Prince Mohammad Bin Fahd University
Department of Electrical Engineering

DEMAND RESPONSE CONTROLLER

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OUTLINE

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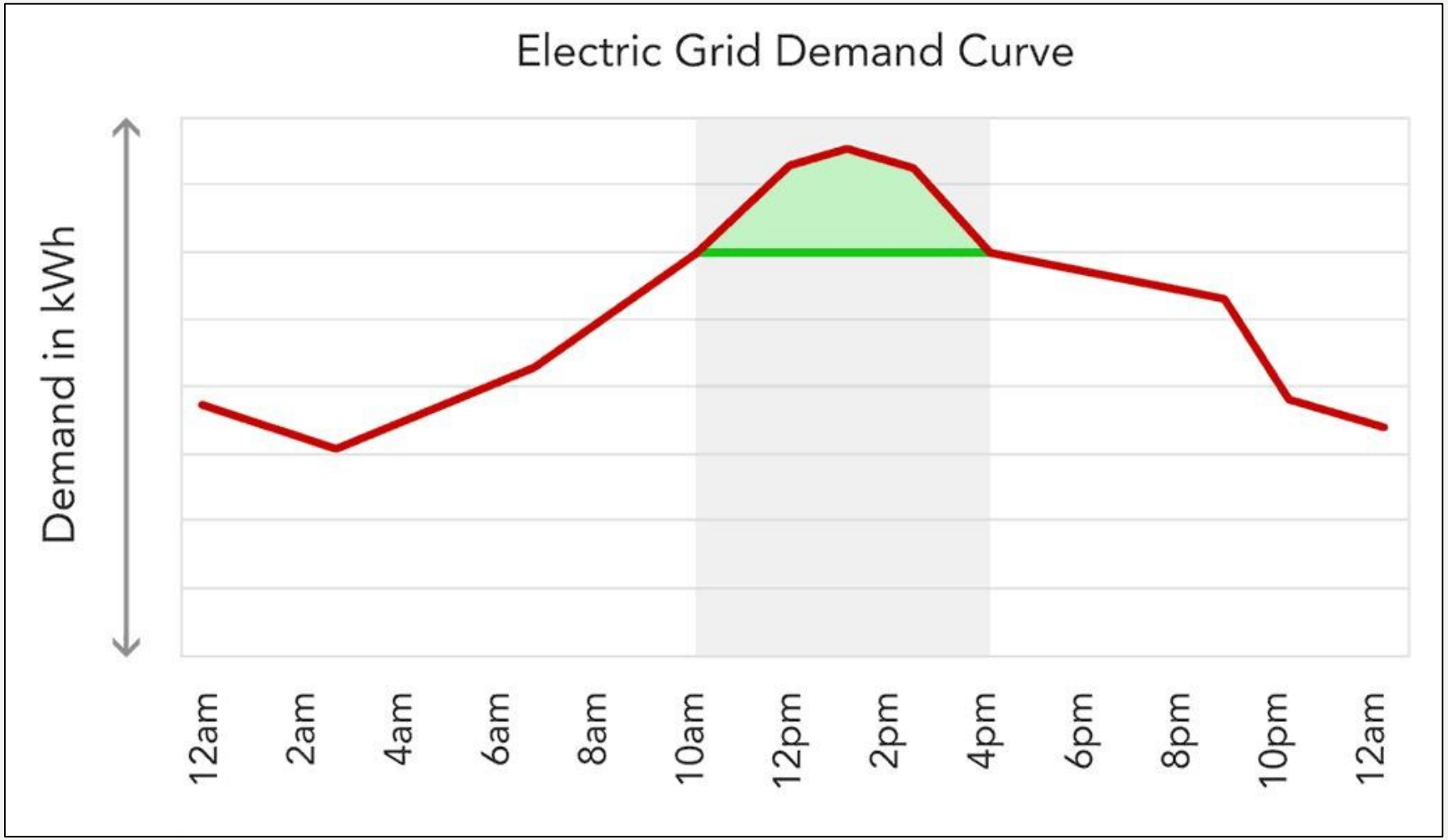
- Project definition
- Project Objectives
- Project Specifications
- Project Architecture
- Previous Projects
- Summary & Comparison
- Planning
- Results and testing
- Budget estimate
- References

BACKGROUND: PROBLEM



BACKGROUND: DEMAND RESPONSE CONTROLLER

- Demand Response controller can make an evaluation of your power usage and determine that you are using too much or using it at the wrong time of day
- To reduce both electricity loads and energy costs for end users in a residential building.
- Demand-response controller seeks to reduce peak demands during times when reliability may be threatened or wholesale market prices are high

BACKGROUND: DEMAND RESPONSE CONTROLLER ADVANTAGES

- Take control of your energy needs costs
- Automatically reduces load
- Eliminate excessive demand side penalties and costs
- Reduce peak demand in plants and/or buildings
- Reduce energy, reduce carbon footprints, reduce costs

PROJECT DEFINITION

- To design a smart home and to control the energy and electricity demand according to a change in the voltage automatically without the need for someone doing it manually. This system is useful for all homes in terms of reducing electricity and power usage or in terms of reduced electricity bills.

