Schedule and Client Contract Documentation

To: Dr. Yaramasu and Dr.Winfree

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Re: Photovoltaic Inverter

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Introduction:

The objectives and goals of the project are to develop the next generation large-scale PV system interfaces with integrated energy storage for improved energy efficiency, reduced manufacturing cost, enhanced system reliability, and grid code compliance with proper control. Also, help calibrate the time

expectation for the project. Our team is included Khaled Albannai , Mohamad Elsaleh, Xuanyu Bai, Jiaxin Zheng and we are working with our clinet Dr. Yaramasu. This is the final schedule and client contract documentation will help us as a group to follow the schedule and think about what are the challenges might lie ahead. In addition, we discussed more in detail about project schedule, team communication strategies, and client contract.

Project challenges / solution:

- One of the big challenges we have to solder 12 gate drivers, voltage sensor, current sensor, and interface board. No one of the team members has an experience with soldering, so we have to make sure to solder correctly. In the other hand, we have soldered all of the components but when we tested some of the devices are not working, so the challenge now to find which component is placed incorrectly and we have to fix it.
- Second challenge, is attaching the inverter components vertically on the board and make some of the long connections behind the board to make it more organized and industrial standard as our client requested.
- Third challenge, is when we solder all 12 gate drivers and tested them all are working perfectly except all LEDs were not working. We found that we used the wrong size of LED, and we had to desolder and solder the right size of the LED.
- Forth challenge, is interface board testing base on the matlab, the team have to install the gate driver over and over again with complex wiring. Making sure the matlab simulink is working properly. In this case, we made wires keep in the same order so that it's easier to make the connection every time when we reinstall the gate driver, at this way we saved time to finish work.
- Fifth challenge is the construction part, the team need to cut a big metal board to get a good size that can be used on our show stand. It takes a lot of time to do the measurement, the team also

need to punch on the metal board using a perforating machine which is danger to work with in the process.

Project schedule:

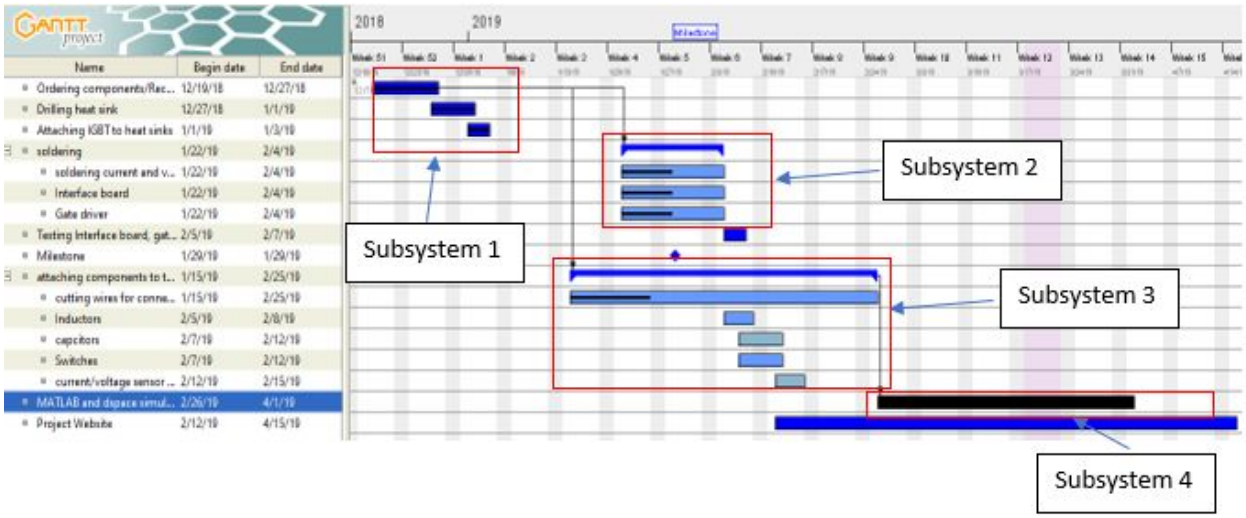

Figure 1: Project Gantt chart.

