Smart Grid Management System Based on IoT

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Presentation Outline

- Introduction
- Purpose And Motivation
- Objectives
- Methodology
- Required Equipment
- Circuit Diagram
- Project Implementation
- Experimental Results
- Societal And Environmental Impact
- Future Work
- Conclusion

Introduction

- IoT based smart grid system is implemented here.
- ESP-8266 micro-controller is used to control this system.
- Google Firebase platform is used to store data in the cloud.
- An Android app monitors the condition of the grid.

Purpose and Motivation

- Making smart grids more reliable, developed, and efficient to meet consumers' accurate demand without load-shedding.
- Maintaining the balance between production and demand.
- Reducing cost of electricity generation.

Objectives

- To design and implement an IoT-based smart grid management system.
- To ensure the economic dispatch system and lowering generation costs.
- To create a model to help the load dispatch centre make decisions on power plant control and load shedding.
- To store all the data in the cloud for better computation and prediction of load schedule.

Methodology

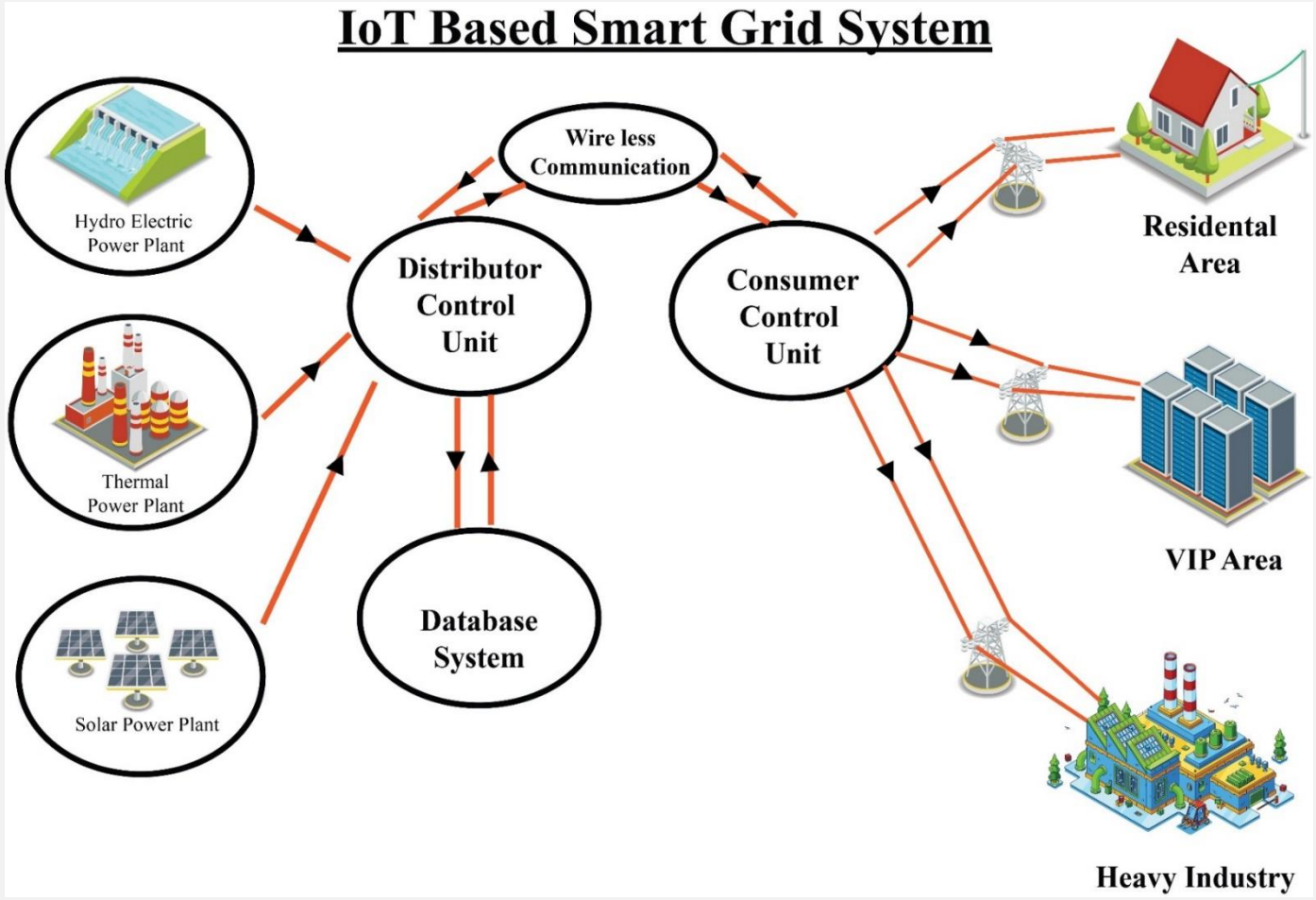

Fig. 1: Flow Chart of the Project

Required Equipment

Fig. 2: ESP-8266

Fig. 3: I2C module

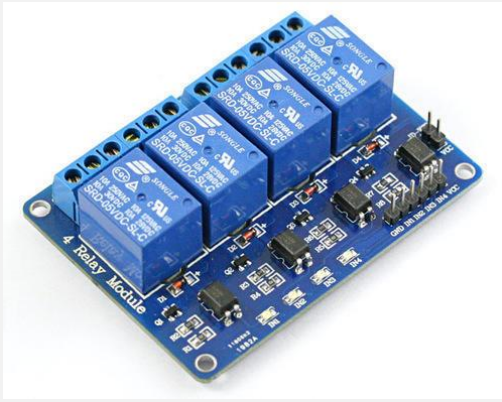

Fig. 4: 4 Channel Relay Module