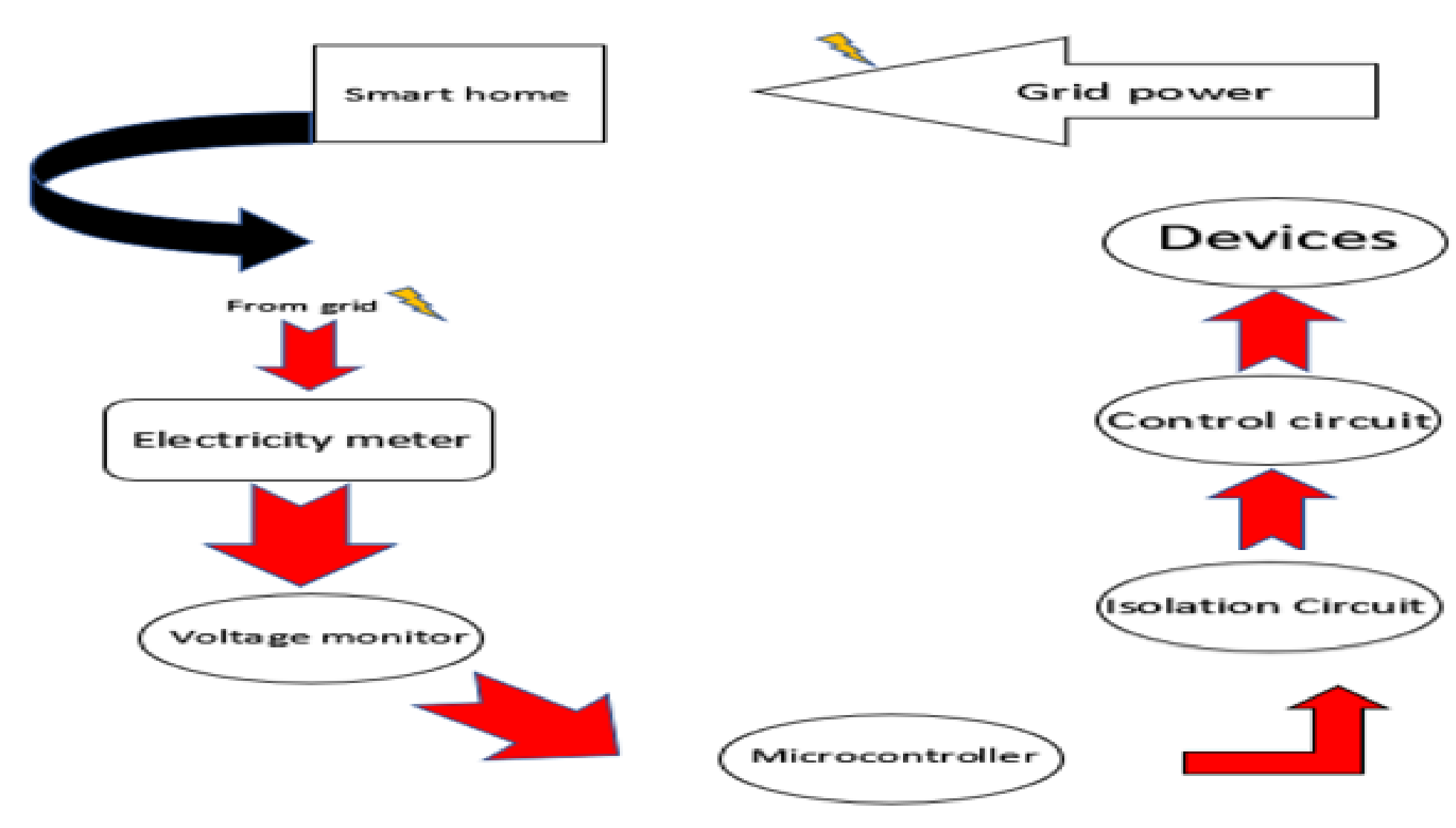
PROJECT OBJECTIVES

1. Reduce electricity consumption.
2. Increase public awareness in term of electricity bills.
3. Facilitate utility to control the load demand.
4. To defer investment cost.
5. To facilitate the end user to control the electricity bills.

PROJECT SPECIFICATIONS

- Power system 220V.
- The power rating up to 200 watts.
- Microcontroller based demand response control.
- Following American National Standard (ANSI C84.1).