Overview of the schedule, the schedule has four main subsystems. Starting with first one, ordering parts and drilling the heat we already received all the parts needed for our inverter, and we drilled and attached the IGBTs and in this subsystem we should be done and continue working on the other parts. That was one of the “milestones” to indicate a completion of a task.

Subsystems:

Subsystem 1

This first system consists of three major parts.

- Ordering parts
- Measurements and drilling holes
- Attaching IGBT’s to heat sink
- Ordering process:

This had one of the subsystems that had a high dependency, because we couldn't work on our project due to missing parts, and to finish the project we need all the components to be available, that's why we placed our order last semester to help us keep on track.

Measurements and drilling holes:

Our project will be built on a wooden board and put on a moving stand to match industrial specification, and we did measure where we are going to attach the heat sink, inductors, capacitors and other components.

Attaching heat IGBT to heat sink:

This process was a part of the measurements and we finished doing it last semester, which required us to drill holes into the three heat sinks, each one will have four IGBT and total of 12.

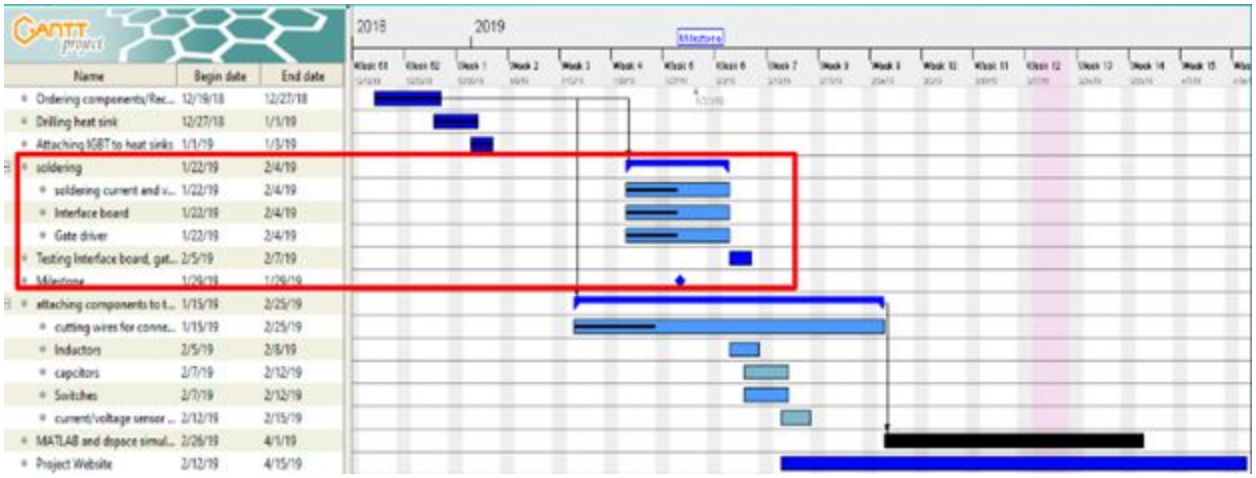

Figure 2: Subsystem 2.

Soldering list:

- Gate drivers
- Current sensor
- Voltage sensor
- Interface board

As we can see we have “critical path” from subsystem 1 to 2, as we discussed that we finished part 1 to be able to start working on Soldering. In addition, we finished all the soldering part and we are in the testing stage and we expect to finish on the 2/7/2019. Also, we can see the testing part is a “float” even if we are late in testing we still can keep working on the next steps.

