Grid Connected Converter

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Mohammed

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Introduction

Client

Dr.Venkata Yaramasu
Assistant Professor at NAU
Director of Ampere Lab
School of Informatics, Computing, and Cyber
Systems

Mentor

Ashwija Reddy Korenda

Client's Research Focus:

    A- Wind Power Systems.

    B- Photovoltaic Systems.

    C- Motor Drives.

Problem
- There is no laboratory scale prototype converters available in the market that fits all of these applications.
- Needs plug and play converter to fit the three power conversion applications.
- Having such converter will help our client to develop new power converter topologies and test new controlling schemes such as model predictive control.

Goal
- Implement and build a prototype of multilevel converter for high power applications and test it using model predictive control.
- Practical power level is at 5 MW.
- Prototype power level is at 5 kW.

Mohammed

WBS for Mohammed

ID	Activity/Task	Description	Deliverables	Other people
1	Hardware			
1.0	Redesign PCB Boards	Redesign circuits and modify design mistakes.	Verified PCB design.	Sayaf
1.1	Purchase components	Placing order for modified PCB versions, and buying any missing components.	1- Complete list of missing parts. 2- Placing Order for PCB's and other components. 3- Receiving parts.	-
1.2	Soldering	Soldering PCB's, replacing boards' components.	Soldered PCB's.	Hardware Team
1.2.1	Soldering 60 Pin Connectors	Desoldering the old 60 Pin connectors, and replacing them with the new isolated connectors to solve the noise issue.	Proper connection between boards with less noise.	-
2	Testing			
2.0	Subsystems Testing.	Testing each subsystem individually.	Verifying subsystems functionality.	-
2.1	Testing set up	Connecting all PCB's together, and making sure the converter is ready for simulation testing.	NPC converter, and complete testing set up.	Sayaf, and Fahad
3	Writing IEEE Paper			
3.0	Writing Assigned Section	Each team member is assigned one section to write. My task is to write my assigned section.	Complete Written Section.	-
3.1	Writing Conclusion Section.	All team members will be contributing in writing the conclusion in addition to their assigned section.	A proper conclusion	Whole Team
3.2	Revise & Edit	Revise and edit the IEEE paper.	Revised IEEE Paper	Whole Team
3.3	Paper Submission	Submitting the IEEE Paper to Dr.Yaramasu.	Submitted paper	-
4	Experimental set up			
4.0	Dismantling testing set up.	Undo hardware testing set up ,and clean lab	Organized lab.	Hardware Team

Activities & Tasks:

1- Hardware :
- Redesign PCB Boards.
- Purchase components.
- Soldering.

2- Testing:
- Subsystems testing.
- Testing set up.

3- Writing IEEE Paper :
- Writing assigned sections.
- Revision.
- submission.

4- Experimental setup:
- Dismantling testing set up.

* Current Status.

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WBS of Fahad

ID	Activity/Task	Description	Deliverables	Other People
	Convertor Designing			
1.0	Designing the NPC convertor	Finding the parameters of the NPC convertor using theoretical equations and according to the specification	Complete design of NPC convertor	Hardware Team
	Hardware Implementation			
2.1	NPC convertor hardware implementation	Implementing the designed NPC convertor schematic on Hardware using PCB	Designed PCB	Sayaf & Mohammed
2.2	Components Soldering	Soldering all the components on a PCB	Complete NPC convertor	Sayaf & Mohammed
	Testing			
3.1	Testing the designed NPC convertor with resistive load	Check the working of the designed NPC convertor with resistive load	Testing results	Group members
3.2	Testing the NPC convertor with grid load	Check the working of the designed NPC convertor with grid load	Testing results	Group members
	Documentation			
4.1	Documenting all the results	Storing all the results of the NPC convertor for different load	Document containing all the results	Group members
4.2	Writing IEEE	Writing one section and the conclusion	Required section, and conclusion	

