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Microgrid Monitoring and Controlling Using PLC

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***Abstract*— Extra loads connected to backup sources should be removed from hospitals and industries. Shedding is unavoidable since overloading could happen if the additional loads are not taken into account. The goal of this project is to create a PLC-based automatic shedding system that will activate when the main generator trips and we need to cut off non-essential. An energy meter will be used to determine the power consumption. This prepaid energy meter is smart. Prior to using the electricity, you will recharge it. It will send a message to your mobile device to inform you of the number of units consumed. PLC (Programmable Logic Controller), Microgrid Systems, Power System Stability, Energy Monitoring, Integration of Renewable Energy.**

I. INTRIDUCTION

India is currently dealing with a severe energy crisis. Even though the country has been dealing with a vitality energy crisis for a number of years, neither the legislature nor the private sector have made any appropriate progress or made any legitimate arrangements as of yet. Due to a lack of proper understanding and implementation, this crisis could worsen. The gap between generation and consumption is widening daily as a result of the industrial revolution and population growth.

Despite strong economic growth and interest in vitality, no steps have been taken to establish new age limits for the necessary vitality sources. With increasing popularity, "load-shedding"—constant power outages—is a common marvel. India's daily electricity consumption is between 15000-20,000 MW, and it is growing daily. There is currently a shortfall of roughly 4000-5000 MW per day because it can only produce 15,000 MW per day. Trade, industry, and people's daily lives are all being negatively impacted by this shortage.

II. ELECTRICITY CONSUMPTION-

Domestic and industrial consumers together make nearly 55% of the total country electricity requirements. Fig.1 illustrates that industrial consumers spend 26% and domestic consumers spend the highest rate which is nearly 43%. [2]

Fig. 2 predicts the demand of electricity in the future with the average rising rate of 8%. With a Gross Domestic Product (GDP) rising rate of 6% and an estimated income elasticity of demand of 1.35 over the period 1998-2013, the growth rate of electricity demand per annum up to the year 2013 is projected to be 8.1%. [3].

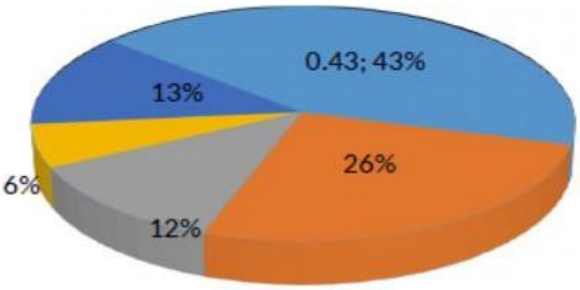


Fig.1.2. electricity demand

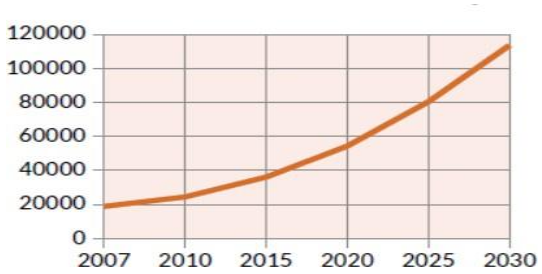


Fig.1.2.3 load demand

III. DEMAND VS SUPPLY-

Indian is recently facing a shortfall between supply and demand of electricity which is about 5500 MW. This shall translate into load-shedding on a large scale in the years to come if this shortfall is not properly addressed.

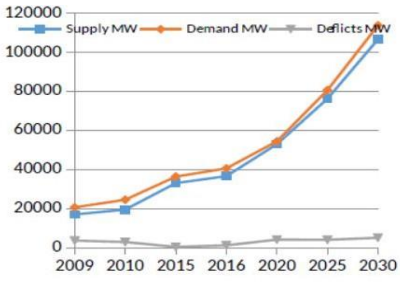


Figure 1.3: Demand vs Supply

Fig. 3shows demand and supply position for the years 2009-2030- [4

IV. PROGRAMMABLE LOGIC CONTROLLER

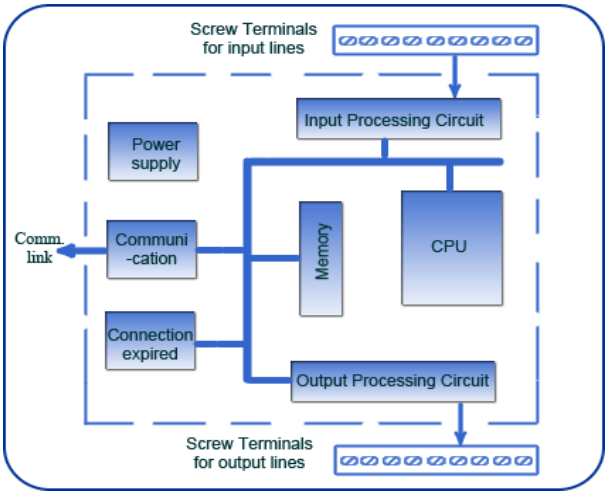


Fig 2 : Processing part of PLC

PLC as a "well working electrical and mechanical assembly which makes use of a programmable memory for the internal storage of instructions by realizing explicit functions, e.g., reason, sequencing, timing, and to drive by computerized or simple I/O modules of various types of machines or processes."

