**Introduction and Problem Statement:** Renewable generation is going to be the leading form of energy generation in the future, but the current electrical grid was not designed to handle bi-directional flow. Utilities that are over 100 years old are now beginning to run into a 21st century problem, with the infrastructure designed and maintained throughout the early 1900s. Utilities are now scrambling to update their system and implement the tools that will allow them to manage an aging and vey expensive asset to accommodate renewable energy.

Whereas pen and paper sufficed, circuit models are now required to analyze the problem and prescribe a solution. Utilities such as DLC are rushing to build a GIS system of all their assets in the distribution grid. But this is costly and infeasible because of the quantity of assets, and the nature of the distribution grid to rapidly change. Research has shown that circuit models can be reconstructed without GIS data (my paper, yangs paper). Using machine learning, AMI data can also be used to identify behind the meter devices.

Currently there is a limit to how much renewables can be added to a distribution grid before safety concerns arise, such as overvoltage, or fast switching. Energy storage is going to play a critical role in keeping the grid safe and increasing the hosting capacity. A customer cannot install renewable generation at their home or buisness if the hosting capacity has already been exceeded for their circuit. Energy storage has already been used to safely operate renewable energy storage projects, but it is currently large scale or in areas that are remote and have limited or expensive access to other energy sources (Hawaii, Alaska).

**Hypothesis:** Using machine learning, AMI data can be analyzed to identify customers who have behind the meter generation or storage devices. Knowing the topology of the system, utilities will be able to improve operation and increase hosting capacity renewable generation and involve customers to improve the reliability and operation of the grid.