1.1 Problem Statement

Fault detection systems are crucial to transmission systems as the faster we can respond to and kill the power to a faulted line, the more outages and damages we can minimize. Our solution to this will be a neural network that can detect these faults by the change in voltage and current waveforms. Also, to make fixing the fault faster our solution will be able to tell where on the line the fault is.

1.2 Requirements & Constraints

Quantitative-

30 ms response time for detecting fault

Where is the fault located along the transmission line in reference to the sending end of the line.

What type of fault is preset - line to line, line to ground, etc.

Response to fault in the transmission line - ie 1 or 0 to open or keep the breaker closed.

Qualitative-

We are not to use impedance calculations and are instead going to analyse the waveforms through the use of a neural network.

1.3 Engineering Standards

Instrumentation and Measurement - We will need to follow this standard to get accurate readings of our waveforms and be able to interpret them to find our fault somewhere on the line.

National Electrical Safety Code (NESC) - Following the NESC code makes sure that our design is safe and effective at all times.

FERC/NERC Compliant - We follow this one to maintain legality and federal operating conditions of our network (ie. Make sure the money keeps flowing).

Power and Energy - We should follow all standards in the IEEE category of P&E in order to keep safety at the forefront of this project.

Power Electronics - We shall be modeling the use of power electronics which will control the flow of current and voltage through transmission lines. We will need to follow the engineering standards associated with power electronics.

Smart Grid - We will be implementing fault detection in a grid which will be able to determine where in the grid the transmission lines are failing. Being able to determine which power electronics to activate.

Software and Systems Engineering - We will need to use this standard to make sure our software for the neural network is made and functions properly.

1.4 Intended Users and Uses

Benefits the electrical company money since it detects the fault faster and trips a breaker so they aren't pushing power into the ground and will not damage any power electronics

Benefits consumers so that they receive the power they are expecting

Land owners and environmental activists will benefit since the system will set a breaker to turn the line off faster so their land doesn't catch fire and harm the environment.