMENT

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

Milestone 2—Data Collection RFI and Memo

ESTCP Project EW20-5271

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Executive Summary

In this memo, we document the data collection portion of the ESTCP demonstration plan. As outlined in the project proposal, the goal of this task is two-fold: (i) standardize the collection of data from Department of Defense (DoD) sites such that it meets the security requirements of DoD data; and (ii) apply this secure methodology to collect vital data needed for the modeling portion of the assessment. In turn, break the report into two sections. The first discusses the standardized approach developed as part of the project, referred to as the XENDEE Project Dashboard (= automated RFI). The second section discusses the use of the Project Dashboard to collect data, the quality of the data received, and best practices for collecting the data in the future.

1.0 XENDEE Project Dashboard—A Secure and Standard Data Collection Approach (automated RFI)

1.1 Overview:

The XENDEE Project Dashboard is a centralized secure platform for storing and sharing project data. The Project Dashboard is designed to reduce modeling time through streamlining the data collection process and providing a single secure location for sharing and organizing files, coupled with a built-in messaging system and notifications to alert team members to changes in the project data. The dashboard security is maximized by the use of password protection and data encryption (https) and is hosted on isolated servers through DoD-approved vendors. Further, the project data will be stored in dedicated DoD servers, with which only DoD certified groups have accounts (the process of establishing the specific DoD servers within the ongoing RMF process will be finalized soon).

This integrated data platform is accessible to XENDEE DoD license holders, as well as collaborators invited to join a dashboard project, making it easy to track and coordinate data collection with clients. The use of roles, such as project administrator, centralizes the control of access to approved personnel only. For example, support staff at the Directorate of Public Works office who have been invited to access a dashboard project (by the project administrator) can share sensitive data directly to the platform without needing to use external transfer tools (or worse yet by using email), thereby eliminating a common bottleneck in projects and maintaining data security.

Further, the Project Dashboard also saves time and maximizes data security with an integrated messaging system that is used to write and displays posts within a dashboard project, saving users from needing to cross reference emails from clients and centralizing all information to a single repository. All messages posted to a dashboard project are contained entirely within the project page, and while users are notified via email if they are tagged in new messages, message content is not included in the email, and users must log in to view messages.

Each Dashboard Project has its own (siloes) page for data storage and messaging. The main page displays a list of all project data, organized into Data Categories as displayed in Figure 1. At the main project page, you can view the project at a glance, including the project team members, the various ‘data cards,’ the status of data, any missed messages, and a list of updates to the project. Data is organized into customizable categories, with certain default categories common to microgrid projects such as utility data, load data, existing DER spec data, one-line data, etc. Within each category, relevant data can be uploaded to a data card, which stores information for a specific topic. As shown in Figure 2, a data card stores files (.pdf, .csv, .mp4,.doc, etc.) and messages relevant to the topic.

The screenshot shows the XENDEE Project Dashboard for 'ESTCP 2020 - NBSD'. At the top, there is a navigation bar with 'Profile', 'Projects', 'Catalogs', 'Documentation', and a user profile 'Zack Pecenak'. The main header reads 'Project Dashboard Project' with a breadcrumb trail 'You are here: Project Dashboard > Project Dashboard Project'. Below this is a project overview card for 'ESTCP 2020 - NBSD' with the description 'Here is where the data files for Naval Base San Diego live.' and buttons for 'Edit Project' and 'Delete Project'. A summary bar shows 'All Data (21)', 'Incomplete Data (17)', 'My Messages (16)', and 'Updates (0)'. There is an 'Add Data Card' button. The 'Project Information' section shows a table with 5 entries:

Title	Description	Status
Air Quality Agreement	Air Quality Agreement	Incomplete
Location Information	Information about the project address and location	Complete
Meeting recordings		Complete
On-Site Fuel Reserves	Amount of fuel available on site	Complete
Use Case Assessment Draft	Here is the living version of the use case assessment	Complete

The 'Team' section lists: Janice Torres, Stephen Banister, Kelsey Fahy (Xendee), Michael Stadler (Xendee), Patrick Mathiesen (Xendee), and Zack Pecenak (Xendee), with an 'Email Team' button. The 'Utility Data' section shows a table with 4 entries:

Title	Description	Status
Fuel Tariff Information	Details relating to purchasing natural gas/diesel	Incomplete

Figure 1: An overview of the project home page from the Naval Base San Diego project data collection process.