PROJECT ARCHITECTURE

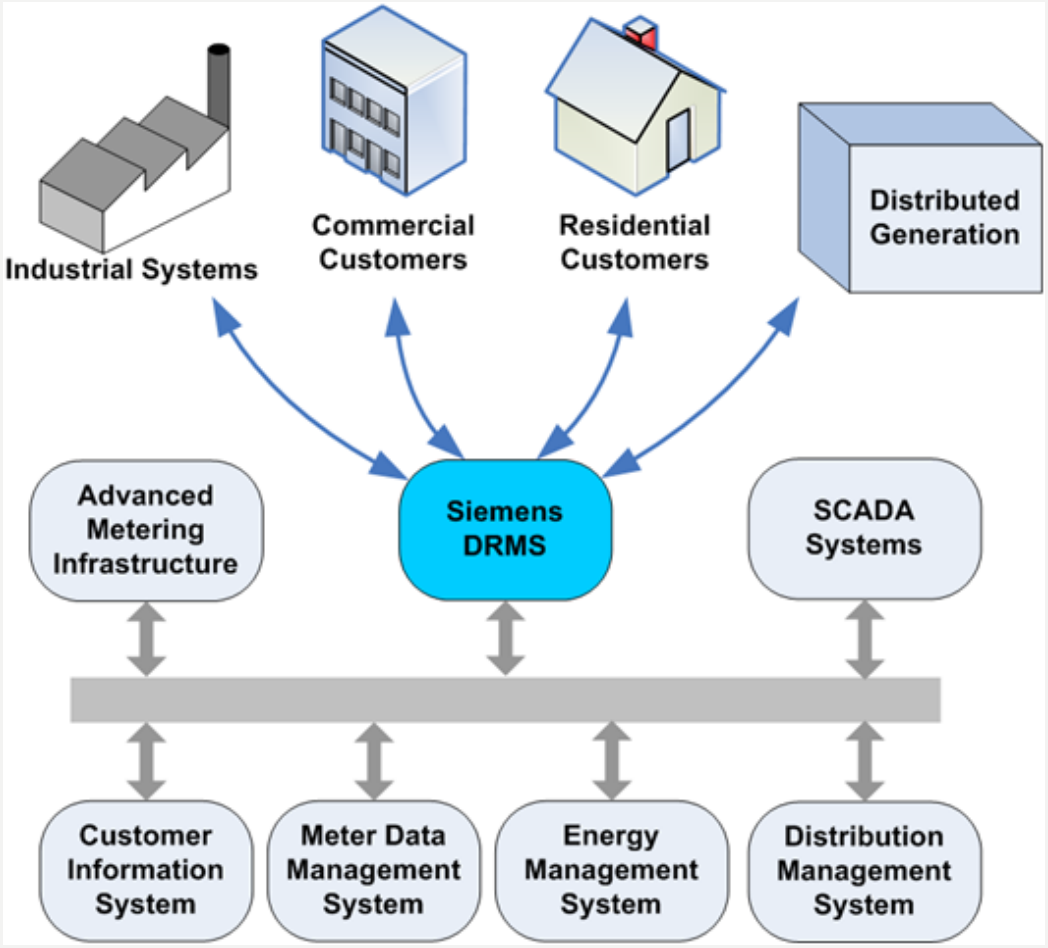


Previous Projects (1)

Demand Response Management System, Jan *2018*

Demand Response Management System (DRMS) is a proven platform that allows utilities to manage all aspects of their demand response (DR) through a single, and integrated system.