What is a PLC?

Programmable sense Controller(PLC) is an advanced PC currently used for robotization of colorful electro-mechanical processes. These regulators are specifically designed to survive in harsh surroundings and cover from heat, cold, dust, and moisture etc. PLC consists of a microchip that's acclimatized with the help of law. Program is written on a PC and is transferred to PLC through string. These layered systems are stored in non – arbitrary memory of PLC. While shifting transfer control boards to PLC, the hard wired hand-off sense was changed with the program displeased by the customer. According to IEC 61131- 3, following are the conventional PLC programming language

Function block illustration(FBD)
ii. Graduation illustration(LD)
iii. Structured textbook(like Pascal language)

V. SOFTWARE IMPLEMENTATION

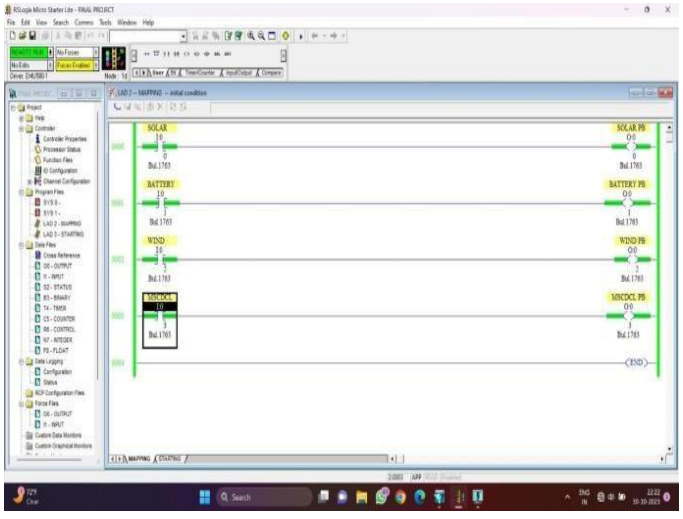
Graduation sense is a programming language that creates and addresses a program by way of stepping coprolite plates that calculate upon circuit arrangements. It's most generally used to make systems or programming for programmable explanation regulators(PLCs), which are used in mechanical systems. The language evolved from being an original system for establishing the plan and elaboration of transfer racks used in assembling and procedure control, with every handoff rack addressed by an image on the stepping coprolite illustration that has correspondences to widgets below them that look like perpendicular rails. The transfer images themselves appear like rungs in a stepping coprolite.

3. How to load the programm.
The whole document must be in Times New Roman or Times fountain. Type 3 sources should n't be used. Other sources can be used if necessary for special reasons.
Recommended fountain sizes are handed in Table 1.

V. TESTING AND EVALUATION IN PLC

Wonderware software are employed in microgrid. Automotive Assembly, installations Management, Food and Beverage, CPG, Mining and Essence, Power, Oil and Gas, Chemicals, Energy, Water and Wastewater.
When an NPN PLC affair is in the ON state, positive current peregrination through the affair device and also to the affair outstation on the PLC and back to ground to close the circuit. With the NPN configuration, the affair device is always handed a positive voltage and is switched ON and OFF when the PLC affair provides a path or prevents the path for current to flow from the affair terminal to base. Because the NPN affair" sinks" the affair device's current to base, NPN labors are also appertained to as" sinking" labors. The PLC configuration used in our design is NPN. This is achieved by short circling the 24V OUT to S/ S indicated in Fig. also short circuit- For switching purpose(ON/ OFF) to power a relay is employed. We can not link Arduino with relay directly because since Arduino contains ATMEGA328P processor and its legs are able of supplying roughly 25mA, Processor legs contain high effective resistance and a high voltage will" drop" since adding current will be taken and a low voltage will increase as cargo.

Fig 4. Testing and Evaluation of PLC software.