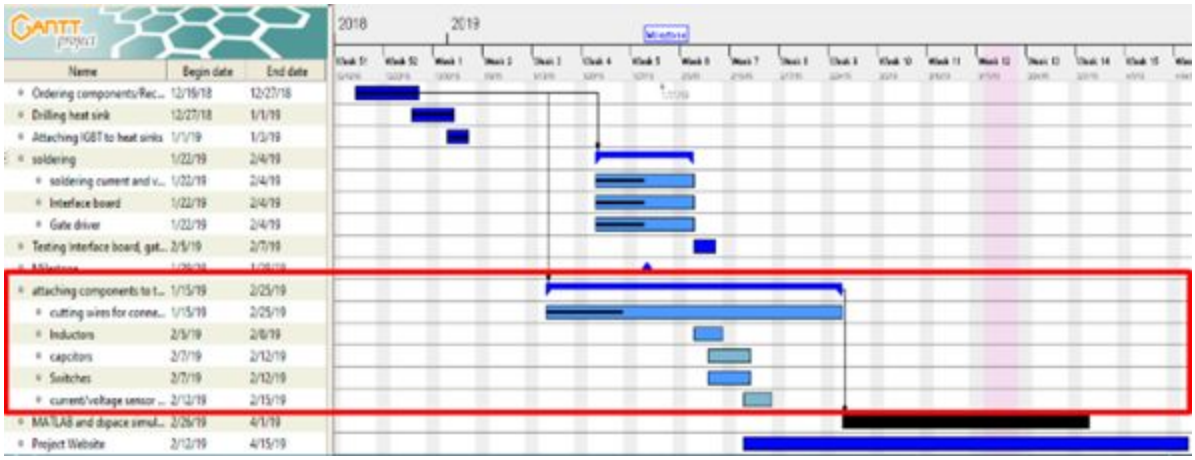

Figure 3: subsystem 3.

In subsystem 3, Attaching all components to the vertical board and wiring all components together to finish our inverter. We expect to start by the 2/25/2019 and we will be done before the spring break. Also as we can see the project testing is the last part and that is “depended” part on finishing all other subsystems.

Components:

- Capacitors
- Safety switch
- Inductors
- Gate drivers
- Current and voltage sensors
- IGBT’s
- Wires

Team communication strategy:

With communication our team usually uses Slack and Whatsapp to set up a meeting outside the regular times and for something emergency we use Whatsapp to make phone call. Our team meet every Tuesday and Thursday from 5:30 to 8:30 in the AMPERE laboratory to work on the project. Also, our team meets regularly with the mentor at least once a week to ask him about the assignments and make sure we are in the correct track also figure out what to do in the next step. For our GTA, the team is keeping in touch with him to report our schedule and ask questions we may meet later. In addition, our team always communicate with Dr.Yaramasu, for example for how would he like for us to arrange the components of the inverter on the board and make sure he approve it.

Client Contract:

The client finds the problem and the opportunity to provide central PV inverter the flexibility, by using MMC (modular multilevel converter), our client requires us to finish the following tasks on time and with his approval:

- Soldering
    - ❑ Gate Drivers
    - ❑ Current sensors
    - ❑ Voltage sensors
    - ❑ Interface board
- MATLAB SIMULINK
    - ❑ Predictive current control
    - ❑ MPPT Control
- Design
    - ❑ Lining the wooden board

    - ❏ Putting together the metal stand
- Test results
    - ❏ Testing with oscilloscope
    - ❏ Testing DSpace
- Attaching the components
    - ❏ Inductors
    - ❏ Capacitors
    - ❏ Gate Drivers
    - ❏ Switches
    - ❏ Current and Voltage sensor
    - ❏ Interface Board
    - ❏ IGBT's
- Wiring
- Testing inverter
    - ❏ MATLAB
    - ❏ DSpace

To assure we are on the right path we will keep our client and mentor update with our progress, and make sure it meets the requirements asked for.

Conclusion:

In this schedule and client contract assignment. we discussed the project challenges and solutions, project schedule, team communication strategies, and client contract. This assignment is very helpful to see where we are and we are following the correct path to be able to deliver a working inverter before the end of the semester.