KURDISTAN ENGINEERS UNION

SMART POWER SYSTEM MANAGEMENT AND CONTROL OF WATER STATIONS OF GARMIAN REGION IN IRAQ BY USING MICRO GRID

THESIS

IN

ELECTRICAL AND ELECTRONICS ENGINEERING

BY

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DECEMBER 2018

Smart Power System Management and Control of Water Stations Garmian Region in Iraq by Using Micro Grid

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Sadeq Mohammed Ameen Saeed AL-BAJALAN

ABSTRACT

SMART POWER SYSTEM MANAGEMENT AND CONTROL OF WATER STATIONS OF GARMIAN REGION IN IRAQ BY USING MICRO GRID

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. December 2018, Pages 43

In this thesis, we have developed a power management system to optimize the power of water station in Garmian (Iraq). A novel approach has been proposed for control of the flow of power in the micro-grid network. The proposed approach includes the typical five microgrid key elements such as micro sources (energy sources), loads, storage devices, and control elements, and point of common coupling. The goal of designing such a system is to provide interruptible high-quality power to sensitive loads in assured area. A model for this goal has been developed and simulated by MATLAB/Simulink programming. Also, smart power management of water station has been designed by using the external controller for Garmian region in Iraq.

Key words:: micro grid, diesel engine, photovoltaic panel , PLC, Xp builder software.

Dedicated to

"To my dear all family"

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Garmain water stations located in Garmain Governorate in northern Iraq consists of a number of plants to filter water and the number of deep wells for drinking as shown in below Figure1.1. And images were shown in terms of number and production water to consumers. For being Garmain Governorate, which covers an area of 120 square kilometres, a component of the fourteen cities and seven hundred and fifty villages and a population of about four hundred thousand people. Note that the energy needed to run water stations in Garmain medium ranging from (50-100)kW for being a very wide area there is electrical problems and maintenance of private stations in terms of quality and energy cost.

Because in Iraq in general in northern Iraq, and in particular there such as electricity ten hours a day and the system of stations where reprocessing and storage and push the water to the water stores and pay consumers to that outage problems and the electricity needs of the work schedule for the project and the costs of the project work a major goal of this work is to meet the energy electric continuously filtered water stations where some devices that must operate through water analyses before the arrival of water to consumers.

Garmain means that the region has a suitable mostly sunny in the four seasons a large area and the conditions of the environment where the air, and for this purpose you study the formation of the new system how management consisting of linking four systems (Photovoltaic, Storage Battery or Battery Bank, Diesel with the National Electricity) and the control and management of intelligent project. electric generating met the needs of water Garmain stations as shown in the search.

electricity distribution problem continuously solution and organization costs need to be intelligent control system Microgrid. For that reason smart management power for water situations Garmain using PLC programming LG XG5000 to work four systems type according to the conditions required as a regular intelligent way automatic and programme XP Builder simulation construction and appearing all cases at the screen to see any unity in action and surveillance all cases holidays to take the information on the screen of the Note and maintenance and problems.

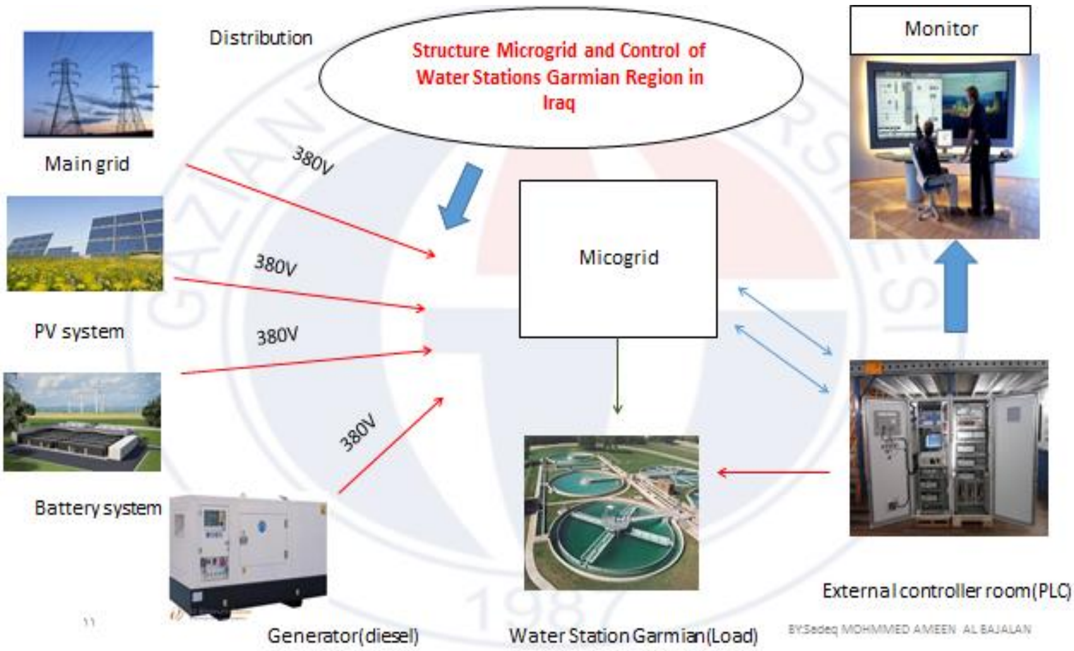


Figure 1.1 Structure microgrid and control of water stations garmian region in Iraq

1.2 Objectives of the Thesis

A system microgrid equips with intelligent elements from smart grids has been relied and energetic control of micro sources energy resources is included in such smart microgrid(PV, Storage Battery or Battery Bank, Diesel with the National Electricity).nevertheless, finite studies are available for reconnaissance the economic incentive of participants to become entangled in a microgrid. Therefore, this thesis goals at addressing this gap via considering the consumer engagement and their interaction based studies on it constantly deal with only one of has many facets in their simulation or experimental appearance These aspects include power sharing modes among macro sources, microgrid control during grid-connection mode, microgrid control during the island mode, and microgrid stability enhancement. The work defined for this thesis aims to thesis all aspects in the microgrid operations area and combine them into one analytical framework in order to gain a full understanding of how microgrids behave under different loading and operational conditions. A key objective of the project management and how to control it a smart way to works stations overall, the objectives of this thesis can be summarized as follows.

 To reinforcement load sharing techniques between micro sources based on their powers.

 To model the Basic components in a 3Ø microgrid. This includes renewable energy systems (specifically PV systems) chargeable battery and diesel, 3 phase inverters, 3 phase Phases Locked Loop (PLL), pi(Proportional integral) controller, dq transformer, SV PWM(space vector pulse modulation), point of common coupling and balanced.

 To describe, develop and demonstrate control strategies based on local measurements that will ensure reliable and efficient operation of a balanced 3 phase low-voltage microgrid during both grid-connected and islanded modes.

 To simulate the complete model in Matlab/Simulink in order to verify the of the activity proposed control voltage from microgrid. Control and management the microgrid, develop and control external using based on PLC (programmable logic controller) with xp builder program to make programmable to interrupt power and dispatch.and Show all alarm on the systems on the screen.

