

# Master Thesis

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## Investigation of Load Models in Residential Load Class for a Black Start Event

### Background:

Increasing penetration of renewable energy sources will introduce new challenges to power systems, including network reconstruction after a blackout (i.e. black start). One promising way to handle this challenge is to construct an autonomous microgrid based on Distributed Energy Resources (DER) and local loads, and connect to the main grid through a Point of Common Coupling (PCC).

Moreover, the dynamic performance of microgrids is significantly influenced by load behavior. An appropriate representation of loads deals with a number of factors including the diversity in types and characteristics. Therefore, this work aims to investigate load models to represent different load categories in local network specifically suitable for a transient study at the start-up, as relevant to a black start.

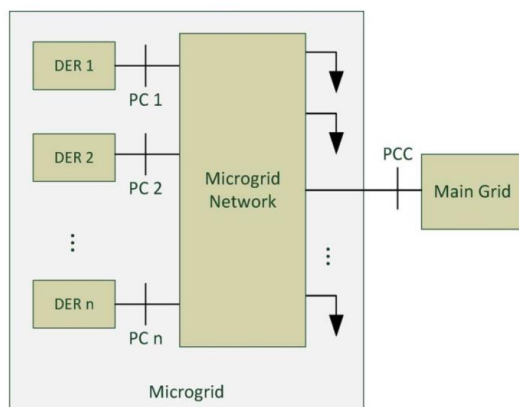


Figure 1: Schematic diagram of a generic microgrid

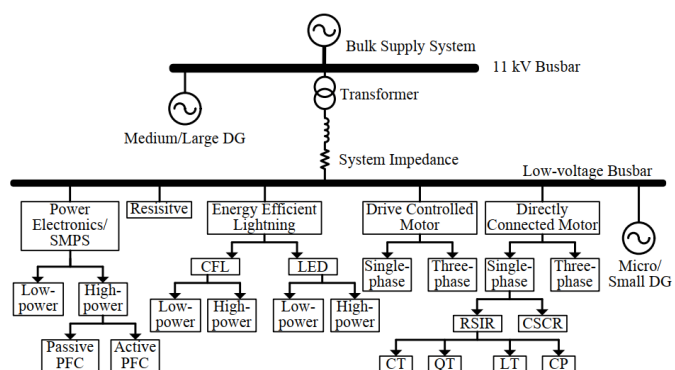


Figure 2: Load categories and sub-categories in the residential load class

### Tasks:

Measurement	Part 1	<p><b>P1.1:</b> Literature review on different load categories (example in Figure 2) and their startup behavior: <u>identification of maximum inrush current and duration.</u></p> <p><b>P1.2:</b> Measurements on a device representing each load category: <u>extraction of current waveform at start-up with proper time resolution and comparison with results from P1.1.</u></p>
Simulation	Part 2	<p><b>P2.1:</b> Literature review on different load models (static, dynamic and combined) for a dynamic start-up analysis: <u>identification of representing load model(s) for the startup of each load category identified in P1.1.</u></p> <p><b>P2.2:</b> Perform simulations in MATLAB Simulink for identified load model from P2.1 taking into account results from P1.1: <u>Comparison and validation of load models with state of the art from P1.1.</u></p>