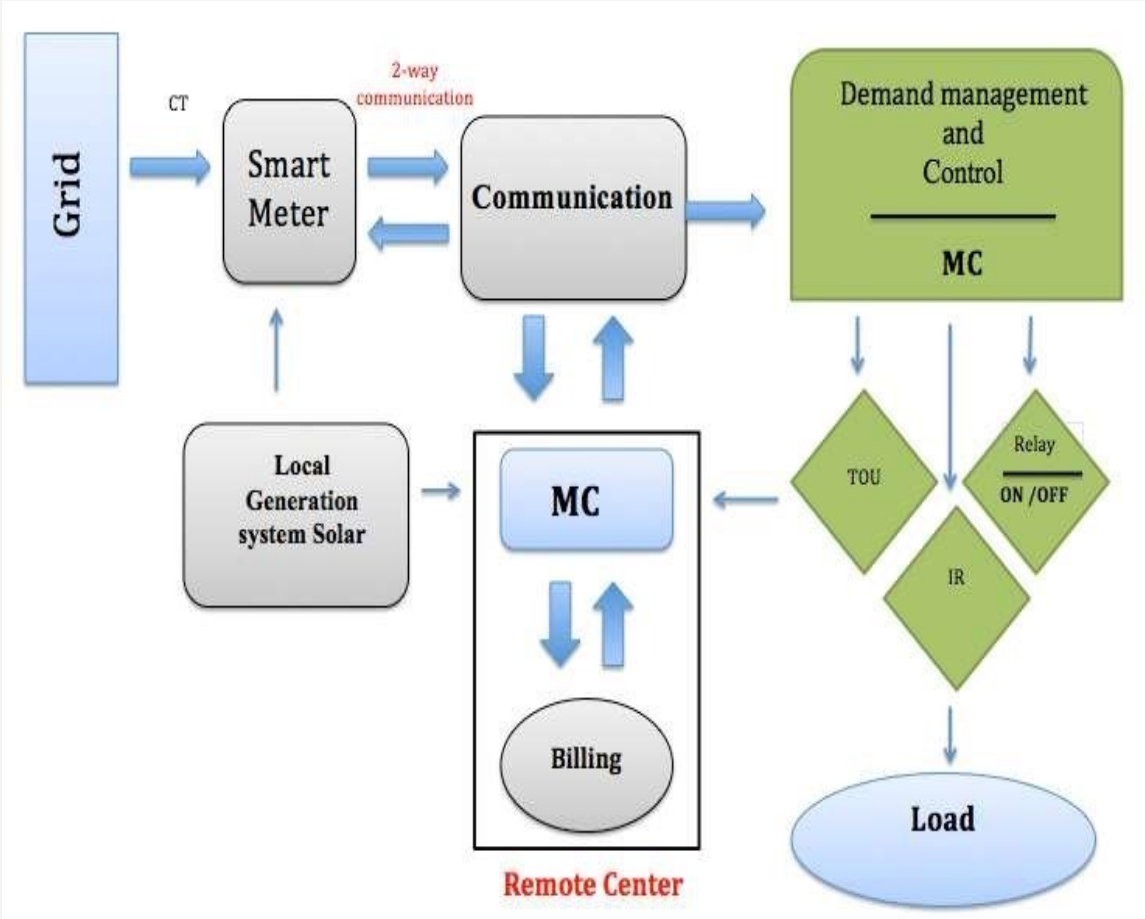
Can be fully integrated with utility systems to leverage investments in Smart Grid technology.



Previous Projects (2)

25 December 2017 , Prince Mohammad bin Fahd university (PMU)

To design a smart energy system with communication, automated billing and demand management functions. The system will use a commercial smart meter to monitor and measure power consumption in residential homes.



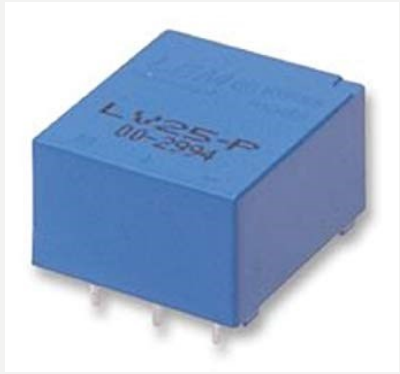
PREVIOUS PROJECTS SUMMARY

Projects	1	2	Our Project
Voltage monitoring	■	■	■
Communication-Free			■
monitoring	■	■	■
Demand management	■	■	■
Local power generation (distribution)		■	