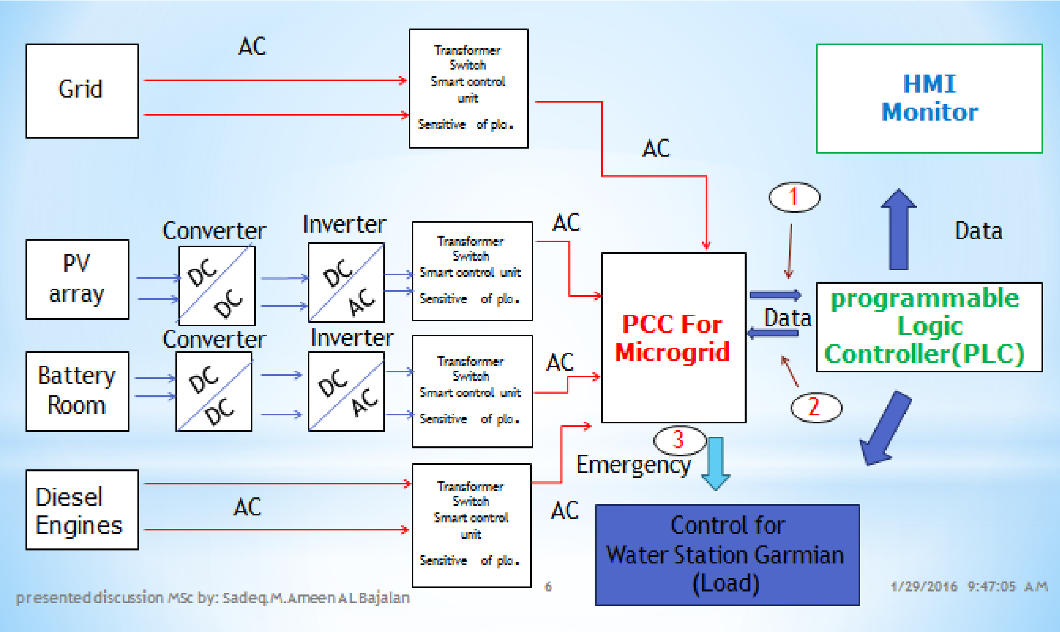


Figure 1.2 Digram of smart control of water stations garmian region in iraq

1.3 Motivation of the Thesis

Technology, incentives to change the features and facilities to generate central generation on the environment, electricity, transportation and control over the management and control of a sophisticated method of work and costs as well as the level. To reduce the loss of traditional economies, and converge to a smaller, more distributed generation part in class generation league includes a wide range of the main engine, such as the internal combustion techniques (IC) engines and batteries banks, PV, and diesel. These emerging technologies have the potential to be less expensive eliminates the traditional-sized economies. Applications include energy subsidies in the sub-stations. And it located a small-sized generator usually at the sites of users to take advantage of the power generated to meet the growing needs of customers a high degree of reliability and quality of power. Since local loads close to the interval, and generators, and sometimes in the same building, and it can be used as well as waste heat into electrical energy. Most of the existing power plants are the central electricity generating stations or distributed. It provides electricity to users in the locations of fuel for electricity generally in the range of 28-32% efficiency. This represents a loss of nearly 70% of primary energy provided by the generator. There are a few ways to reduce this energy loss: to increase fuel efficiency in electricity generation and / or the use of waste heat station. The growing need to reduce carbon emissions makes a great Microgrid more attractive. Microgrid has the potential to reduce emissions compared with centralized tool systems. Many countries and research groups have in Microgrid projects and how to deal Mahahnak number of economic and technology smart way.

1.4 Contribution of the Thesis

Implementation coordinator for the design of Microgrid and communication between the four systems (PV, storage battery or battery bank, with the national diesel). Using clever techniques PLC(programmable logic controller) to obtain a stable system management by an intelligent way. The purpose of solving the problems exposed in the transfer of electricity distribution and reduce the cost optimization to reduce costs and control the distribution and transmission of electricity in the regular shape in order to provide the required target process.

CHAPTER 2

SIMULATOR STUDIES

2.1 System Model of migrogrid

Power plant water-Germain of four systems hybrid system calls MG as shown in Figure 2.1. User controls an external intelligent way through electrical switches and so sensitive to the use of the flow of energy through the medium PLCxg5000 design a special unit to control the flow of energy to power management smart to feed the station water Garmain controller is shown in Figure system 2.7. Devices used programming automate electromechanical processes logic controller. PLCxg5000 system in this transformation process from a network of cash precise load control is a crucial element and smart with a power outage at the forefront of power. The data that appears in the panel XGT. And is moved Panel XGT and displays a variety of information through a program xpBuilder interaction between the machine and human build simulation by a key used, editing tool, and resulted in the switch, digital / text on output devices on the screen lamp to simulate a clear and intelligent management and inputs for the operation of four systems for feeding water station Garmain is shown in Figure 2.8 Under conditions and observers (the battery charger and the load, water and oil for the generator, the voltage and frequency in each system and cost).And shown in the Figrue 2.5,2.6 the simulation of control micrgrid.

The Simulation model consist of the following components:

• For design, the control system by the programmable logic controller PLCxg5000 model used Relay Smart, timer and anther tool of program in side the plc XG5000 that through switch is shown in Figure system 2.7

• For design to appear operation and result in simulator of microgrid and output the PLC ON Monitor by used one of program Human Machine Interface is XPbuilder. is shown in Figure 2.8

- Utility grid 25e3kv,50Hz, transformer, three phase series RLC branch, Main Switch to change between Grid-connected and islanded modes.
- Photovoltaic nominal voltage V=380 [V], power100-kW,F=50HZ,universal bridge2(IGBT), three phase series RLC branch, three-phase breaker3,Diode mask, transformer is shown in Figure 2.2
- Battery storage, Capacity= 75kAh nominal voltage V=380 [V], F=50HZ. Universal bridge (IGBT), three phase series RLC branch, three-phase breaker3, Diode mask, transformer. is shown in Figure 2.3
- Normal diesel generator system, three phase series RLC branch, three-phase breaker3, three-phase breaker3, transformer. is shown in Figure 2.4
- Eleven buses (A, B, C, D) and MG controller.
- The point of Common Coupling(PCC), and load(water station Garmain).

Table 2.1 System Parameter

model	**Parameter**	**Value**
PV Array	Open Circuit Voltage(V_{OC}) Short Circuit Current(I_{sh}) Voltage at MPP(V_{max}) Current at MPP(I_{max})	64.2V 5.96 A 54.7V 5.58A
Grid	Voltage(V_{gabc}) Frequency(f) Impedance((R_f), (L_f))	220V_{rms} /L-N 50Hz 0.12mΩ,54μ
Battery	Battery Type Nominal Voltage(V_{bat}) Rated Capacity(Ah)	Lithium-Ion 125V 600Ah
diesel	Voltage(V_{gabc}) Frequency(f) Impedance((R_f), (L_f))	220V_{rms} /L-N 50Hz 0.12mΩ,54μ
Load	Active power P Capacitive reactive power Qc (negative var)	90Kw 33Var