Fig. 5: Buzzer

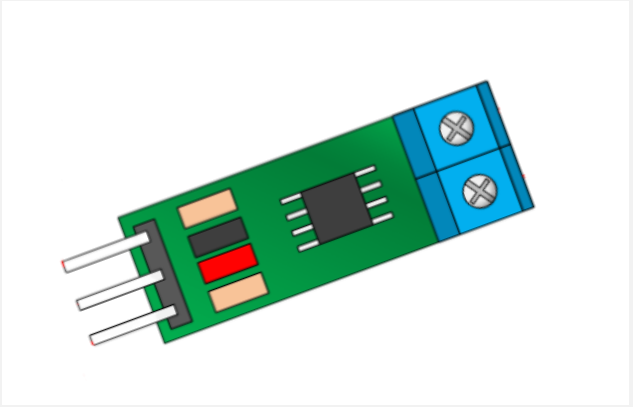

Fig. 6: Current Sensor

Fig. 7: LCD Display

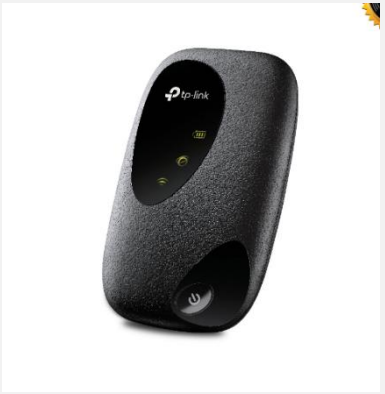

Fig. 8: Pocket Router

Circuit Diagram

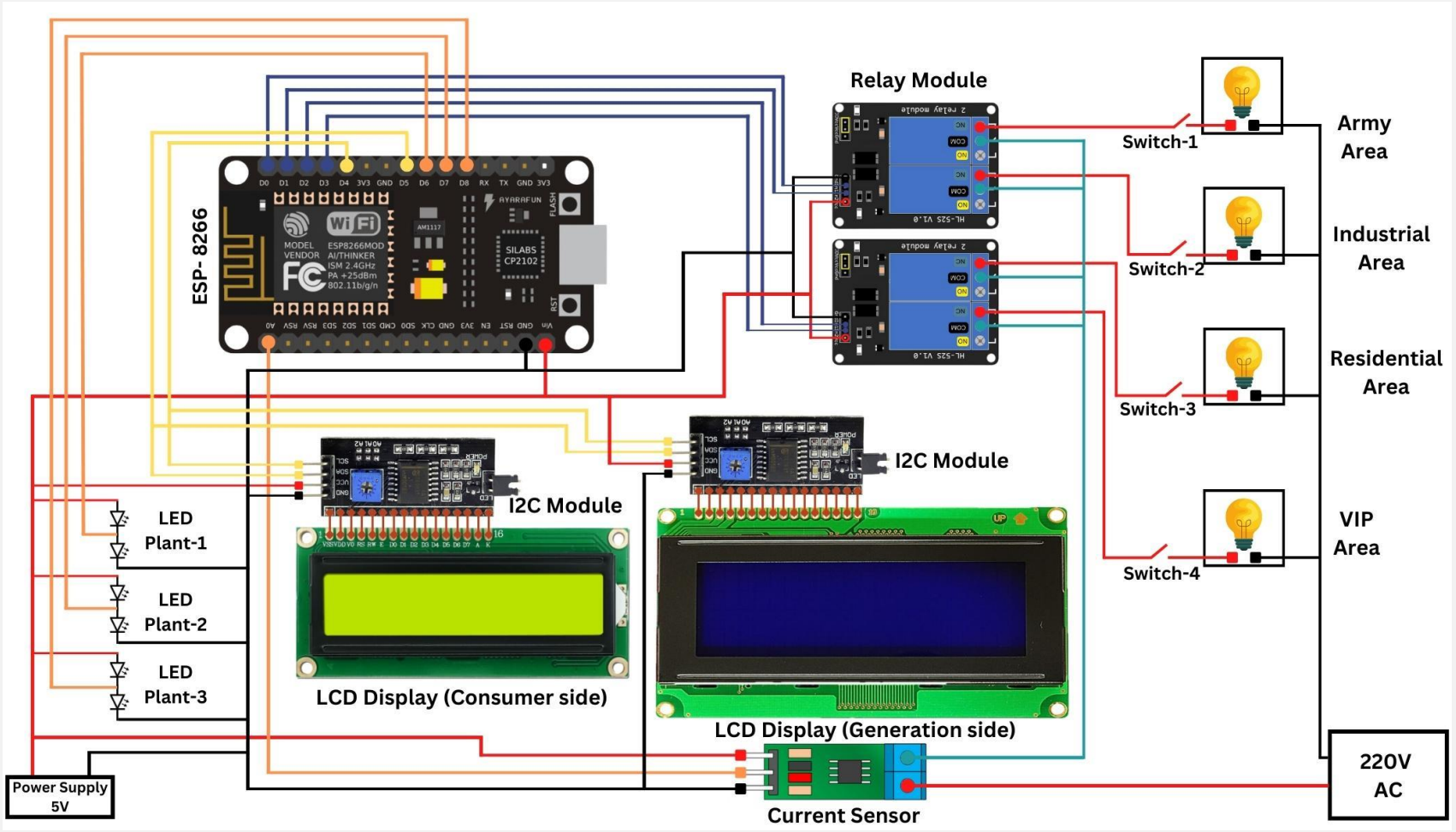

Fig. 9: Circuit diagram of the Project

Project Implementation

Power Plant Capacity and Cost Per Unit:

Power plants	Hydroelectric power plant	Solar power plant	Thermal power plant
Max. capacity	3 Amp	3 Amp	2 Amp
Cost per unit	1.65 Tk.	2.35 Tk.	7.50 Tk.

Load Consumption rate in this project:

Consumer area (listed by priority)	Max. Load consumption	Base load consumption	Ampere rating
Army	400W	200W	2A
Industry	400W	100 W	2A
VIP	100W	50W	1A
Residential	100W	50W	1A

