

1. Introduction

1.1. PROBLEM STATEMENT

Our project attempts to solve one of the primary problems associated with transitioning to renewable energies. The generation of power from renewables is not able to match fluctuating demand, so we cannot rely on them for all our energy needs by themselves. In other words, peak windy or sunny hours are not consistent with when consumers use the most energy. The utility-scale battery energy storage systems (BESS) that we are designing addresses this problem by allowing excess energy to be stored during peak production times and then released energy during high demand times.

Our project is designing a BESS to be constructed in the Ames area. It will be located near the Ames substation and support wind and solar energy use. With the implementation of our project, the local utility landscape will be able to rely more on renewable energy and less on fossil fuels.

1.2. INTENDED USERS

The intended users of our project are the resident of Ames, Iowa, the construction and maintenance teams, and the local utility's engineers. Each of these three groups will interact with our BESS differently, have a variety of needs, and will benefit from it in different ways.

The people of Ames will interact with our project only by using electricity. This group includes college students, middle-class residents, homeowners, and business owners. They need to be able to work and live undisturbed by power outages. Many are also concerned about their environmental impact and need to have environmentally friendly options available. However, the primary concern of this group with respect to our project is financial, meaning they don't want their utility bills to increase. This group will benefit from this project because it will save them money on their utility bills in the long run. Additionally, those with environmental concerns will benefit knowing that more of the electricity they use comes from renewable sources.

The construction and maintenance teams will interact with our project during the building phase and throughout its lifespan for upkeep. This group includes blue collar workers and site supervisors. They need to work in a safe environment and complete the project and maintenance in a timely manner. To satisfy these needs, we will provide a detailed and complete site layout diagram. It should include accurate measurements that comply with NEC (National Electric Code) standards. This group will benefit from our project because it will provide them the opportunity to work on a well-organized, safe, and efficient construction project.

The local utility will interact with our project through the distribution substation that we are interconnecting to and mainly consists of electrical and civil engineers. This group needs to monitor the loads on each of the substation's feeders, including our BESS. Connecting our system may also require additional equipment, such as cables and breakers, be installed in the substation. This will require a detailed one-line diagram of our site with equipment sizes and ratings. The local utility will benefit from our BESS because they will be able to easily monitor the power it is generating and drawing.