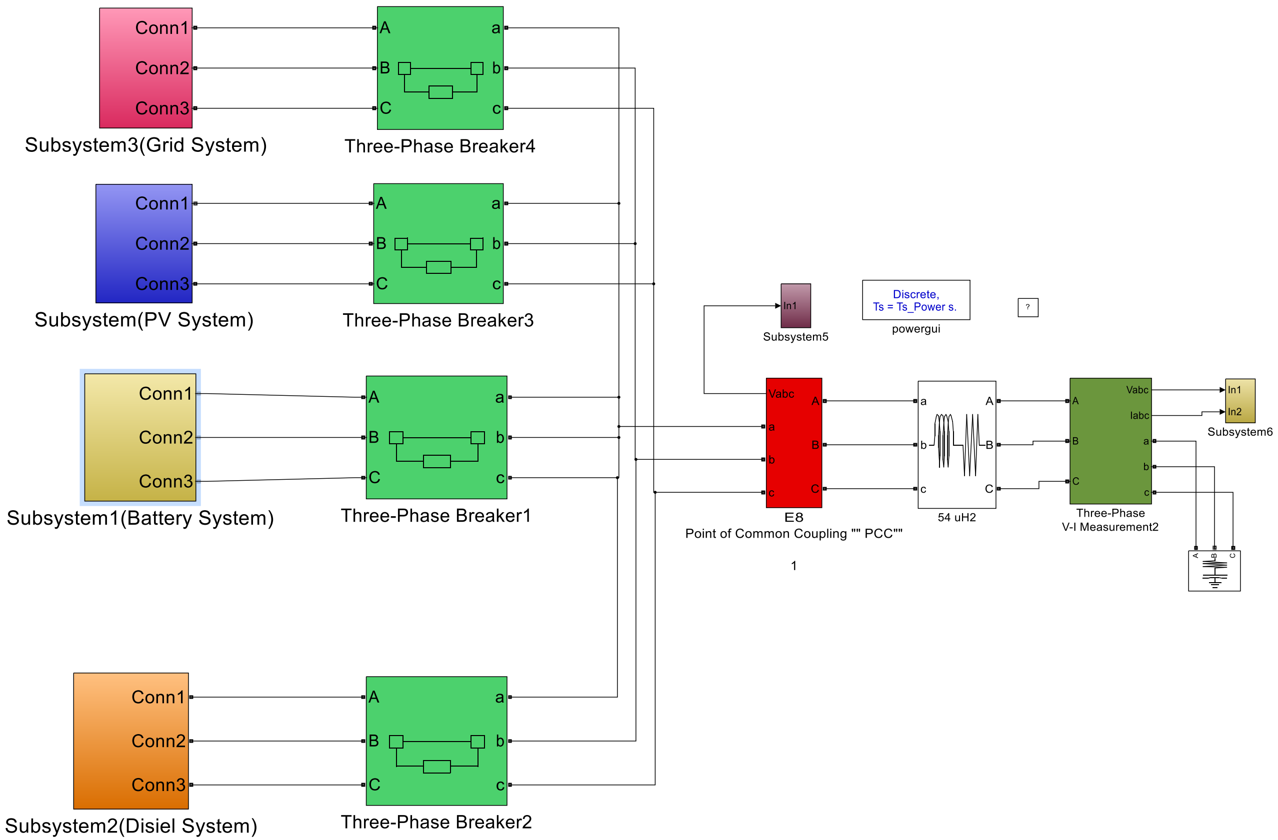


Figure 2.1 Simulation model Microgrid

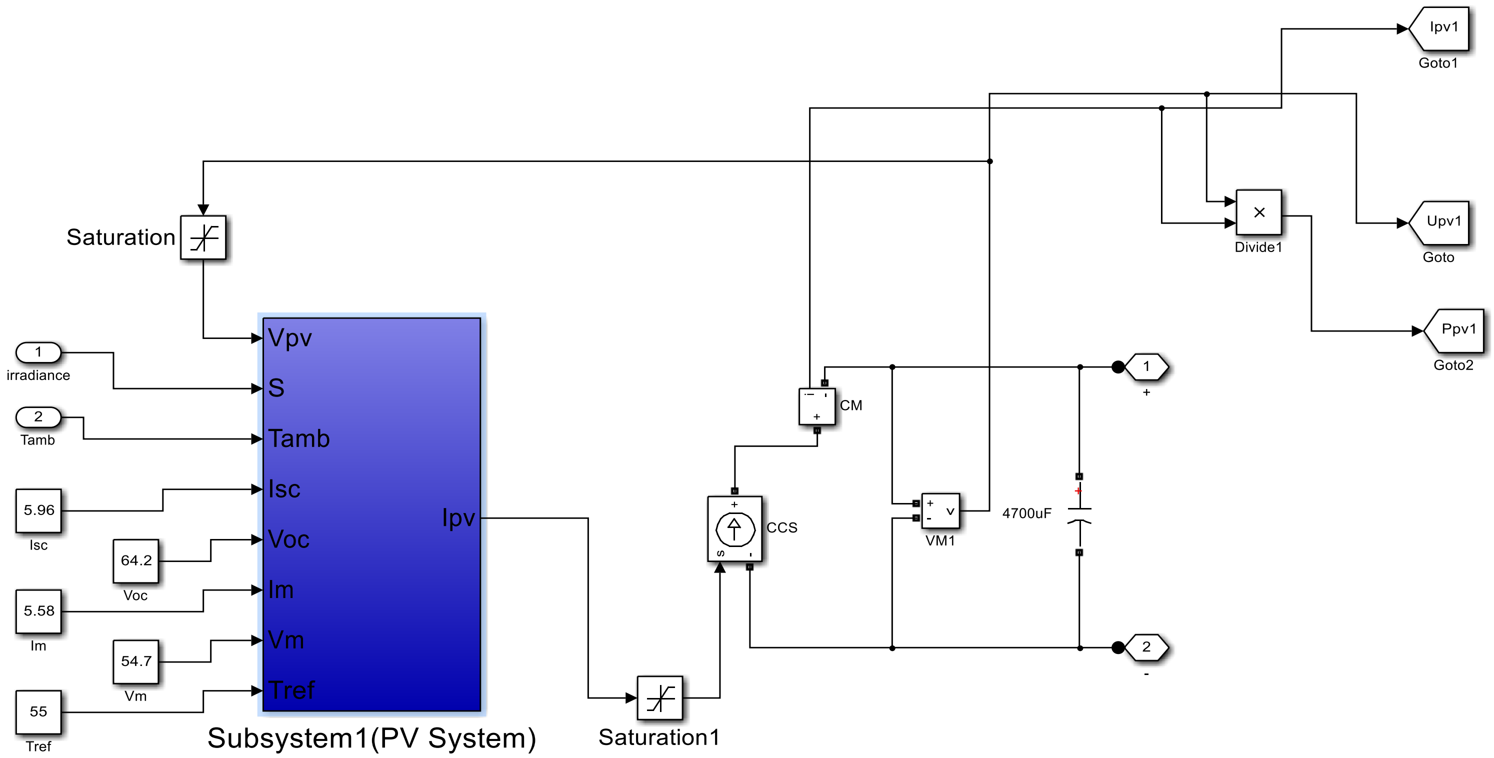


Figure 2.2 Simulation model PV

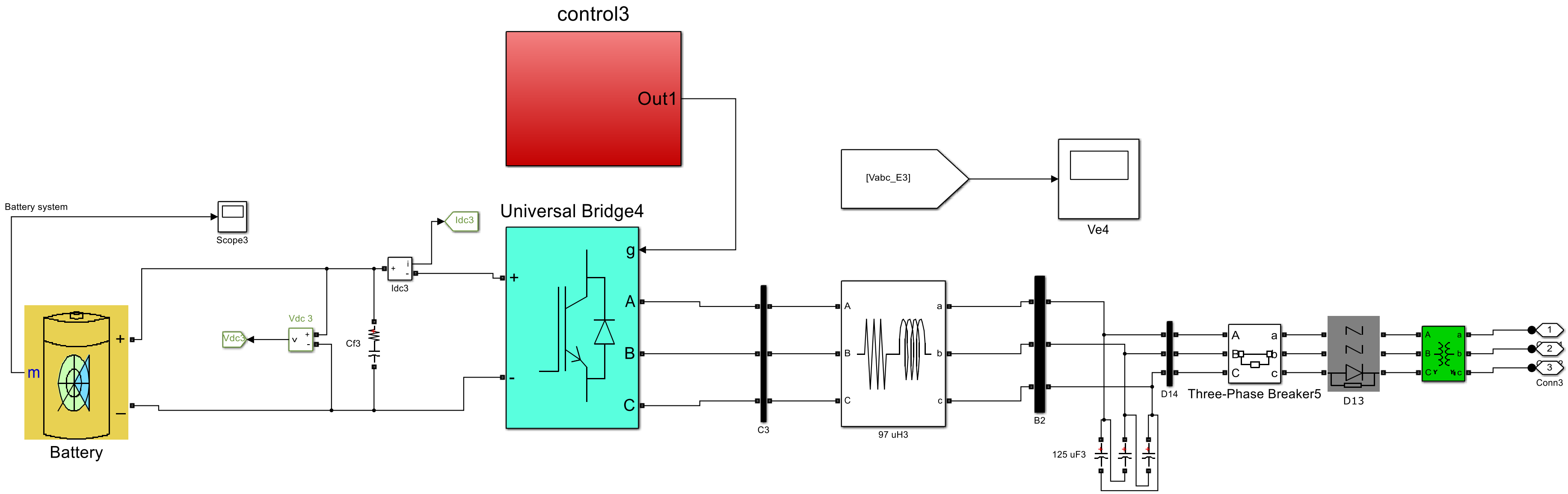


Figure 2.3 Simulation model Batterry

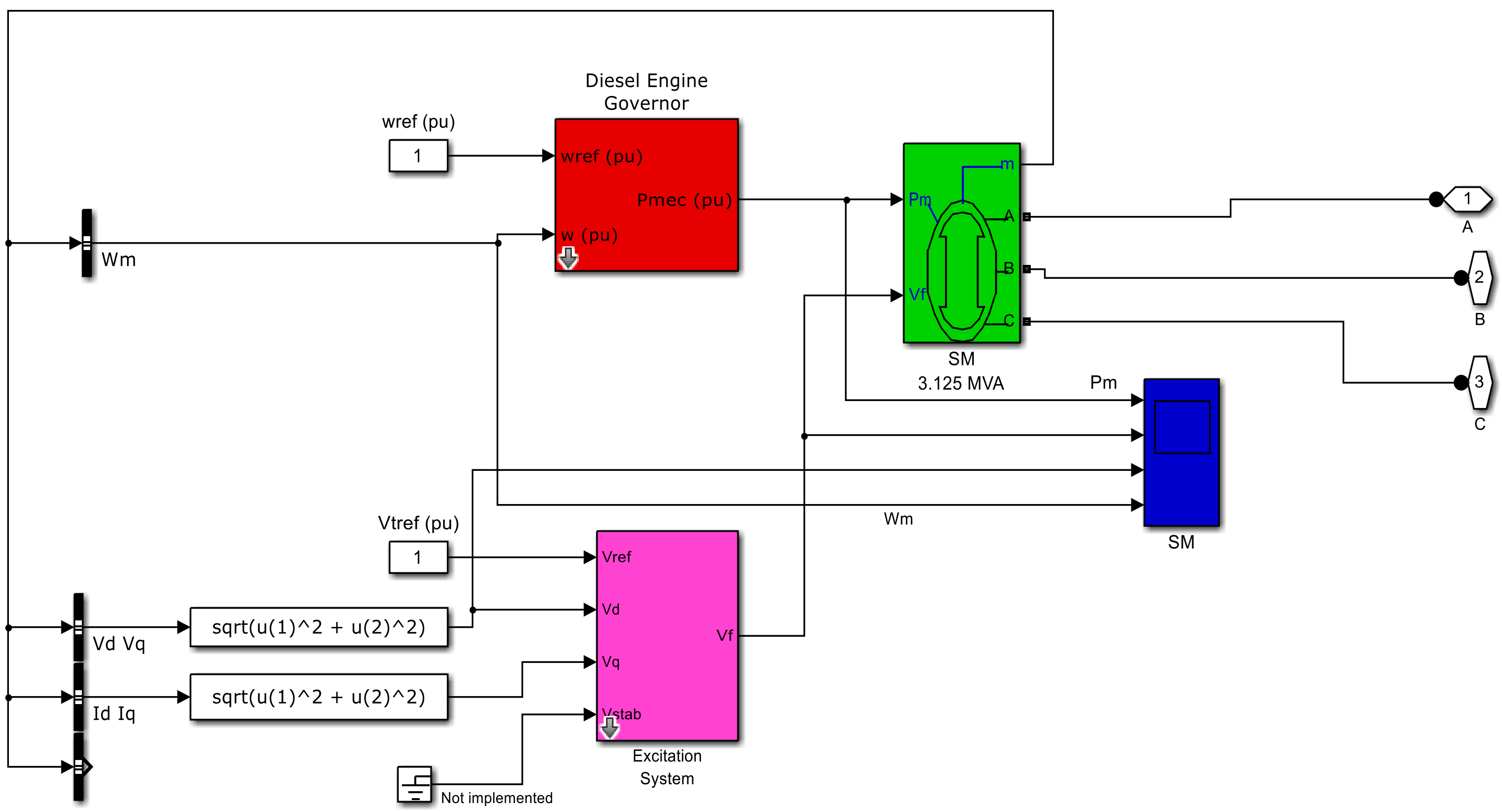