Assumed values that implemented in this project's coding section

Project Implementation

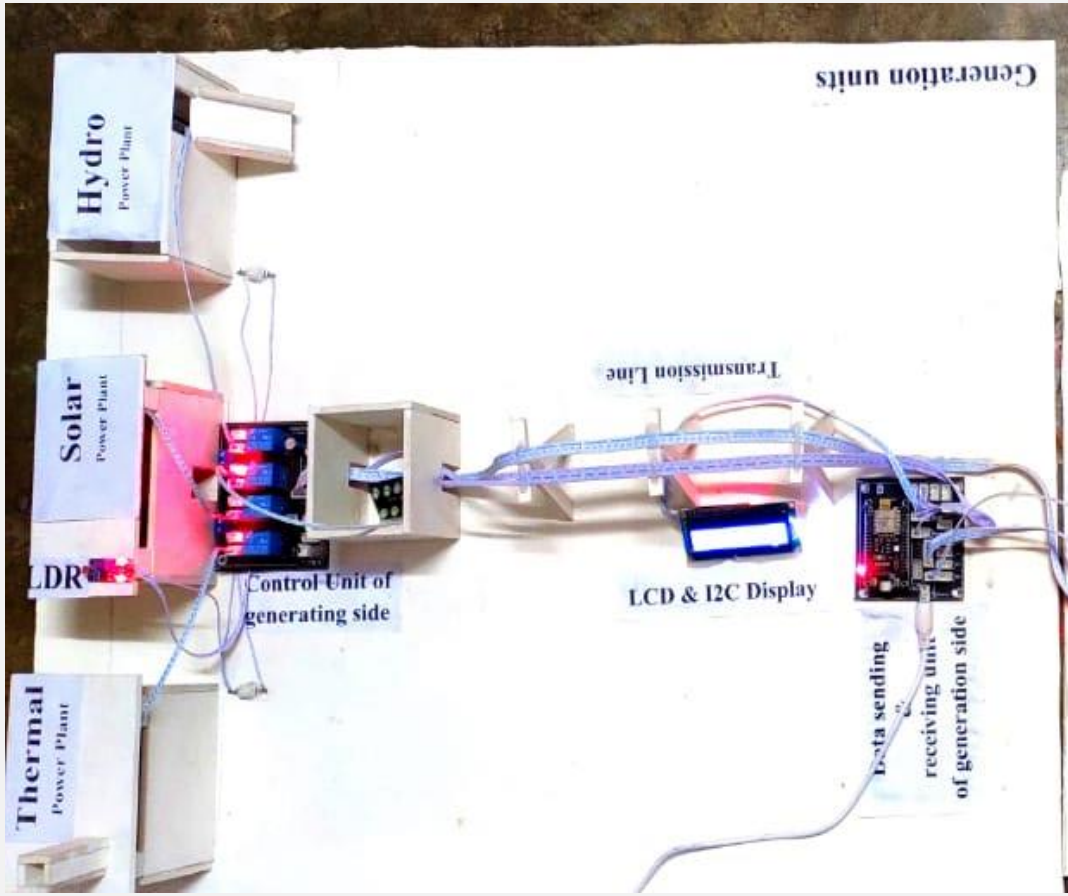

Fig. 10: Generation side of the project

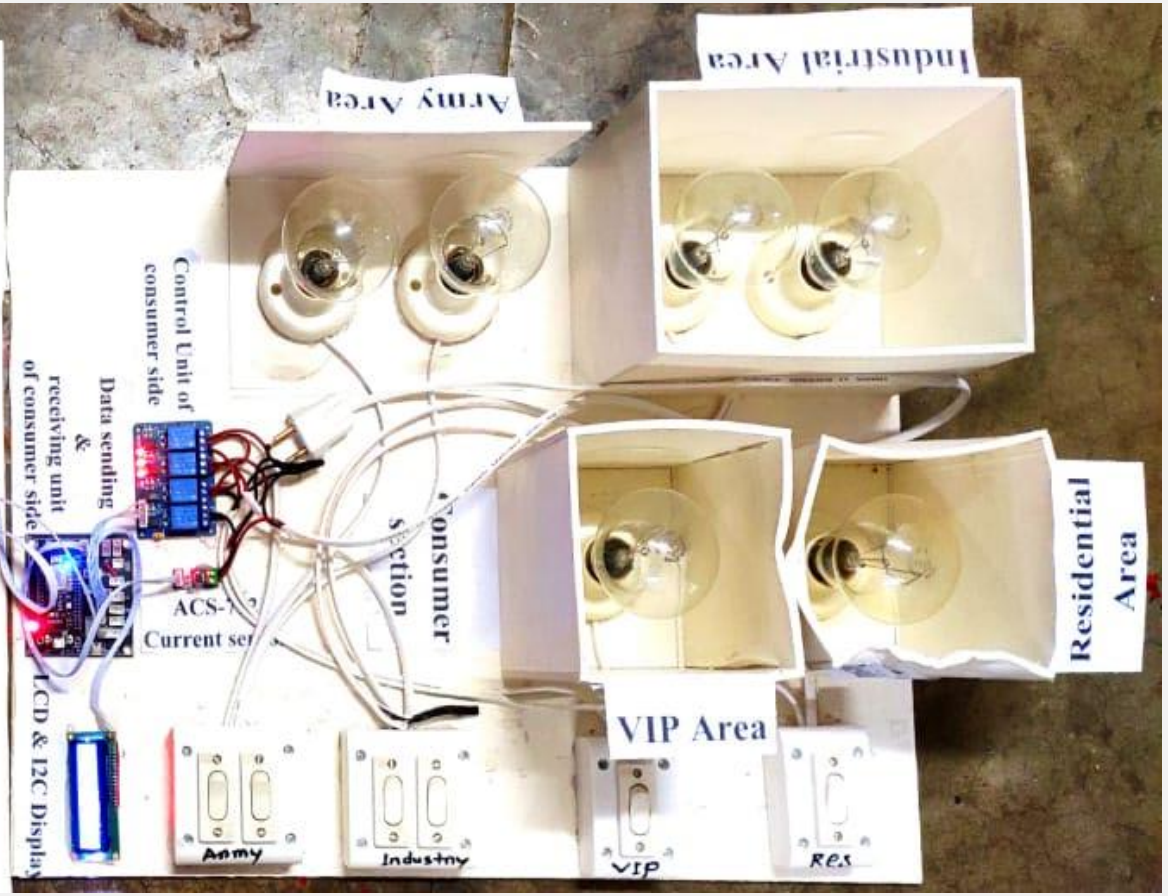

Fig. 11: Consumer side of the project

Experimental Results

Test	Availability of energy source	Consumers load demand	Result
Test 01	**Solar – available** **Hydro – available** **Thermal - available**	Residential- 200W 1 Amp	**Solar – on** **Hydro – off** **Thermal - off**
Test 02	**Solar – available** **Hydro – available** **Thermal - available**	Residential- 200 W VIP area- 200W Total 2 Amp	**Solar – on** **Hydro – off** **Thermal - off**