The screenshot shows the 'Project Dashboard: Edit Data Card' page for 'ESTCP 2020 - NBSD'. The form includes:

- Data Category:** Utility Data
- Name:** SDG&E TR&D Charges
- Description:** Description of transmission and distribution charges
- Notes:** A rich text editor containing the text: 'Please provide a summary of. 1) Transmission Charges, if applicable. 2) Distribution Charges, if applicable. 3) Other charges from SDGE'.
- This Information is Complete:** A toggle switch that is currently turned off.
- New File:** A 'Choose File' button with the text 'No file chosen'.
- Uploaded Files Table:**

File	Last Uploaded
SW01EL000020201104.pdf	11/4/2020 by Stephen Banister
SW01EL0001020201104.pdf	11/4/2020 by Stephen Banister

Buttons at the bottom include 'Update Data Card', 'Cancel', and 'Delete Data Card'. Below the form is a 'New Message' section with a rich text editor.

Figure 2: An example of a data card within the XENDEE Project Dashboard, which shows two files uploaded relevant for the SDGE agreement.

1.2 How to use the Project Dashboard

In this section we will document how to set up a Project Dashboard for DoD modeling efforts.

1.2.1 Creating a new project

To create a new project, click ‘Add New Project’ and enter a name and description. Choose a Project Team to assign to the dashboard project. When adding team members to the dashboard project, the choice of Project Team will determine which users can be granted access, showing only the users belonging to the Project Team.

After clicking ‘Create Project’ you will be taken to the main page for the new dashboard project. The main page displays a list of all project data, organized into seven Data Categories: Project Information, Utility Data, Load Data, Existing DERs, DERs to Consider, Power System Information, Site Weather Measurement, and Additional Data. You can also view a streamlined selection of data that remains incomplete, check your messages, and view a list of updates to the dashboard project.

1.2.2 Specifying project team members

After a dashboard project is created, access can be granted to any members of the associated Project Team. The option to edit the team, shown on the main dashboard project page, allows the Project Team administrator to grant access to project team members and update user privileges.

Clicking the Edit Button in the Team module shows a list of all users belonging to the Project Team with which the dashboard project is associated. When the box next to a Project Team member’s name is checked, they are added to the dashboard project, granting them access. Default user privileges let dashboard project members view and download all data and create messages for other members. User privileges can be extended by the project team to allow uploading and/or editing data and notes. Users designated as either Client POC or Project Team administrator can modify the dashboard project team.

Project Team You are here: [Project Dashboard](#) > [Project](#) > [Project Team](#)

Don't see a team member? [Invite a user to this Project Dashboard.](#)

	Name	Is Client POC	Is Project Admin	Upload Only	Can Edit
<input checked="" type="checkbox"/>	Janice Torres	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	Stephen Banister	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	Kelsey Fahy (Xendee)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	Michael Stadler (Xendee)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	Patrick Mathiesen (Xendee)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	Zack Pecenak (Xendee)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Figure 3: User classes in the XENDEE Project Dashboard.

Through an invite-only system, dashboard project access can also be granted to non-XENDEE users (Users who should contribute data, but do not model in XENDEE). Invites can be sent through the Manage Project Team page by the Project Team administrator.