Planning

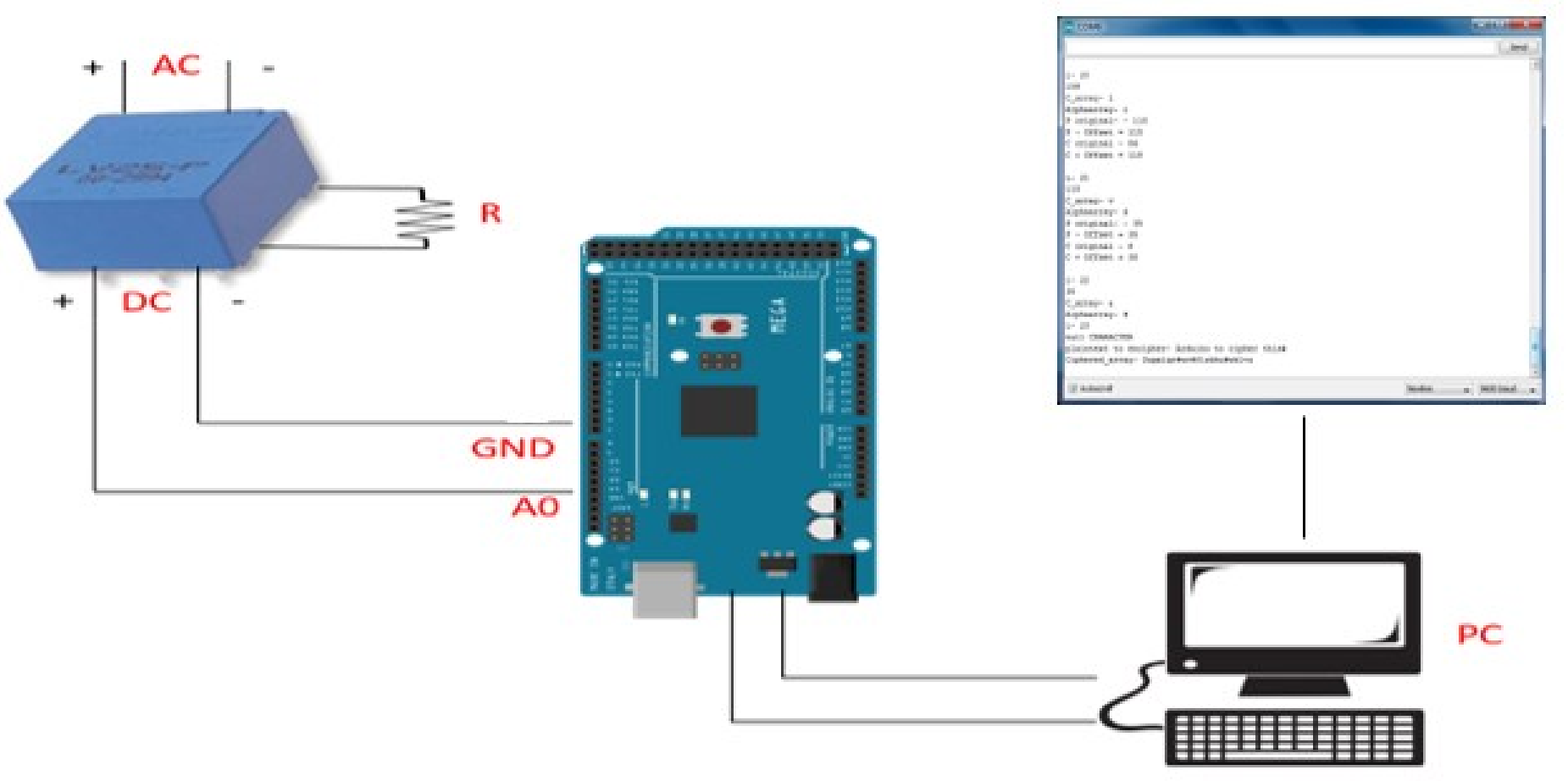
- Did you verify project feasibility?
- Did you verify that all components will be available locally or can be ordered within a reasonable time?
- Did you verify that the required testing can be performed at PMU Labs (instruments and technical help availability?)
- If not where can you get help, test …..