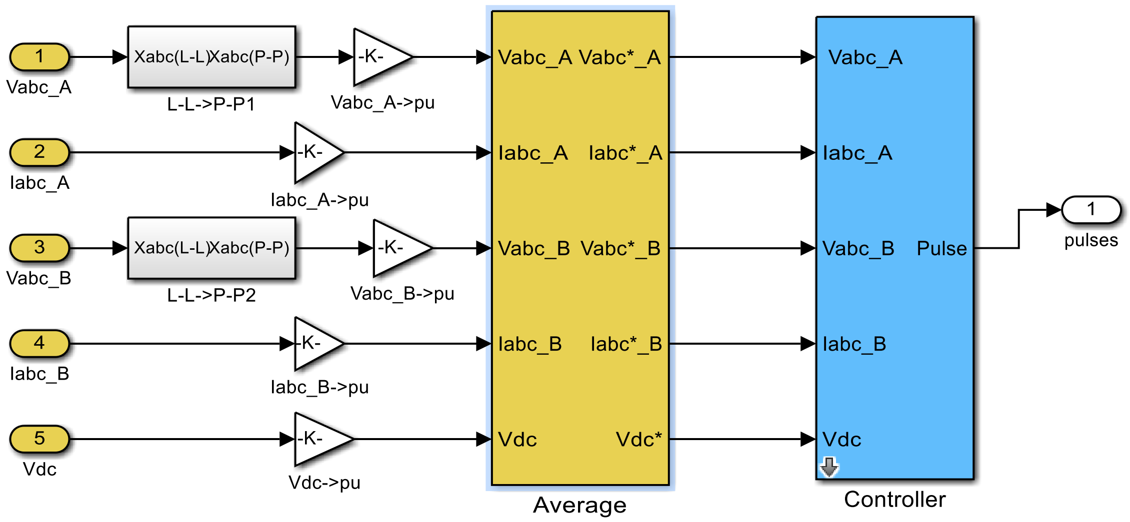


Figure 2.4 Simulation model Disiel



Ts_Detection is detection and sample time and Ts_Detection=3Ts

Ts_control is control's discrete time and Ts_control=Ts

where Ts=1/3150s,also is IGBT switch periode

Ts_Power is dual trangible wave time and Ts_Power=1/(3*100*Ts)