1- Convertor Designing :
　　　Designing the NPC convertor.
2- Hardware Implementation:
　　　NPC convertor hardware implementation
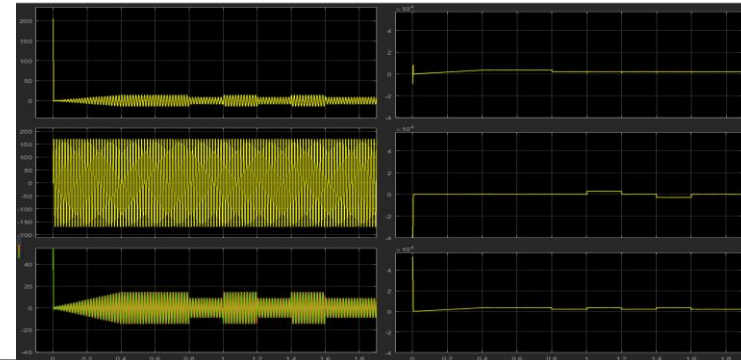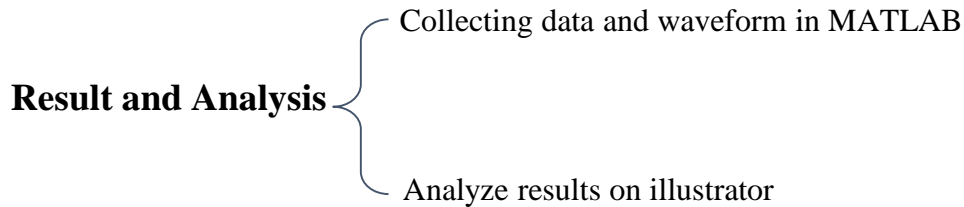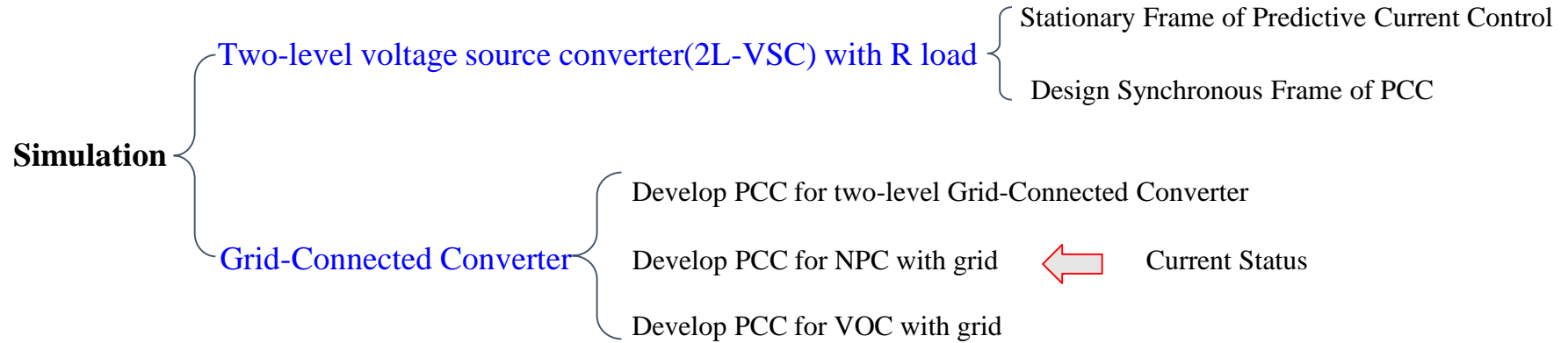　　　Components Soldering
3- Testing:
　　　Testing the designed NPC convertor
　　　Testing the NPC convertor with grid load
4- Documentation:
　　　Documenting all the results
　　　Writing IEEE paper

WBS of Kaiqiong Ji

Simulation

Two-level voltage source converter(2L-VSC) with R load
- Stationary Frame of Predictive Current Control
- Design Synchronous Frame of PCC

Grid-Connected Converter
- Develop PCC for two-level Grid-Connected Converter
- Develop PCC for NPC with grid ⟸ Current Status
- Develop PCC for VOC with grid

Result and Analysis
- Collecting data and waveform in MATLAB
- Analyze results on illustrator

Kaiqiong Ji

WBS of team Di Miao

Person Primarily Responsible: Di Miao				
ID	Activity/Task	Description	Deliverable(s)	Other People
1.0	simulation			
1.1.1	*Design Stationary (αβ)* Frame PCC of 2L-VSC	Initialize parameter in Matlab and connect circuit in simulink function	1. Circuit schematic 2. Simulink model 3. waveform	Kaiqiong Ji
1.1.2	*Design Synchronous (dq)* Frame PCC of 2L-VSC Feeding an Inductive-Resistive Load	According to stationary frame, change the circuit connection and test	1. Simulink model 2. waveform	Testing help by Dr. Yaramasu
1.1.3	Design Predictive Current Control for Grid-Connected Converter	The PCC scheme for two-level GCC and calculate of reference grid currents	1. Simulink model 2. waveform 3. Feedback signals	Kaiqiong Ji and testing help from Dr.Yaramasu

Di Miao

WBS of Sayaf

ID	Activity/Task	Description	Deliverables	Other people
1.0	Hardware- Building the NPC Converter	Start building the project.	NPC Converter	Sayaf, Mohammed and Fahad
1.1	Build NPC converter complete platform	Assembly of all the components of the NPC platform.	NPC platform	Sayaf, Mohammed and Fahad
1.2	Soldering gate driver interface boards	Solder the components to the gate driver interface PCB	Soldered boards	Sayaf, Mohammed and Fahad
2.0	Section I (Introduction)	Write the background section of the IEEE paper.	-	Sayaf

Sayaf

Conclusion

➢ **Current Status:** Simulation and Testing

➢ One week behind planned schedule.

➢ **Delay**: Design mistake

➢ Back on track plan.

➢ Product will be delivered at specified date.

Sayaf

Thank You

Questions?