DESIGN: STRUCTURE OPTIONS

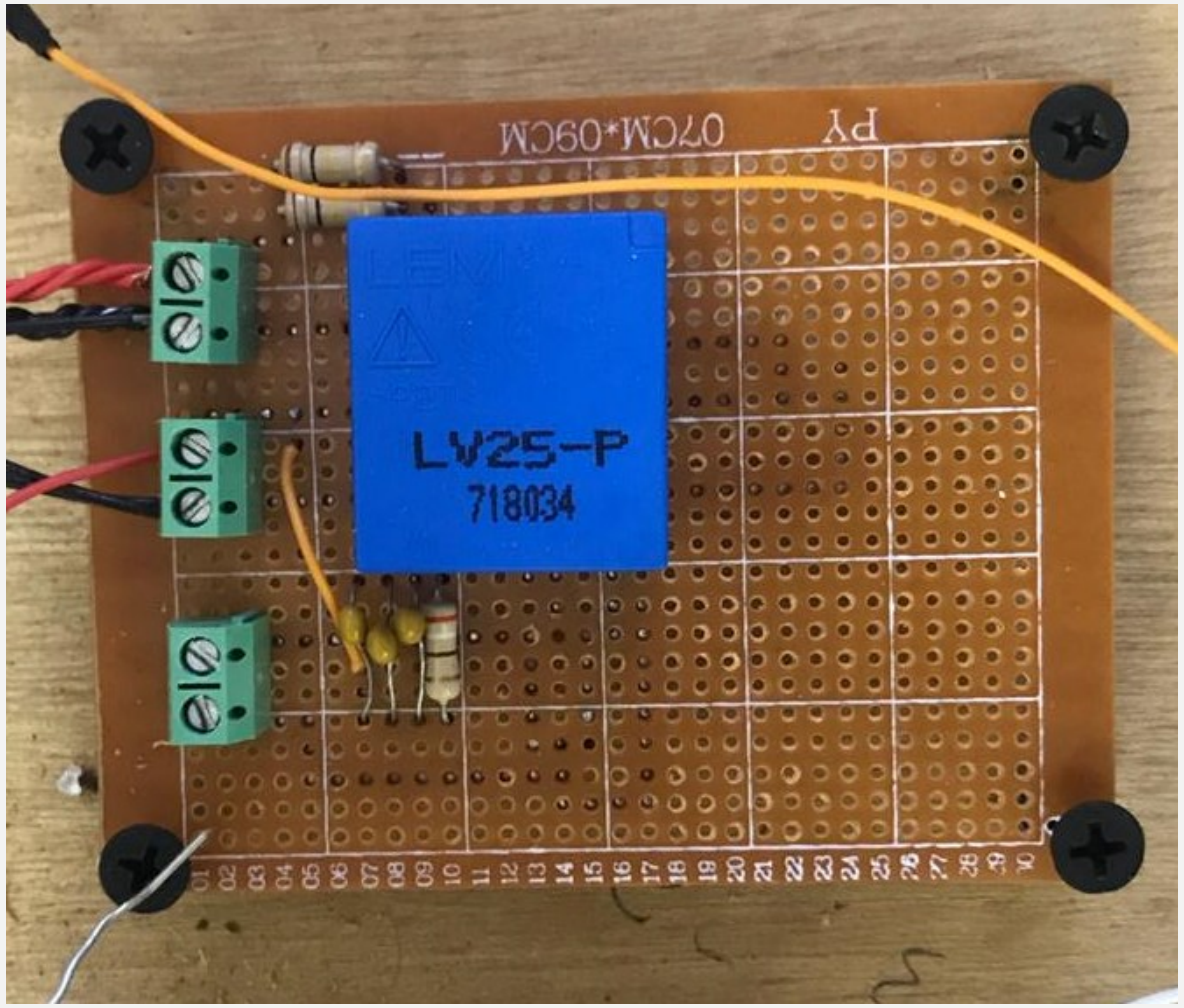


Voltage sensor	Voltage transducer
Cheaper	Expensive
Smaller	Larger
Can take only small voltage 5V – 25V	Can take a huge voltage 10V – 500V