Figure 2.5 Simulation model average and control

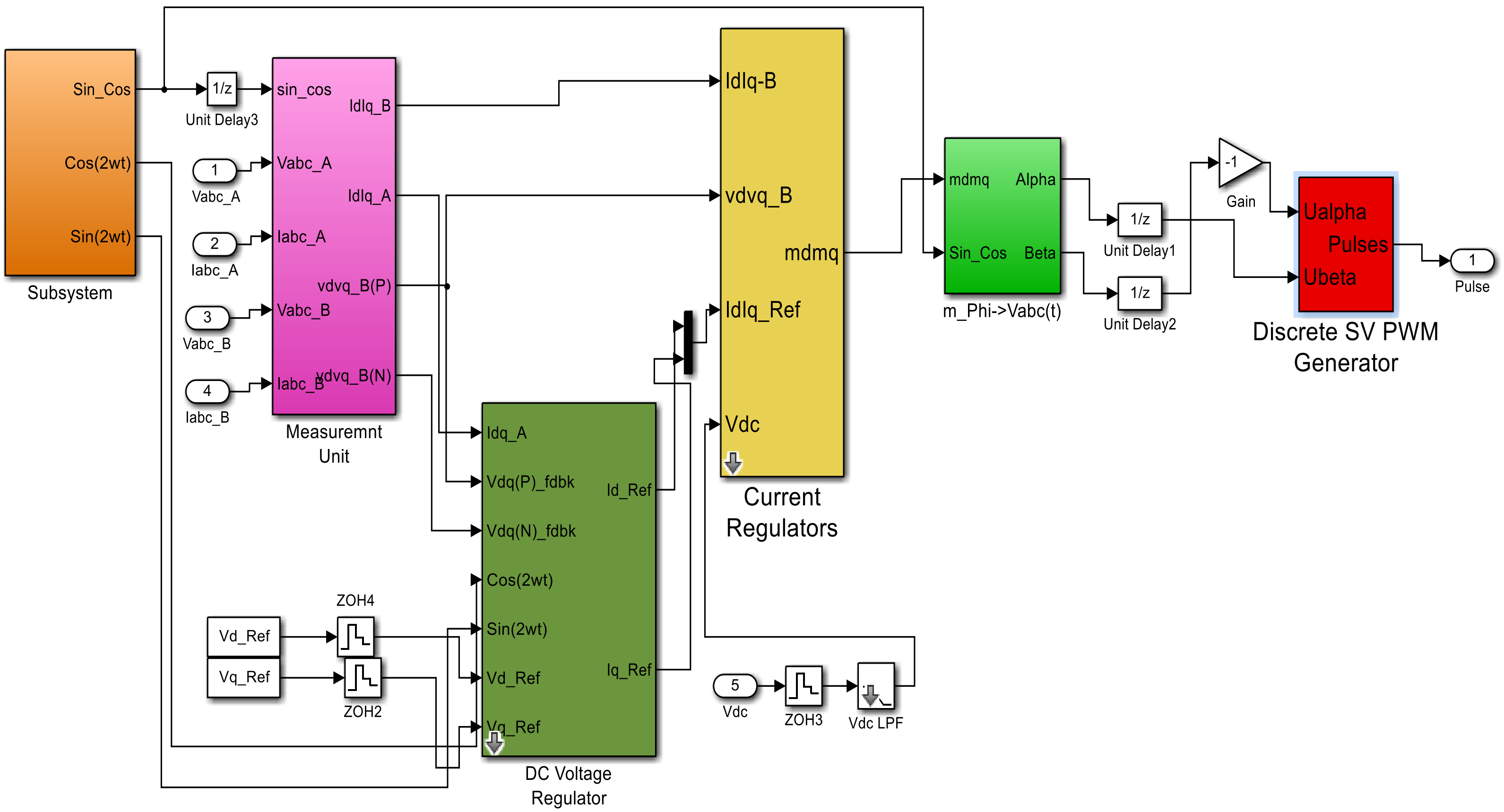


Figure 2.6 Simulation model general control micogrid

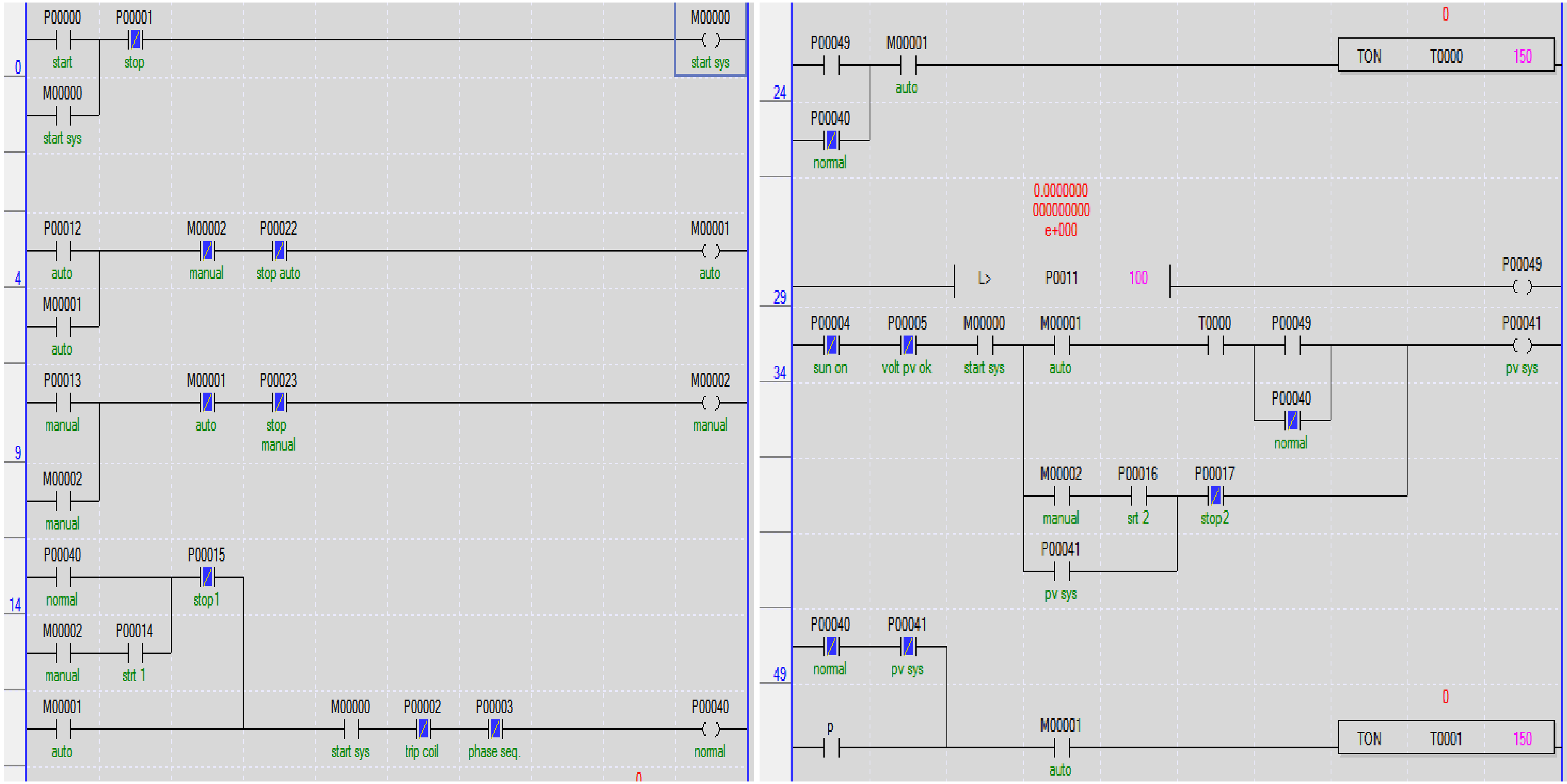


Figure 2.7 Desgine controller of PLC XG5000

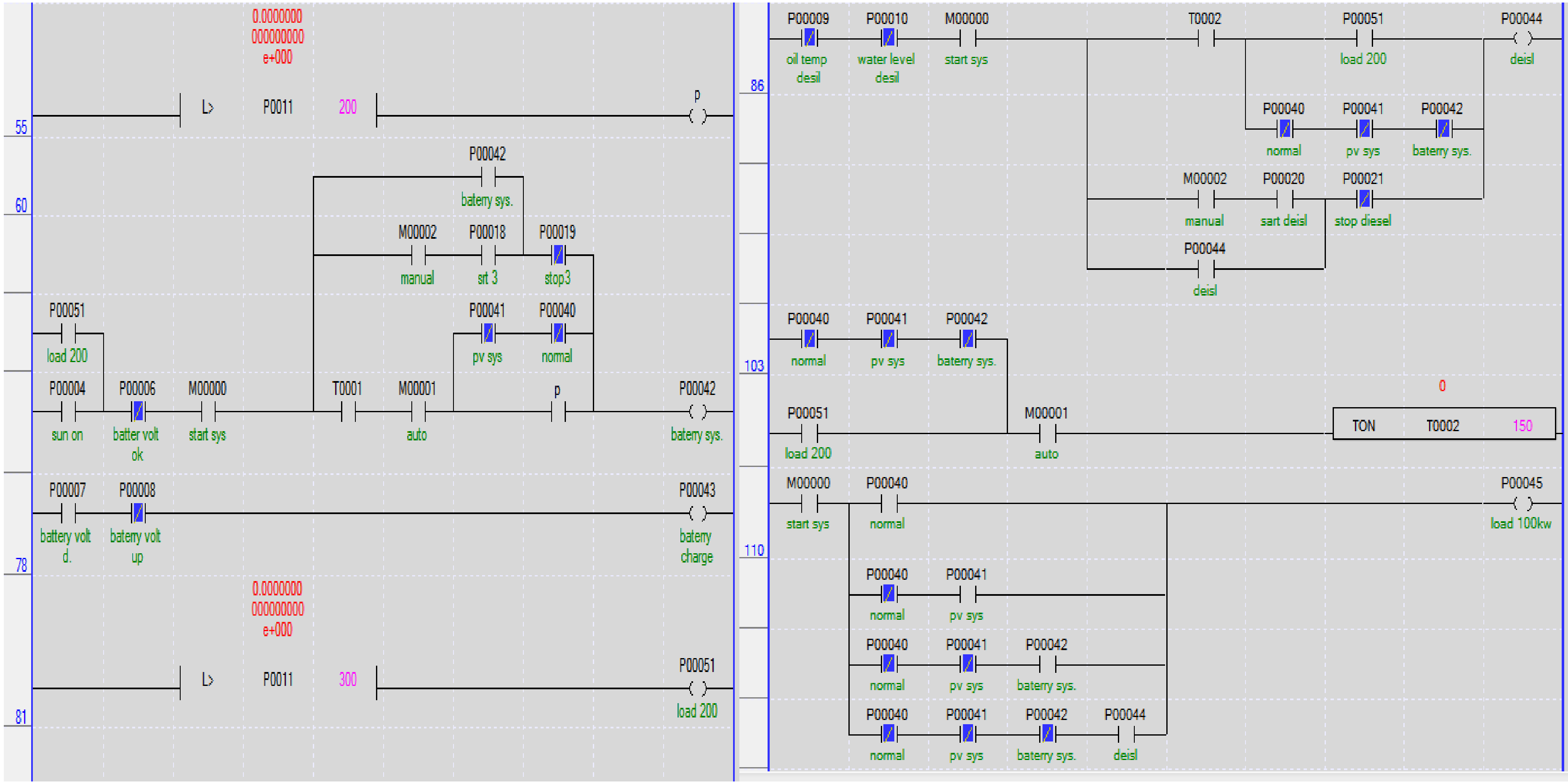


Figure 2.7 Desgine controller of PLC XG5000

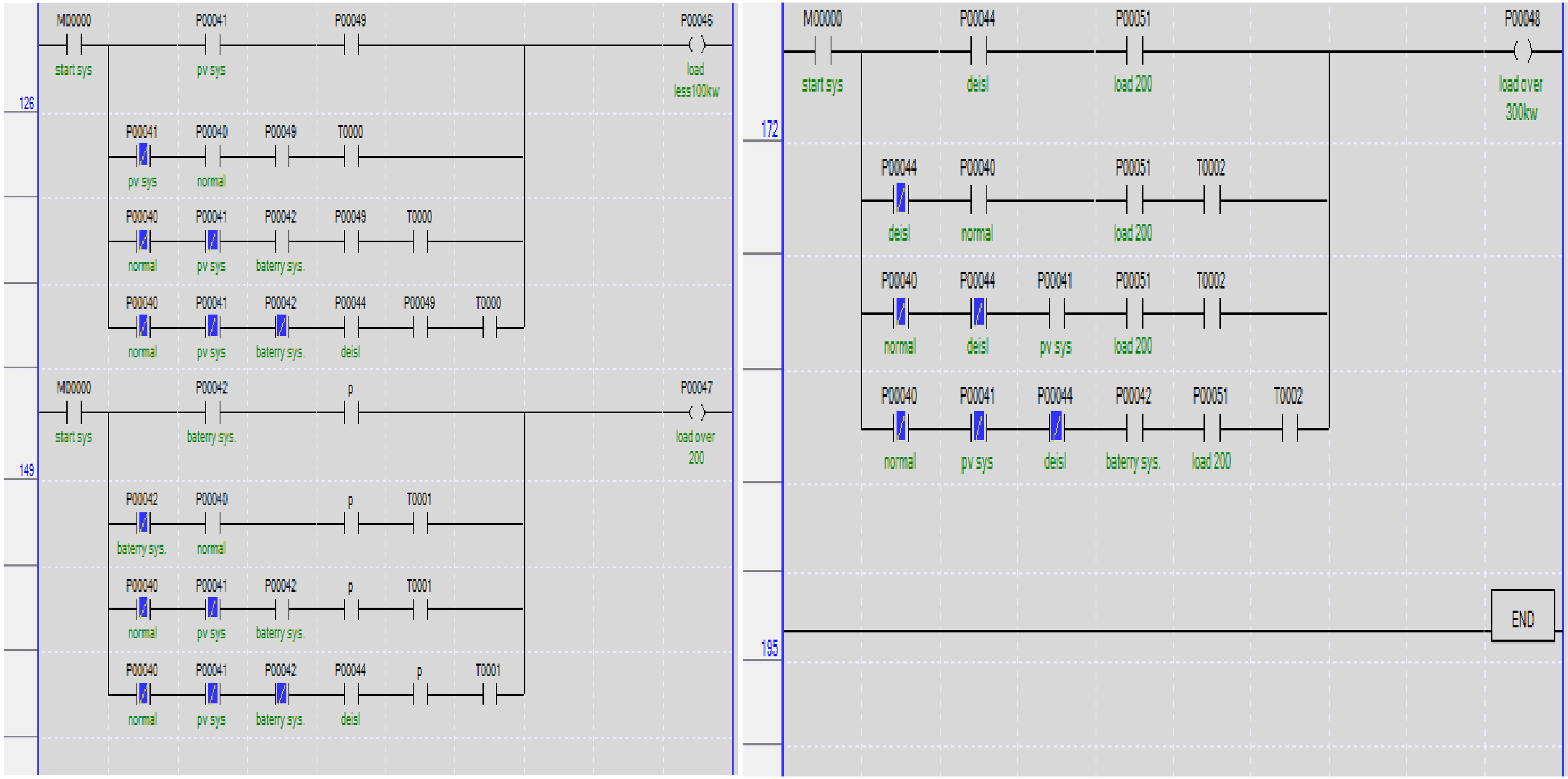


Figure 2.7 Desgine controller of PLC XG5

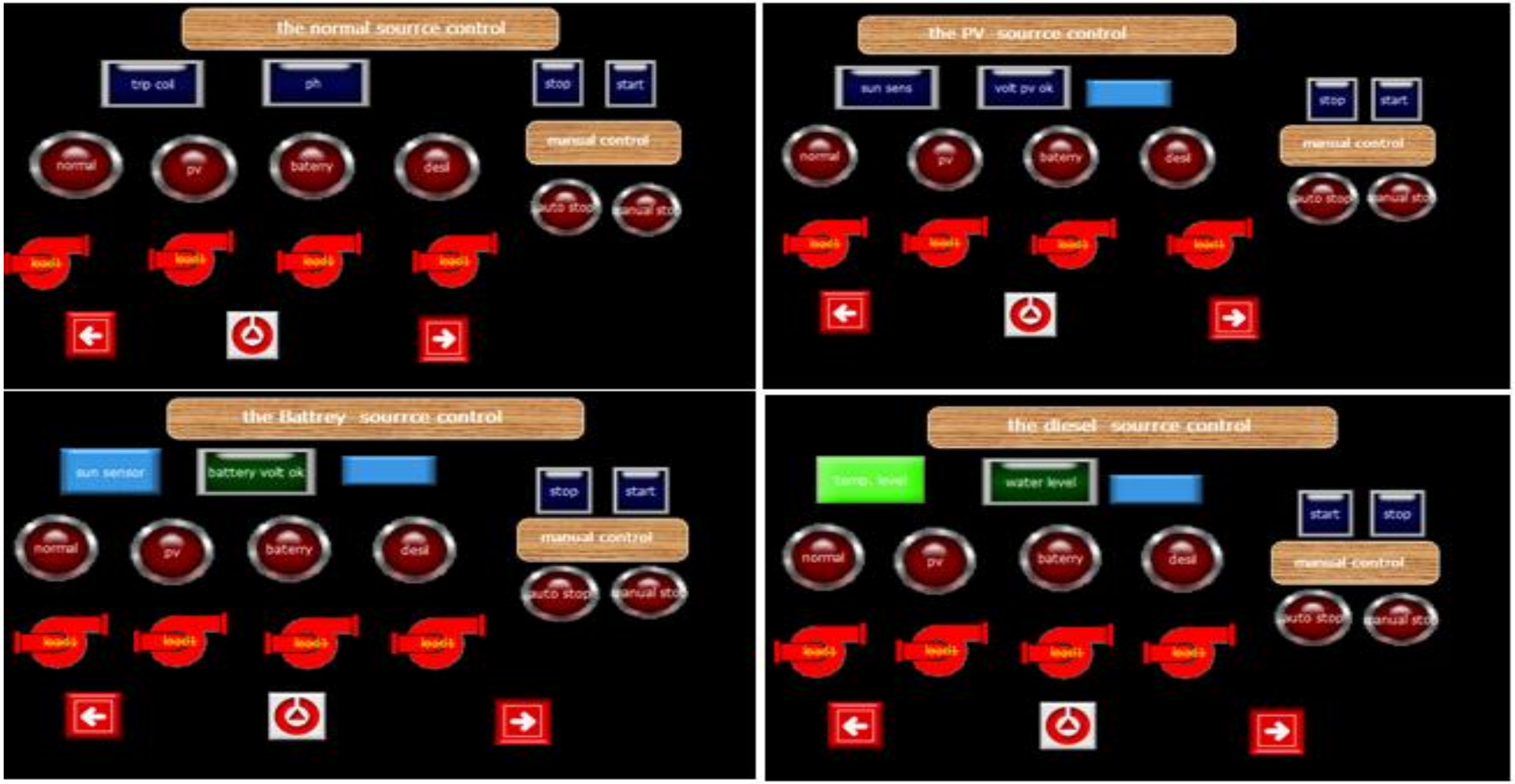