The Manage Project Team page can be opened from a dropdown menu under the user's name on the XENDEE website header, or from the Edit Team page on the dashboard project, where a 'Manage My Team' link will be visible to Project Team administrators. The Project Team administrator can send an invitation to non-XENDEE users to join the Project Team in a 'Project Dashboard Only' role, which does not require use of a XENDEE modeling license. After they accept the invitation, these users can be given access to dashboard projects. This serves as an important function in providing clients the ability to directly collaborate on and upload data to the Project Dashboard. It streamlines the data collection by eliminating the additional step of using external tools to coordinate project updates with non-XENDEE users. This also addresses data security concerns by allowing clients to share sensitive files directly to the dashboard.

All user privileges, including default user access, are specific to each dashboard project. Below is a complete list of all user permissions.

Table 1: User privileges for XENDEE Dashboard users.

	Default User	Upload Only	Can Edit	Is Client POC	Is Project Admin
View Data Cards	Yes	Yes	Yes	Yes	Yes
View and Download Files	Yes	Yes	Yes	Yes	Yes
Create Messages	Yes	Yes	Yes	Yes	Yes
Delete Messages	No	No	Yes	No	No
Create Data Cards	No	No	Yes	No	No
Delete Data Cards	No	No	Yes	No	No
Edit Notes, Descriptions of Data Cards	No	No	Yes	No	No
Upload Files	No	Yes	Yes	No	No
Delete Files	No	No	Yes	No	No
Edit Notes, Descriptions of Files	No	Yes	Yes	No	No
Email Dashboard Project Users	No	No	No	Yes	Yes
Edit Dashboard Project Users & Permissions	No	No	No	Yes	Yes
Edit Project Name or Description	No	No	Yes	No	No

1.2.3 Adding and organizing data

In each category, project data are saved in the form of data cards (see Figure 2). Data cards can be used to store files, document notes and descriptions, and create messages directed to other team members. Each newly created dashboard project includes pre-existing data cards for some of the more common types of project data, serving as a starting point for organizing the data collection process, as well as demonstrating how remaining data collection tasks are easily flagged in the Incomplete Data tab. These data cards can be modified to suit the project needs. Additionally, users can add new data cards, creating them from either the main page or from the viewing pages for the data categories.

When creating a new data card, users choose the Data Category the card will be sorted into and create a custom name and description that will appear on the category's list of cards. The Notes field provides a space for more extensive documentation, and a file can be uploaded at this stage using the Choose File option. The data card can be marked as complete if no further data collection is needed for this data card.

Once the card is created, the data card can be continuously modified as the project develops, allowing users to reorganize data cards by changing the Data Category, toggle the status of the data card between complete and incomplete, and add new notes and files.

Additional files of any extension type can be uploaded to the same data card, and View Details lets users add descriptions and notes to each file. The details page for a file also provides the ability to re-upload new versions of the file itself while retaining the description and any existing notes. While downloading files is available to all users with access to the dashboard project, a preview window lets users view PDFs, CSVs, and image files prior to downloading them.

1.2.4 Dashboard messages and notifications

Self-contained messaging is a central tenant of the project dashboard. All messaging is completely self-contained in the project, to maximize security. The details page of each data card has a messaging space for communicating with other dashboard project team members. These messages are posted to the details page of the referenced data card, keeping any communications on data updates saved to the same location as the corresponding card for quick reference. If a message is directed to any dashboard project team members, the writer can select users to be included in the message. Users included in the message are notified of new messages on the main landing page of their Project Dashboard, as well as under the Messages tab of the actual dashboard project the message is posted in (Figure 1). Additionally, an automated daily digest is emailed to update users who have been tagged in any new messages. Members designated as dashboard Project Admin or Is Client POC can also email the team if more prompt delivery of the daily digest is needed. For security purposes, these emails do not contain any details on message content or associated data card, and prompt the user to log in to view the message on the dashboard.