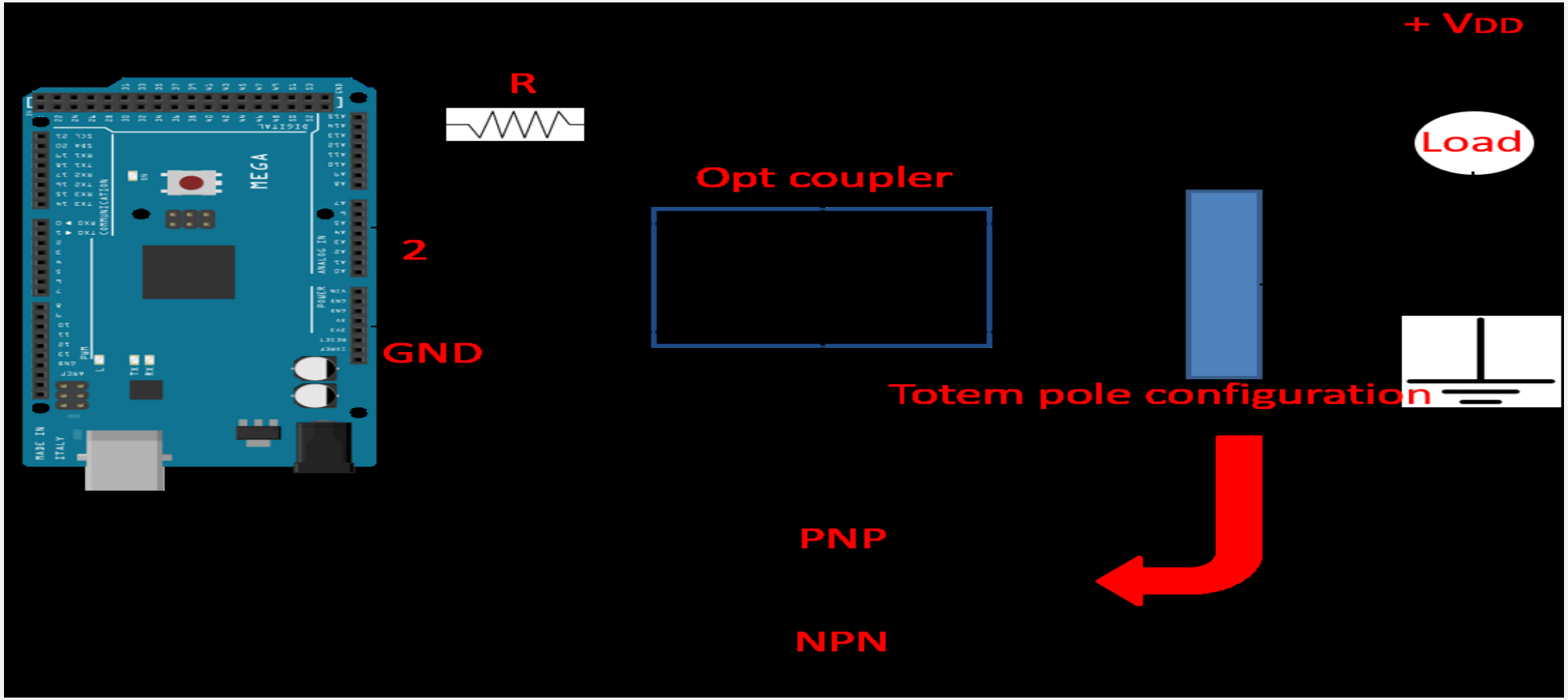
SUBSYSTEM 1: VOLTAGE MONITORING



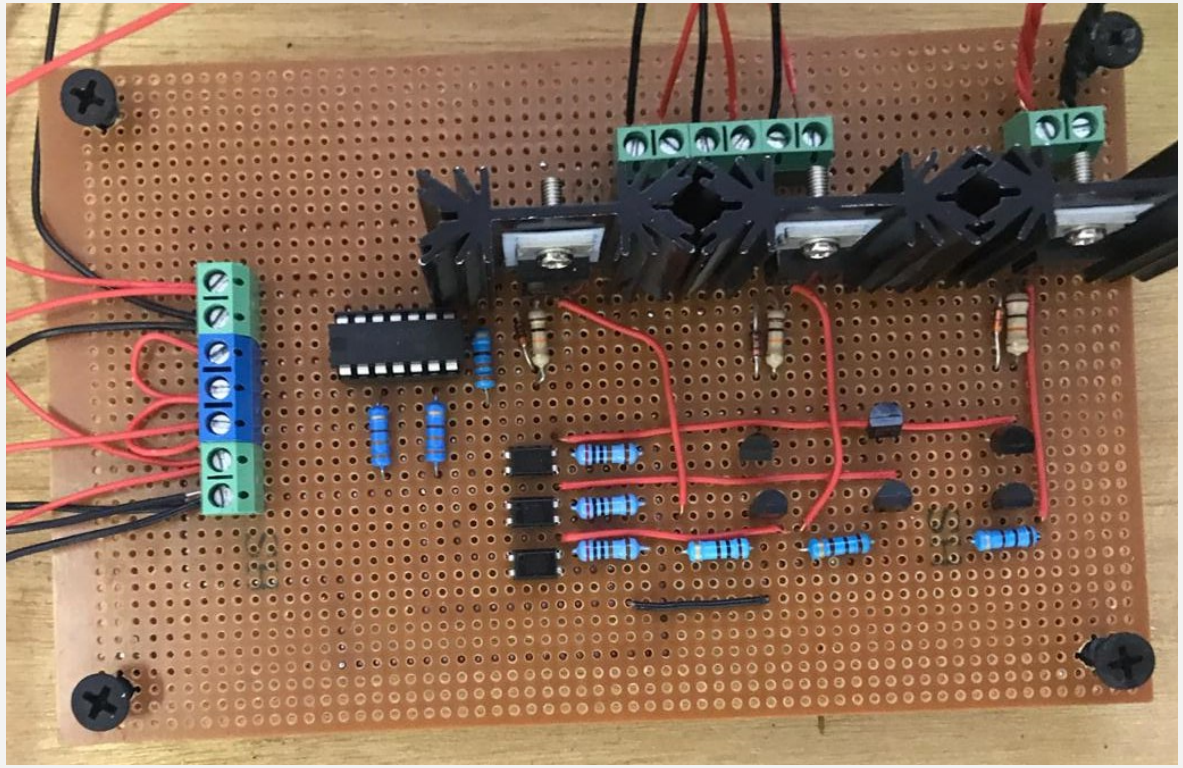
VOLTAGE MONITORING CIRCUITS

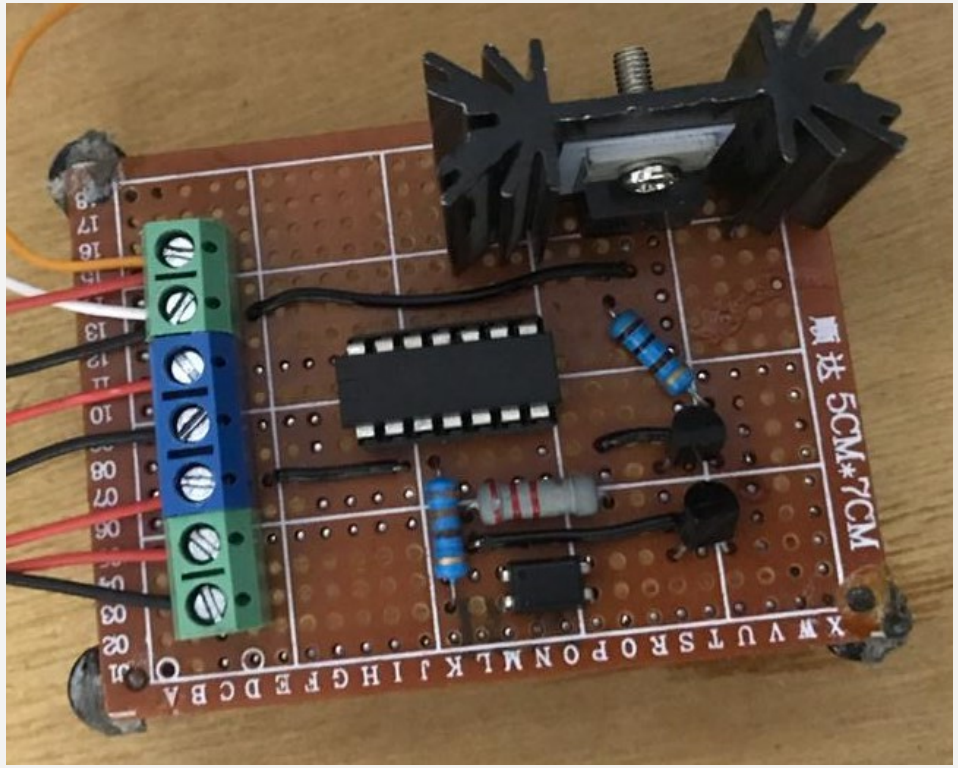


SUBSYSTEM 2 : CONTROL SYSTEM



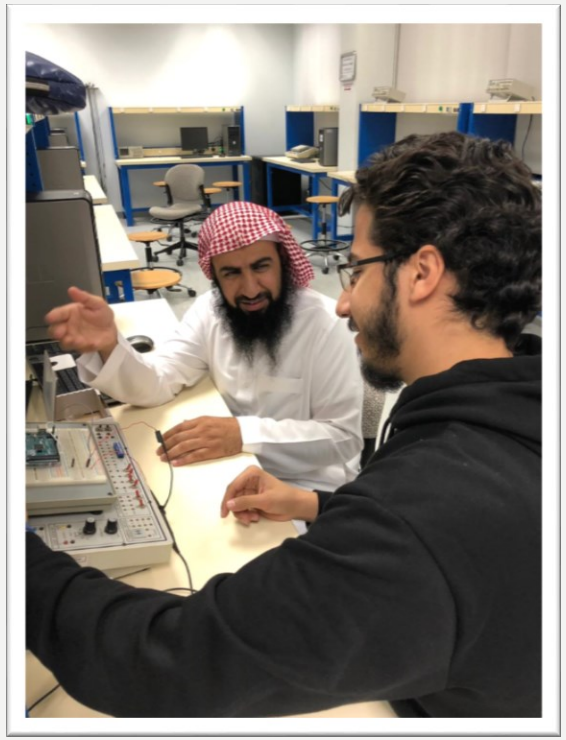
CONTROL SYSTEM CIRCUITS

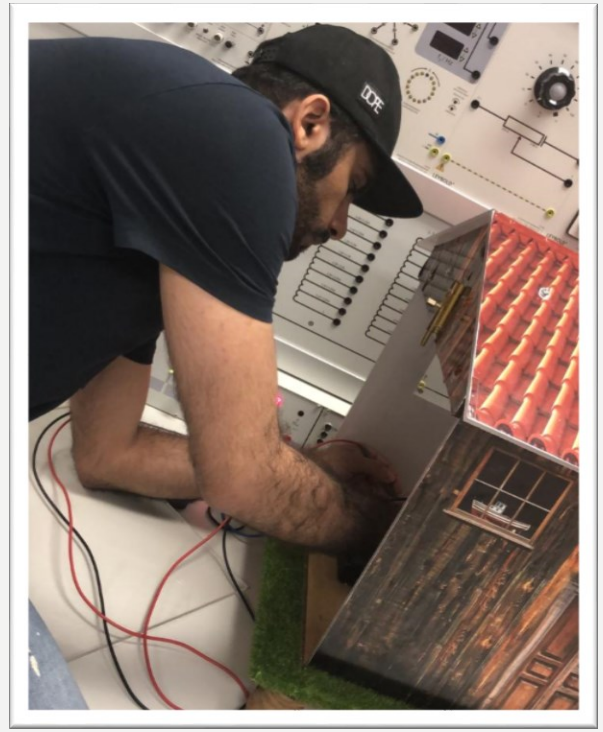




DESIGN: VIDEO FOR TESTING

DESIGN: TEAM WORK





DESIGN: COMPLETED / REMAINING

BUDGET ESTIMATE

Item	Quantity	Unit Cost (SR)	Subtotal (SR)
Microcontroller	1	200	200
Voltage sensor	2	292	583
NAND Gate	2	10	20
IRF 840 (MOSFET)	4	5	20
Resistor 15 Watts	3	7	21
Circuit board	3	60	60
Optocoupler	4	5	20
Smart house prototype	1	800	800
Battery + charger	1	300	300
Miscellaneous			300 SR
Total			2324 SR

REFERENCES

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- http://www.powerqualityworld.com/2011/04/ansi-c84-1-voltage-ratings-60-hertz.html


Thank You