Figure 2.8 The structure control smart power system of microgrid

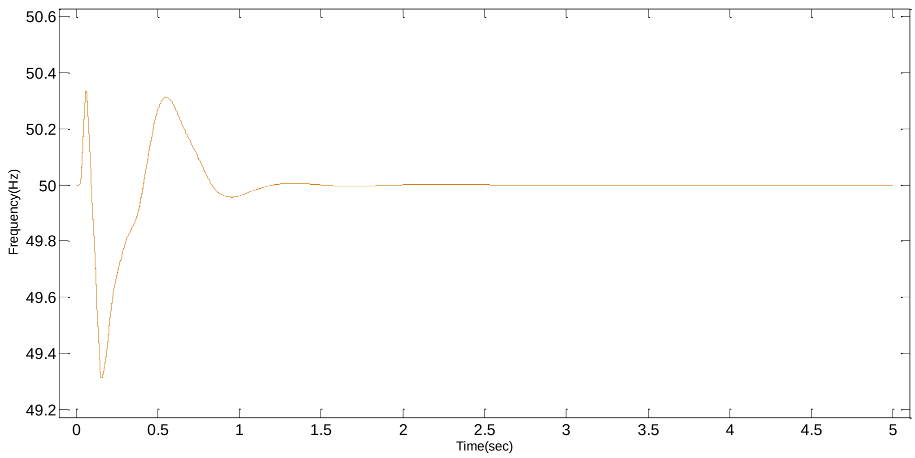
2.2 Simulation Studies

The system model in Figure 2.1 is tested under various conditions in two case studies: migrogrid design on grid when connection with grid(main switch between grid- rwenable energy connected is close called hybrid modes1), microgrid design off-grid when connection with grid(main switch between grid- micro source connected is openly called islanded modles2)