Test 03	**Solar – available** **Hydro – available** **Thermal - available**	Residential- 200 W VIP area- 200W Industrial – 400W Total 4 Amp	**Solar – on** **Hydro – on** **Thermal - off**
Test 04	**Solar – unavailable** **Hydro – available** **Thermal - available**	Residential- 200 W VIP area- 200W Industrial – 400W Army area – 400W Total 6 Amp	**Solar – off** **Hydro – on** **Thermal – on** **(Residential area under load shedding)**

Experimental Results

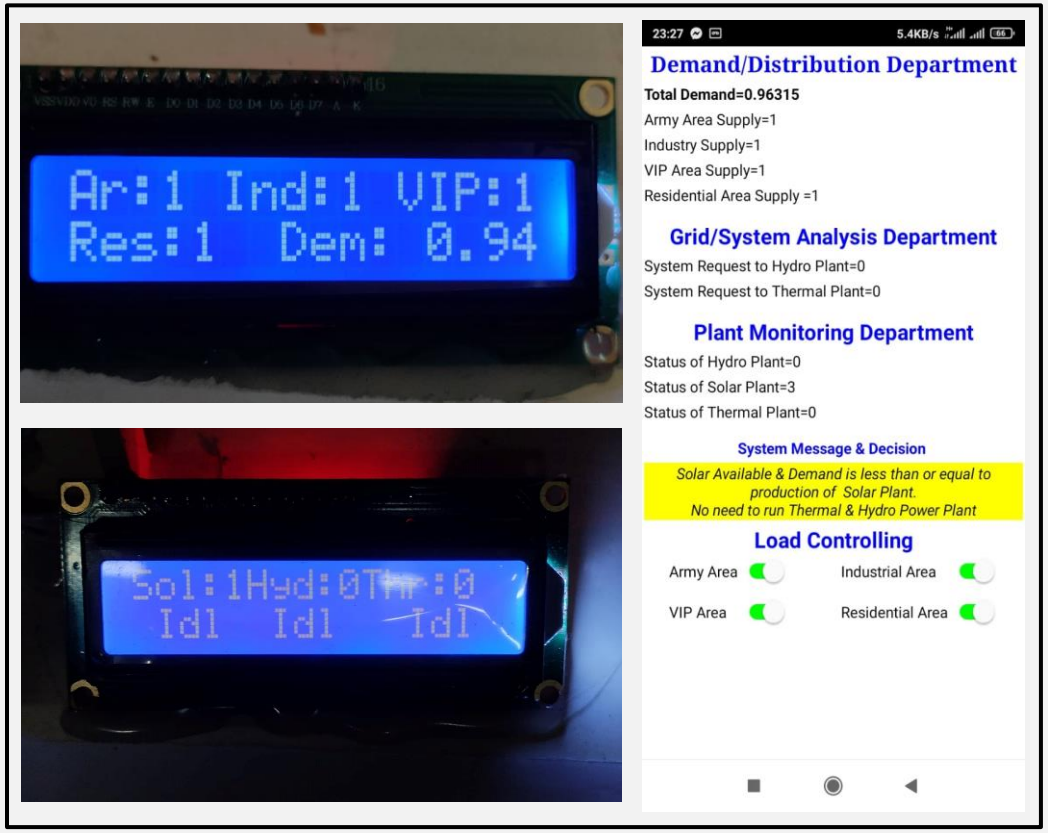

Fig. 12: Supplying Electricity from Solar Power Plant to Residential and VIP Areas