Messages posted to a data card are also duplicated on the details page of the card's data category. For a data category with several data cards, this provides a quick way to scan the messaging section of the category for any new messages in any of the cards, with a reference tag indicating which data card it was posted in. Additionally, a message can be written directly in a data

category and tagged with references to multiple data cards, and the message will be duplicated on the details page of each referenced card. If a message is no longer relevant to a data card, use the “Remove from Data Card” option to remove the reference to the card without deleting the message. Deleting the actual message can only be done on the data category page.

As indicated in the previous section, users tagged in new messages will see notifications on their Project Dashboard landing page and on the Messages tab in the dashboard project. The Incomplete Data tab reports the number of data cards that remain marked as incomplete clicking on this tab opens a streamlined list of these cards. The updates tab lists all changes to the project data, such as new cards, re-uploaded or deleted files, and modified notes; and tracks which user made changes.

1.3 Future enhancements to the XENDEE Dashboard

The XENDEE Project Dashboard, as described above, provides all the functionality originally envisioned and described in the project proposal. It provides a strong basis which can be leveraged to further streamline the modeling process. For example, once data is obtained and uploaded, there is still significant work to be done in cleaning the data and providing quality control for missing or ‘bad’ data, which is ubiquitous in data capture. XENDEE will provide tools as part of the upload process which will aid in the quality control of this data, removing another significant time sink. Following this processing, XENDEE can put it in the form needed for the model, and automatically attach it to a real project, streamlining the process of setting up a model. In other words, the goal is that XENDEE can automatically set up projects in real time and deliver results as a project dashboard is filled out.

2.0 ESTCP Demonstration Collected Data Overview

2.1 Overall site collection

Overall, the XENDEE Project Dashboard facilitated safe and seamless transfer of project data. As discussed in detail below for each installation, several overarching themes were present from the task:

- Electrical data is readily available through Advanced Metering Infrastructure (AMI), but quality may be poor.
- Thermal data is rarely available.
- XENDEE Project Dashboard is easy to use and provides critical messaging and storage functions.
- Tracking down data is still a significant time sink.

2.2 Site specific data

Below we provide discussion about the base data collection process, including how the Project Dashboard was received during pilot. For each base we provide a summary of the experience and major takeaways from the experience.

2.2.1 Naval Base San Diego

Members of Naval Base San Diego (NBSD) were extremely receptive to the use of the Project Dashboard, as all direct members signed on and used the dashboard for data upload and secure messaging. However, NBSD was also the base with the lowest overall data availability and quality. This provides a nice use case compared to the other installations, which each had high data availability and quality. Given the simplicity of the NBSD use case, the lack of data could be mitigated.

The major takeaways from the interaction with the installation are as follows:

- Partial greenfield modeling (the facilities in question have not been built yet) and project expansion make modeling data difficult to obtain, since there is no historical record.
- Project Dashboard is an effective tool for communication with project members.
- Project Dashboard required no training or explanation for NBSD team members to use.
- Obtaining data can take several weeks and require intermittent meetings to align on what is needed and outstanding items.

Below is a summary of the data needed (as determined on the kick-off call), the submission status, and any difficulties relating to specific data sets.

Table 2: NBSD data.

Category	Item	Status	Noted difficulties
Site Demand	Electrical Demand	Estimate provided (i) existing consumption pattern (ii) Engineering estimate of oncoming demands	Mix of greenfield and brownfield site without metering. Estimates needed.

Category	Item	Status	Noted difficulties
	Cooling Demand	Estimate provided (i) existing consumption pattern (ii) Engineering estimate of oncoming demands	Estimates from energy modeling only
	Thermal Demands	Estimate provided (i) existing consumption pattern (ii) Engineering estimate of oncoming demands	Estimates from energy modeling only
Energy and Utility costs	SDGE Tariff	Provided	
	WAPA Agreement	Provided estimate	Unclear on what they pay, as they are part of regional agreement.
	Fuel Tariff	Not provided	Unclear on what they pay, as they are part of regional agreement.
	Air quality agreement	Not provided	
General Site Details	One-line Electrical distribution	Not provided (determined to be not needed for final analysis)	Not relevant, but not able to provide.
	One-line thermal distribution	Not provided (determined to be not needed for final analysis)	
	Electrical Drawings of building	Provided	
Existing Generator Assets	Diesel Gensets	Not provided (determined to be not needed for final analysis)	
	Large gas pipe	Provided	
Planning parameters	Plans to add additional training services over time	Provided	