The different case studies test conditions are:

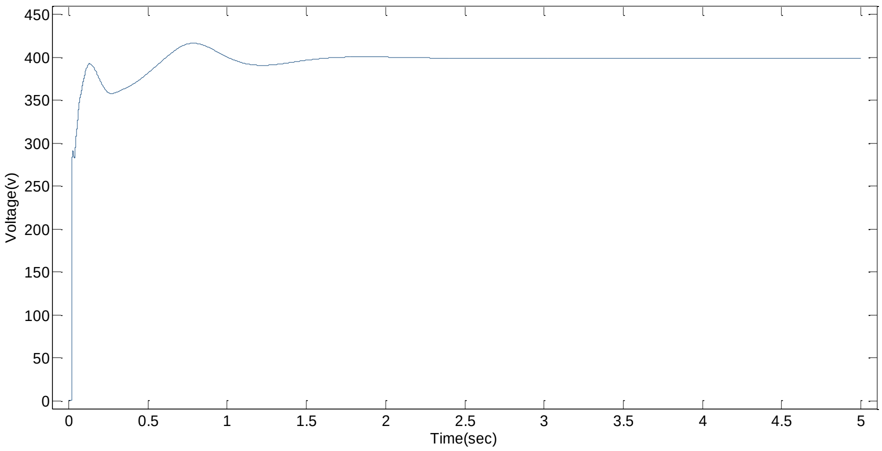
2.2.1 Case Study 1

The simulation results of the switch to the main network and the partial network allow the transfer of power in both directions near that means that the system is on the network. We came out as a result of discussing without fault the voltage and frequency at the point of common coupling and load of the system microgrid.



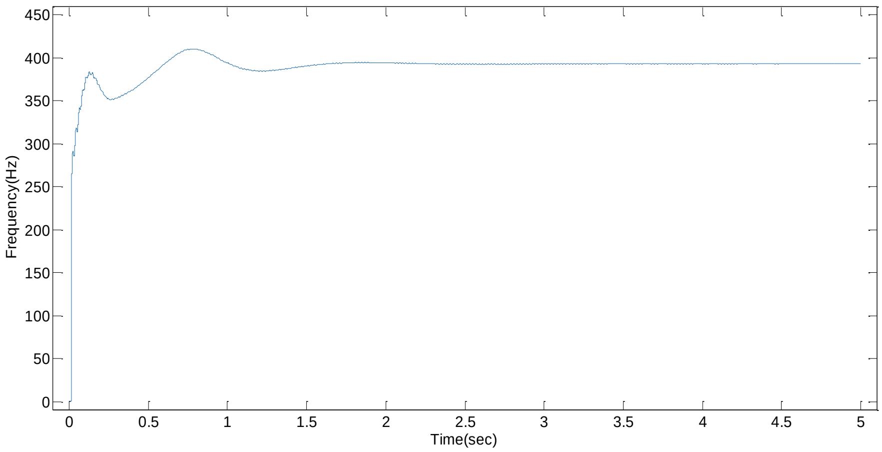
Fgrue 2.9 .The frequency with case on grid

Figure 2.9 illustrates the frequency has oscillations occurring (0.1- 1.3Sec), the frequency these oscillations and frequency range between (49.3-50.3)Hz. Will damp rapidly at this range when the controllers start running and at time 1.4 Sec the oscillation will damp and it became zero and stay at that value until 1.4 Sec is given the frequency 50Hz.



Figrue 2.10 The voltage with case on grid at point of common coupplig

The voltage magnitude of the point of common coupling, it affected by the oscillations of the system and it will change in a range (0.1 to 1.3) sec, and damping rapidly and voltage range between (270-410)v. when the time reaches 1.4 sec and will stay in stable state to 1.4sec as shown in Figure 2.10 and voltage reached 400v.

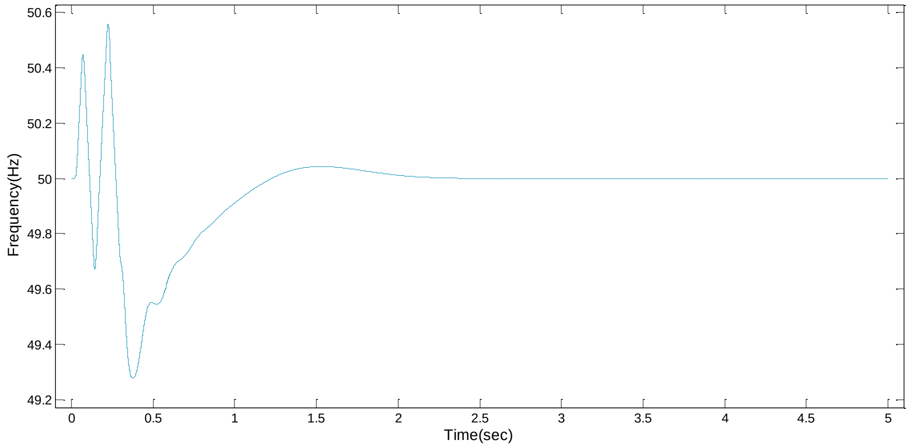


Figrue 2.11 The voltage with case on grid at Load

The Figure 2.11 Above shows the voltage magnitude of V. I measurement load. It the oscillations in the system will change in a range (0.1 to 1.3) sec as shown in Figure 2.11 and voltage range between (270 -415)v. Of the system when damping rapidly the time reach 1.5 sec and will stay in stable state to 1.5sec.

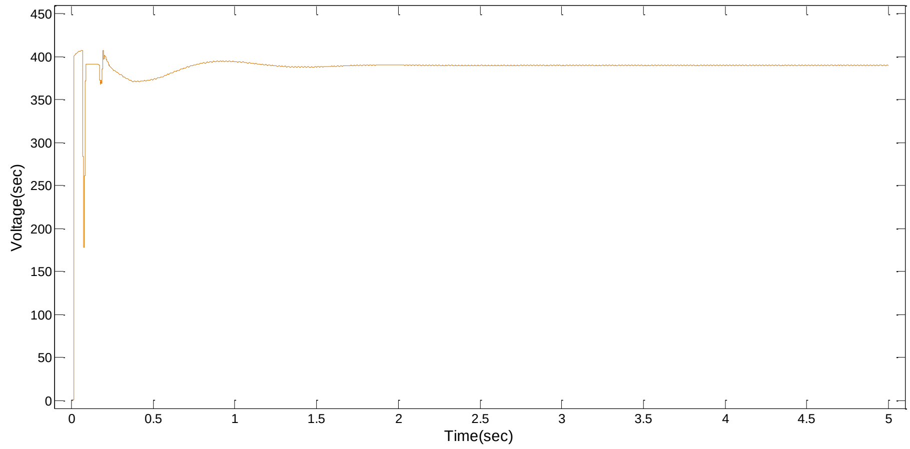
2.2.2 Case Study 2

The simulation results to switch between the main network and the parting network allows the transfer of authority is open in both directions and this means that the system is off-line. We came out as a result of discussing the voltage and frequency of the system microgrid



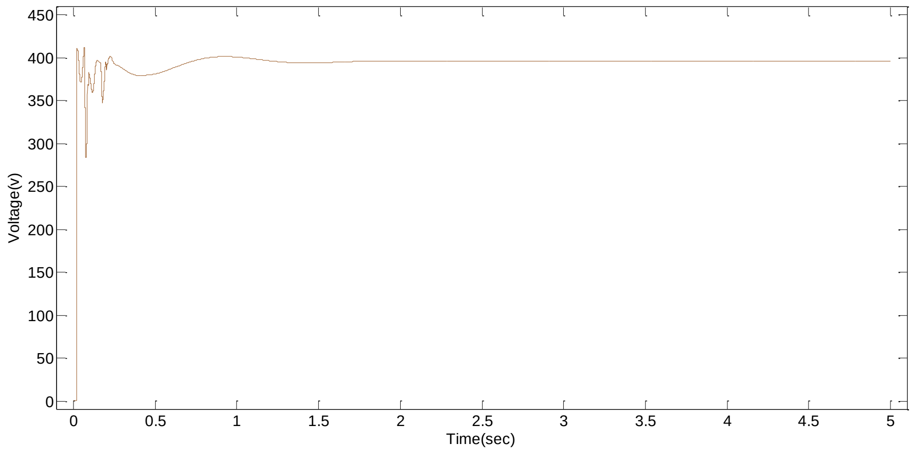
Figrue 2.12 The frequency with case off grid

Figure 2.12. illustrates the frequency has oscillations occurring (0.1- 1.2Sec), the frequency these oscillations and frequency range between (49.3-50.5)Hz.Will damp rapidly at this range when the controllers start running and at time 1.3 Sec the oscillation will damp and it became zero and stay at that value until 1.5 Sec is given the frequency 50Hz.