Fig. 13: Supplying Electricity from Solar Power Plant to Residential and VIP Areas

Experimental Results

Fig. 14: Supplying Electricity from Solar and Hydro Power Plant

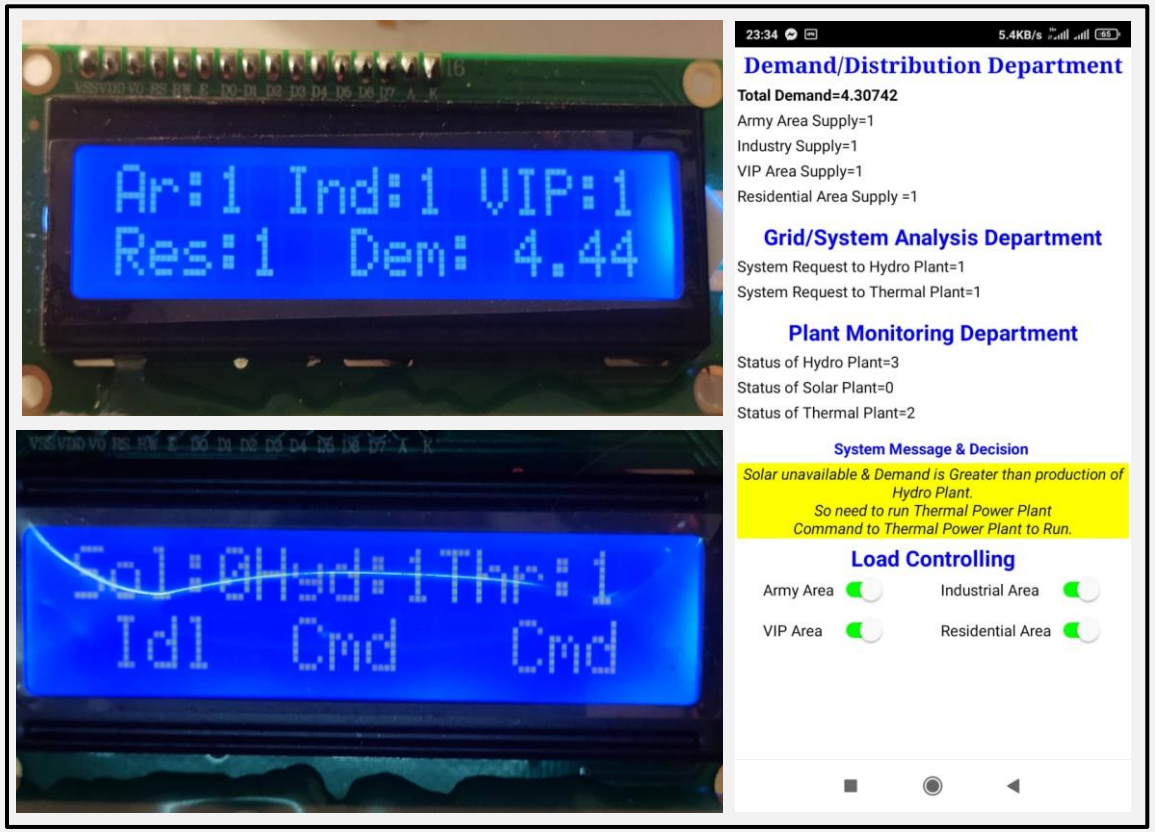

Fig. 15: Supplying Electricity from Hydro and Thermal Power Plant

Societal and Environmental Impact

- This project helps to maintain the low costs of electricity.
- Energy efficiency is increased because resources are used properly, reducing unnecessary fuel usage.
- Utilities stand to benefit from a higher rate of return on capital investment and lower costs.
- It can reduce electricity costs, meter reading costs, T&M operations and maintenance costs etc.

Future Work

I. This project can be more useful to design GPS system which automatically updates the information via SMS into mobile.

II. The complete smart grid network information can be updated/monitored by web site or web portal using laptop/mobile/tablet/PC.

III. Web portal communicates with DCUs in real time for data collection and data processing.


SUSTAINABLE DEVELOPMENT GOALS
1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS
SUSTAINABLE DEVELOPMENT GOALS

Conclusions

I. While incredibly expensive and demanding, these practices can have an equally incredible effect on electricity production and electricity use, consequently improving our effect on the Earth’s delicate ecosystem, securing our electric supply system and lowering electricity costs.

II. With or without the perspective of global climate change, there are many benefits to implementing such a radical change in the electricity supply system.

THANK YOU