Category	Item	Status	Noted difficulties
	What DER classes to consider or assumptions on cost and operation	Provided	Not knowledge that the installation team has.
	Outage and reliability requirements	Provided estimate and requirements	No-cost alternative has intangible cost (boats can't leave dock).
	Cost of alternative	Not provided	Alternative is upgrade to existing distribution. Site specifics not known.

Relation to use case: For NBSD, the use case is to 'microgrid' a single facility which is critical for training. For this use case, the required data is inherently lower, since the project is small. Despite that, the data provided was below the desired amount of data. In short, none of the critical inputs (demand, tariff, and infrastructure) are addressed completely. Each of those inputs is going to require significant assumptions which will be documented as part of the modeling process. However, the use case can be modelled and completed in a satisfactory way.

2.2.1 Naval Submarine Base Kings Bay

The data availability was the highest at Naval Submarine Base Kings Bay (NSBKB), as they have had a number of assessments performed in the past. While the Project Dashboard proved successful overall for storage, not all members signed onto Project Dashboard. Communication through email was still used (no data transfer though) to track down data. One file was transferred through DoD encryption transfer, from a member not directly involved in the project. Overall the major takeaways from the project were:

- Data availability was generally high.
- Tariff was very complex and required interaction with the utility directly to get components.
- Project Dashboard is an effective tool for communication with project members.
- Project Dashboard required no training or explanation for NSBKB team members to use.

Below is a summary of the data needed, the submission status, and any difficulties relating to specific data sets.

Table 3: NSBKB data.

Category	Item	Status	Noted difficulties
Site Demand	List of critical Demands	Provided	
	Interval Demand - Electric	Provided	
	Interval Demand - Cooling	<i>Will Provide</i> - AMI	Cooling load counted as part of Electrical metering

Category	Item	Status	Noted difficulties
	Interval Demand - Thermal	<i>Will Provide</i> - AMI	No metering on thermal assets
Energy and Utility costs	Electricity Tariff	Provided – tariff name and detailed agreement	Was not sufficient, needed to coordinate with Georgia Power to get accurate tariff
	Natural Gas Tariff	Provided	Generic military rate
	Diesel Fuel Tariff	Provided	Generic military rate
General Site Details	Fuel Storage Capacity	Provided	
	Physical layout – electric	Provided – detailed one lines and overall site map	
	Physical layout – thermal	Provided – detailed one lines and overall site map	
	Air Quality Permit	Provided	
Existing Generator Assets	List of assets	Provided	
	Diesel Generator model/capacity	Provided	
	Chiller Model/capacity	Provided	
	Boiler model/Capacity	Provide	
Planning parameters	Load growth projections/rate	<i>Will Provide</i>	
	Price escalation rates	<i>Will Provide</i>	

Relation to use-case: For NSBKB, the use-case is to improve operation of the existing assets, while examining a plan for replacement in the future for a large military campus. The existing assets include 30MW of dispatchable generation behind an RTP tariff with demand response obligations. The data provided, while it took a few iterations to obtain, is sufficient to analyze detailed portions of the use-case.

2.3 United States Army Garrison at Bavaria

The data quality and availability for United States Army Garrison at Bavaria (USAGB) was very high. However, the use case was very involved (large site, a lot of data was needed), and took a lot of time to coordinate and receive. Overall, the installation team used the Project Dashboard consistently and without any issue. The major takeaways were:

- Project was a good test case for uploading and storing the large datasets required.
- Project Dashboard communication was used by certain team members, but others preferred email.
- Data required significant follow up effort across multiple teams, likely due to the scale of the project. Several months of coordinated effort to get the data.
- Some data needed quality fixes and missing data points had to be filled in.

