NORTHERN ARIZONA UNIVERSITY
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To: Professor Kyle Winfree

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Subject: GCC Project: Schedule Documentation

This is the Schedule Documentation given by Team GCC regarding the Capstone Project Schedule for spring 2018 semester, building a grid connected converter that fits customer needs. In this report are the project introduction, Gantt chart discussion of the project. Also included are the team communication strategies.

Attachments: [None]

1. Introduction

Grid Connected Converter (GCC) project, working on multilevel converters using neutral point clamped topology with model predictive control. The project will implement a prototype of multilevel Neutral-Point Clamped (NPC) converter for high power applications and test it using model predictive control. Our prototype power level is at 5kW.

GCC group project consists of Mohammed Abu Radhi, Sayaf Almari, Fahad Alghareeb, Di Miao, and Kaiqiong Ji. The project client Dr.Venkata Yaramasu. He is assistant professor at NAU and director of ampere lab. Project mentor is Ashwija Reddy Korendashe is GTA (Graduate Teaching Assistant). In the end of last semester, GCC group finished designing PCBs, and worked on simulation. GCC group is in testing stage, and below is the GCC group expected schedule for the rest of the semester.

2. Gantt chart Overview

Figure 1, below shows the schedule of the GCC group for spring 2018 semester, and the current status. GCC group has four main tasks to do in spring 2018 semester. First, Hardware-Building the NPC Converter, this main task is independent and has two subtasks which are building the NPC converter complete platform, and soldering gate drivers interface boards. The first part of the schedule is 95% complete. The second task is simulations and testing, we will be using MATLAB with Simulink function in order to do real-time implementation method. Third, the team will collect and analyze the testing data. Fourth, writing IEEE paper in this paper we have seven weeks for writing the paper, and there are six sections. The last week of writing the paper is scheduled for editing and revising the IEEE paper. Finally, the last task is dismantling experimental setup.

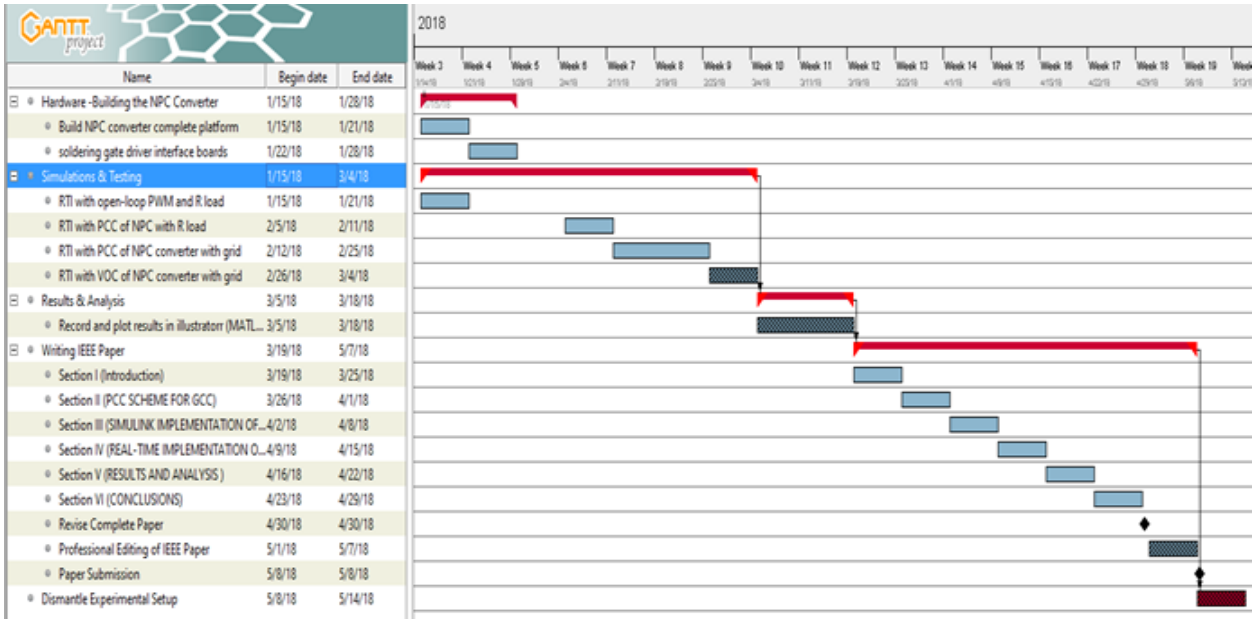

Figure 1: Spring 2018 Schedule Overview

3. Critical Path and Float

As shown in Figure 2, the Gantt chart highlights the five main tasks that needs to be completed in order to successfully reach our project goals. The black line illustrates the critical path the team will go through this semester. The team is almost finished with the hardware part of the project, and is working on simulation at the same time. After that, the team will be able to start testing, and recording results. By reaching the fourth stage which is writing the IEEE paper, the team should have a fully designed NPC converter, and testing results. Finally, the team will have to dismantle the experimental setup since we are using our client's lab. The schedule is designed in a chronological order where the team hopefully won't face any problems or delays.