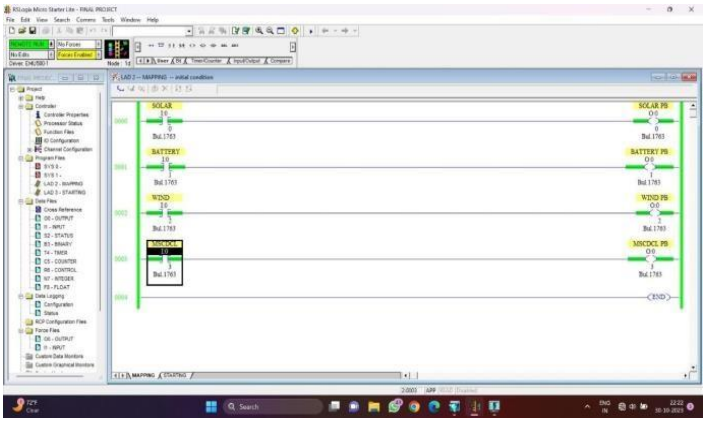


Fig.6.1. first condition

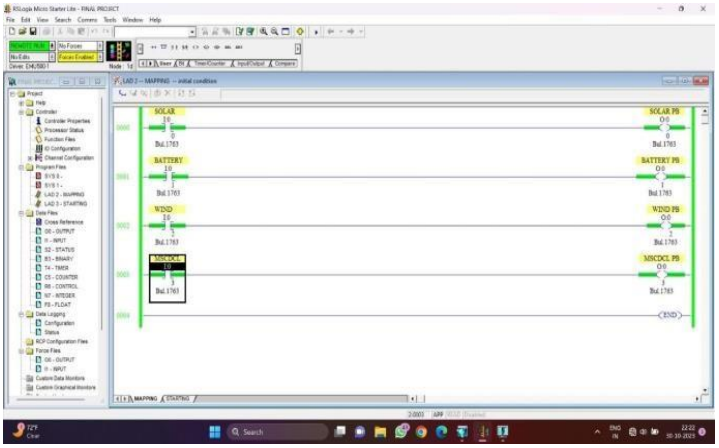


Fig.6.2. Second condition

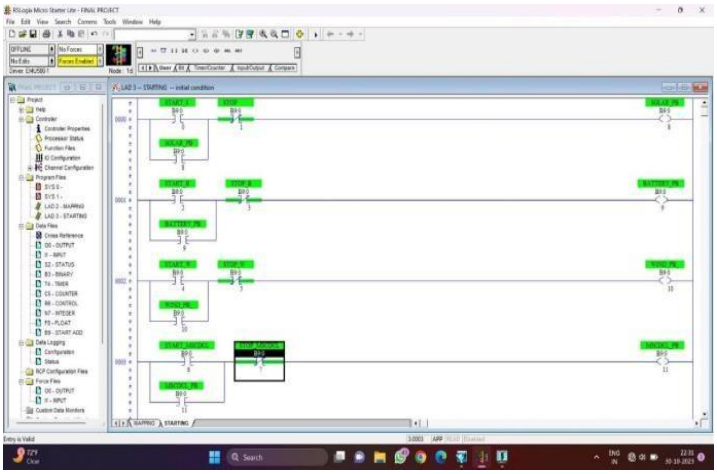


Fig.6.3. Three condition

The Wonderware software now known as AVEVA is applied across multiple industries, including: Automotive Assembly, Facilities Management, Food and Beverage, CPG, Mining and Metals, Power, Oil and Gas, Chemicals, Energy, Water and Wastewater.

VI. INTERMEDIATE RESULTS

The PLC is a hardware device in the SCADA system that reads sensors (inputs) and activates control devices (outputs) when the set parameters of the system are met. Due to its ability to monitor data remotely and exercise logical control, PLC-SCADA architecture is employed as a primary automation tool in power industry in contemporary times.

Sr. no	Solar 10 watt	Wind 5 watt	Battery 84 watt	MSDCL 60 watt	Total G. Watt	Load			
						7 watt	9 watt	40 watt	60 watt
1.	OFF	ON	OFF	OFF	6.1	ON	OFF	OFF	OFF
2.	ON	ON	OFF	OFF	15.66	ON	ON	OFF	OFF
3.	ON	ON	OFF	ON	57.06	ON	ON	ON	OFF
4.	ON	ON	OFF	ON	70.49	ON	ON	ON	ON
5.	ON	ON	OFF	ON	80.44	ON	ON	ON	ON
6.	ON	ON	ON	ON	105	ON	ON	ON	ON

Table 1 . Intermediate Result

VII. CONCLUSIONS

The design is enforced virtually in diligence and in domestic colonies from further than one source. In tripping situation, only designated loads are shut down and not the whole system. This helps to help a great quantum of losses. It also minimizes the mortal intervention and give applicable and prompt automatic system. There's a inflexibility in precedence list that through which loads can be shut down as per the demand of diligence. System covering i.e. which source is tripped and which loads are shut down is carried out through suggestion lights installed on electric panel. The possibilities of overfilling are avoided and there's a protection scheme that prevents from any type of fault. colorful primer and tackle cadence have been designed. still, the use of GSM in this particular structure provides some advantages over styles that have lately been espoused. Data transmission is billed at normal SMS rates; therefore the freights are n't grounded on the length of data transmission.

The cost saving transmission of readings ensures control application esteems can be transmitted more constantly from time to time to a remote station. The counteraccusations of having the capability to transmit readings more frequently are that energy serviceability will most probably induce timely bills, understand energy request patterns more, manage cadence failures more and manage fraud more. The frame likewise presents significantly lower of a peril since mortal cooperation has been limited. The created bill is

available as SMS at the time of age itself and published clones are available to the buyer as postal correspondence. A soft dupe can be transferred to the buyer's correspondence if client is registered with his dispatch address.

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