Below is a summary of the data needed, the submission status, and any difficulties relating to specific data sets.

Table 4: USAGB data.

Category	Item	Status	Noted difficulties
Site Demand - Electrical Point of Delivery (POD) Level Interval Demand	POD1 (EON1)	Provided	
	POD2 (EON2)	Provided	
	POD3 (EON3)	Provided	
	Metzenhoff Range 305	Provided	
	Tanzfleck Range 132	Provided	
	Ernstfeld Range 301	Provided	
	Zogenreuth Range	Provided	
	Tower Barracks	Provided	
	Radar Station Hütten	Provided	
	Nitzlbuch Range 213	Provided	
	Stegenthumbach Range 101/Range 102	Provided	
	Range 211	Provided	
Site Demand - Heating Interval Demand	Vilseck	<i>Incomplete</i>	Provided, but data quality poor/incomplete
	Eastcamp Grafenwöhr	Provided	
	BCT	<i>Incomplete</i>	Provided, but data quality poor/incomplete
	Aachen-Algier	Provided	
	Normandy 1	Provided	
	Normandy 2	Provided	
	Normandy 3	Provided	
	Amberge Höhe	Provided	
Site Demand - Critical Loads		<i>Will Provide</i>	Not known
POD Location - Electric	POD1 (EON1)	<i>Will Provide</i>	Likely in GIS dataset
	POD2 (EON2)	<i>Will Provide</i>	
	POD3 (EON3)	<i>Will Provide</i>	

Category	Item	Status	Noted difficulties
	Metzenhoff Range 305	Provided	
	Tanzfleck Range 132	Provided	
	Ernstfeld Range 301	Provided	
	Zogenreuth Range	<i>Will Provide</i>	
	Tower Barracks	<i>Will Provide</i>	
	Radar Station Hütten	Provided	
	Nitzlbuch Range 213	Provided	
	Stegenthumbach Range 101/Range 102 Range 211	Provided Provided	
POD Location - District Heat	Vilseck	Provided	Likely in GIS dataset
	Eastcamp Grafenwöhr	Provided	
	BCT	<i>Will Provide</i>	
	Aachen-Algier	<i>Will Provide</i>	
	Normandy 1	<i>Will Provide</i>	
	Normandy 2	<i>Will Provide</i>	
	Normandy 3	<i>Will Provide</i>	
Energy and Utility Costs	Electricity Rate	Provided	
	District Heat Rate	Provided	
	CO2 Emissions Tax	Provided	
General Site Information	Site Layout	Provided	
Existing Site Infrastructure	Infrastructure Overview	Provided	Requires interfacing with different team who stores data. Communication lines not clear.
	GIS Infrastructure Attributes Layer	<i>Will Provide</i>	
	Transmission Line Attributes	<i>Will Provide</i>	
	Substation Attributes	<i>Will Provide</i>	
	Transformer Attributes	<i>Will Provide</i>	
	Low Voltage Distribution Attributes	<i>Will Provide</i>	
Technology Information	Technology Assumptions	<i>Will Provide</i>	Not knowledge that the installation team has.
	PV Performance Data	Provided	

Relation to the use-case: The use-case for the installation is to examine microgrid a large geographic area with several substations. The data provided is very detailed. However, due to the

largeness of the facility studied, it requires a lot of effort to track and sort the data and convert that to a working model.

3.0 Conclusion

The data collection as part of the ESTCP demonstration was a very useful exercise which provided:

- (i) A secure and standard data transfer platform.
- (ii) Working data for modeling the determined installation use cases.
- (iii) Takeaways from the collection process to leverage in future DoD modeling efforts.

The disparity in data quality and size of the demonstration projects gives a wide range of data collection efforts to learn from in future efforts. This document can be used as a starting point for all DoD modeling efforts using the XENDEE platform.