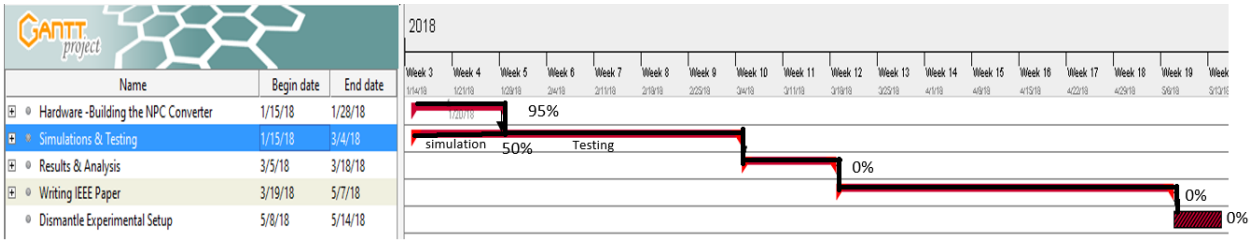

Figure 2: Critical Path Spring 2018 Schedule

4. Subsystems

According to our schedule, there are four main subsystems that must be completed in order to deliver a fully functional converter, and an IEEE paper.

4.1. Hardware

The hardware subsystem is one of the highest priority subsystems. Completion of the hardware subsystem means that the team has completed building the NPC converter. Figure 2 shows that %95 of the hardware work is done. The remaining work in this subsystem should not take more than one week based on our proposed timeline. The hardware subsystem has two subtasks, and the subsystem will be finished whenever these subtasks are completed. Hardware is almost independent from other subsystems in this semester. Although it is independent, the functionality of the hardware subsystem depends on the testing and simulation subsystem.

4.2. Simulation and Testing

Our testing strategy uses simulations and real-time implementation. Simulation team is working on simulation files since last semester to have it ready for testing, and implementing the predictive current control method. Team is half the way done, and have some simulation files to start the testing process. Figure 2 illustrates that simulation is independent, and could be completed regardless of other subsystems. On the other hand, testing depends on full completion of the hardware subsystems, and partial completion of simulation subsystem. According to schedule, simulation and testing stage should not take more than seven weeks starting from the beginning of the semester.

4.3. Results and Analysis

This subsystem main goal is recording results, and collecting data. Our team will collect data, and plot them using MATLAB. Analyzing results will enable our team to decide whether the converter is working properly, or needs modifications. In addition, this step is crucial for the next subsystem where we will be writing an IEEE paper based on these results. This subsystem is also dependent because it can't be completed unless previous subsystems are completed.

4.4. Writing IEEE Paper

Our client requires delivering an IEEE paper about building the NPC converter written by team members. An IEEE paper needs to be written in professional academic language. Since all group members are international students, team decided to give more time for writing the IEEE paper. The paper consists of six sections. According to our timeline, writing each section will take one week. Revising and editing process also will take about a week. Total scheduled time for writing the paper should not exceed seven weeks. The writing subsystem depends on the completion of the previous subsystem.

5. Contingencies Plans

Our team realizes the complexity of the project. Hence, we identified some areas where we could face possible delays. One of these possible delays could occur in the simulation and testing stage where some design mistakes might show up such as mistakes in PCB designs, or burning some components when testing. Our goal is to stick to our schedule and make up any lost time. We have two options when facing such delays. First, team members could spend more time per week than the regular meeting time to debug the problem and find a solution. The second option is minimizing the time for writing the IEEE paper, and shift the schedule one week or two depending on time needed to solve the problem. This summarizes our contingencies plans.

6. Communication

In order to complete our remaining tasks mentioned on our Gantt chart, we plan to meet twice a week. The first meeting is held on Monday afternoon from 1:00 pm to 4:00 pm and the second is on Thursday from 5:00 pm to 8:00 pm. The total time of our meeting is 6 hours per week. We will hold these meetings under the guidance of Dr. Venkata to improve our project in the SICCS laboratory. Generally, we use the WhatsApp to keep in touch with each member in the group. In addition, this discussion group also includes our client Dr. Venkata. If we encounter problems, we can easily contact with him and get a quick reply from him. We can also send pictures, documentations and circuit testing videos to each other by email. For the lead time on meeting, if we have some important or urgent things to deal with, we should meet as soon as possible. In other cases, we should inform the team at least one day in advance if we need a meeting. When we receive messages on WhatsApp, we should respond the moment we receive the messages.

7. Conclusion

The team is implementing a prototype converter. This plug and play converter will be delivered to our client Dr.Yaramasu. The schedule is designed in a chronological order. The highest priority tasks are hardware, simulation and testing, results and analysis, and writing the IEEE paper. Each task is depending on the previous task except simulation which is independent. Team is on schedule, and hopefully we don't face any delays. By the end of the semester, a functional grid connected converter and an IEEE paper will be delivered to our client.