# Plan Overview

*A Data Management Plan created using DMPonline*

**Title:** Engineering

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**Template:** Edge Hill University DMP Template

**Project abstract:**

With the increasing integration of renewable energy resources, such as solar and wind, into utility grids, the development of novel systems and control architectures has become essential to maximize their potential. A promising approach in this regard is the hybrid multi-microgrid (HMMG) system, a high-level structure operating at the medium-voltage level. This system comprises multiple interconnected microgrids, each linked to its respective renewable energy sources. Furthermore, there is growing global interest in establishing net-zero hybrid AC/DC energy systems. To achieve this objective, innovative architectures and topologies for renewable energy-based microgrid systems are being investigated. This study proposes a unique system architecture for an HMMG, integrating both AC and DC microgrids (MGs). These microgrids are interconnected via AC and DC tie-lines, along with interconnected converters. Each MG within the proposed HMMG system includes a distributed generation (DG) unit, a storage battery (SB) unit, and associated converters. The system operates in two distinct modes: grid-connected mode and islanded mode. Under normal operating conditions, the microgrid functions in grid-connected mode but transitions to islanded mode in the event of upstream network faults. This capability enhances network resilience and operational efficiency, owing to its advanced control mechanisms. During islanding conditions, whether in an AC MG or a DC MG within the HMMG system, disruptions in load voltages and real power balance may occur. To mitigate these issues, a specialized control system and associated local converter control strategies are proposed. Simulation studies are conducted to evaluate the performance of the HMMG system under islanded conditions for both AC and DC MGs. The results demonstrate that the proposed control system and methods effectively regulate load voltages within the MGs and maintain the desired real power exchange between them. These findings underscore the system's potential to ensure stability and efficiency in hybrid multi-microgrid operations.

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# Engineering

## Edge Hill University Required Information

### What stage are you at in this project?

- PhD project

### Are you a member of staff or a postgraduate research student/GTA?

- Postgraduate research student/GTA

### Who is your supervisor?

Dr Ray Sheriff and Dr Thomas John

### Which Faculty do you belong to?

- Faculty of Arts and Sciences

### How will this research be funded?

Planning for industrial fellowship later if required.

### Are you collecting or using personal, special category or sensitive data?

- No

### Are you obtaining any data from the NHS?

- No

### Do you intend to share your data, e.g. by depositing it in an open repository?

- Yes

**Which repository will you use?**

- Edge Hill Figshare

## Data collection

**What data will you collect or create?**

Question not answered.

**How will you collect or create the data?**

We will use MATLAB/Simulink to simulate and collect microgrid data, including energy generation, consumption, and system performance, which will be stored for analysis.

**What formats will you hold the data in?**

Simulink Model (MDL format)

**How much data do you estimate you will collect?**

200 - 500 GB

**Will you organise your data in a certain way due to the formats used, your specific discipline or the repository you will deposit your data in?**

We will use the Simulink file format and compress the files into a ZIP archive for easier extraction and use in MATLAB/Simulink, as well as on the FPGA platform for hardware implementation.

## Ethics: Human participants and/or personal data

**Have you obtained ethical approval?**

- No

**Why not? Do you intend to obtain ethical approval at a later stage?**

Question not answered.

**Do your participant information sheet and consent form include information about and consent for data preservation, sharing and re-use?**

- No

**What personal data will you collect or use?**

Question not answered.

**How will you store, protect and ensure confidentiality of personal data?**

Question not answered.

## Copyright and intellectual property rights

**Who owns the data?**

Public Dara

## Documentation and metadata

**Are there any standards within your discipline on how to present your data for re-use?**

- No

**How do you anticipate organising your data?**

- README file

## Storage and backup during the project

**Where will the data be stored and backed up during the research?**

Data will be backed up in the EHU One drive and also a copy of the important data will be kept on an external data when required.

**Who needs to access the data, for what purpose and how will they access it?**

The Principal Investigator (PI), supervisor, and internal collaborators may access and use the data for collaboration and verification purposes.

**What are the risks to data security in your project and how will you manage them?**

There is a risk of data loss during the project, which could delay experimentation. To prevent this, I will create backup copies of all essential data to ensure the project runs smoothly.

## Storage after the project

**Which data are of long-term value and should be kept?**

For the engineering project, the raw data and processing techniques will be documented in detail within a securely stored README.md file, ensuring easy reproducibility. Additional data will be stored on the Edge Hill Figshare platform.

**How long will the data be kept?**

3 to 5 years

**If you are not planning to share your data in an open repository, where will the data be**

**stored?**

Edge Hill Figshare platform

**What costs or resources are associated with preparing and preserving your data? Have you included these in your funding proposal?**

Yes. No cost associated.

## Data sharing

**Which data do you intend to share in an open repository?**

The publicly available data, along with the processed and transformed data utilized for experimentation, will be documented and stored for reference.

**Will you make the data freely available under a Creative Commons licence or do you need to control access to it?**

- Creative Commons licence

**When will you share your data?**

- During the project

## Resources

**What resources will you require to deliver your plan?**

Access to a good laptop/workstation and access to cluster server (Run:MATLAB/ Simulink at EHU)