Figrue 6.13The voltage with case off grid at point of common coupling

We can see the voltage magnitude of point of common coupling, it effected by the oscillations in the system and it will change in range (0.1 to 1.2) Sec, and damping rapidly quickly at the point (0.1,0.2) voltage range between (220 -400)v. When the time reaches 1.3sec and will control effect on the system stay in stable state to 1.3 sec as shown in Figure 2.13and voltage reached 390v.



Fgrue 2.14 .The voltage with case off grid at Load

The Figure 2.14 above shows explain the voltage magnitude of V. I measurement load. It the oscillations in the system will change in range (0.1 to 1.2) sec, as shown in Figure 6.8 and voltage range between (290 -405)v. If the system when damping rapidly the time reach 1.3 Sec and will stay in stable state to 1.3 sec as shown in Figure 2.14and voltage reached 390v.

2.3 Simulation Smart Management Micrigrid Studies

The design system model in Figure 2.7,2.8 is tested under various controlled conditions in three cases to smart management microgrid studies: Smart power management for microgrid systems under basic control system duration (Load≤100kw are normal operation), for operation MG during the load change. (In this case controls the control of the load ranges between(100kw 300kw)) smart management operation stations such as that a state of emergency operation

The different case studies test conditions are:

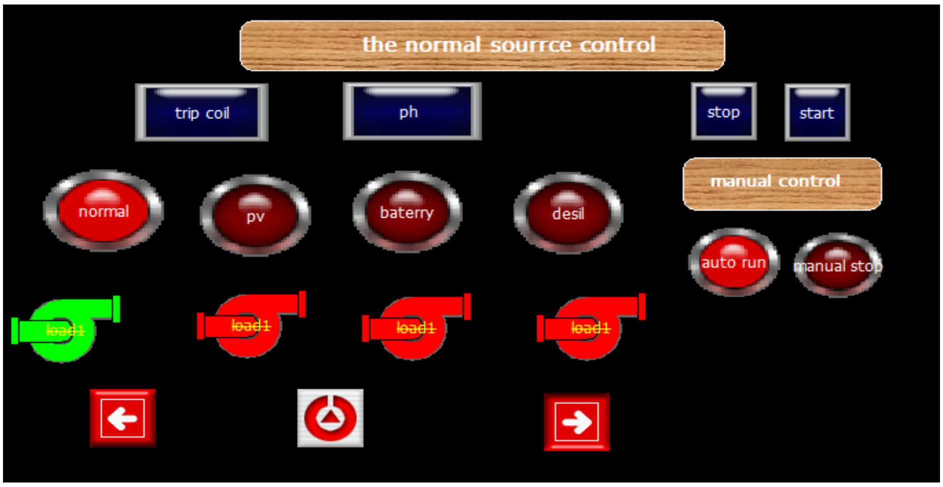
2.3.1 Study Cases 1

Load≤100kw: Smart power management for microgrid systems under the basic control system, which includes stability of the system from the voltage and frequency and charge batteries for operation MG during pregnancy change. In this case controls the control of the load ranges between Load≤100kw The stations working each unit with the other to skip pregnancy and electricity quality as high as shown in table 2.2

Table 2.2 Operation microgrid in case $load$≤100kw

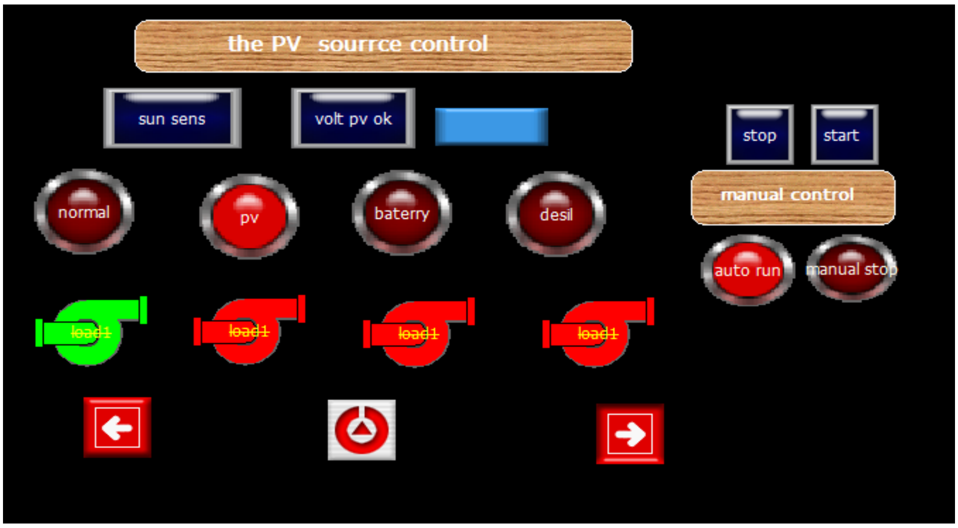
CASES	P.N	PV	BATTERY	DESIL	CASES	NOTES
Normal	ON	OFF	OFF	OFF	$Load \leq 100$ KW	any time when voltage and frequency under condition
PV	OFF	ON	OFF	OFF	$Load \leq 100$ -KW	At day when the sun voltage under the condition
Battery	OFF	OFF	ON	OFF	$Load \leq 100$ -KW	At night when voltage and charger under the condition(emergency)
Diesel	OFF	OFF	OFF	ON	$Load \leq 100$ -KW	Emergency

The result is clear from building simulator (HMI(X builder programme) with XGT PLC) for the design and operation of the system (MG) as a regular and intelligent image management and display cases to work on screen and alarm monitoring and maintenance are simulators shown in figures below.



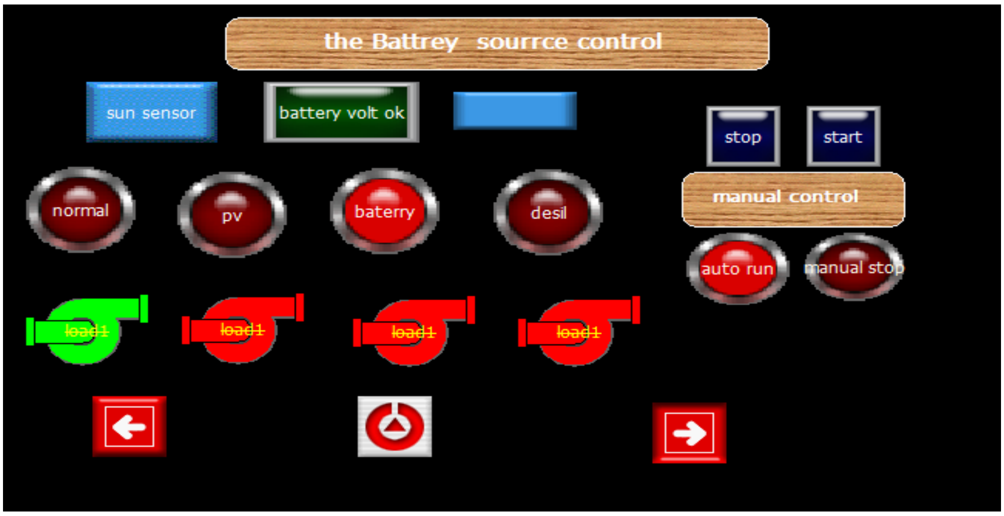
Figrure 2.15 Monitor Smart and control operation normal in case $Load \leq 100$

The result as shown in figure 2.15.the controller senses the voltage and frequency under conditions and the load Load≤100 the grid work.



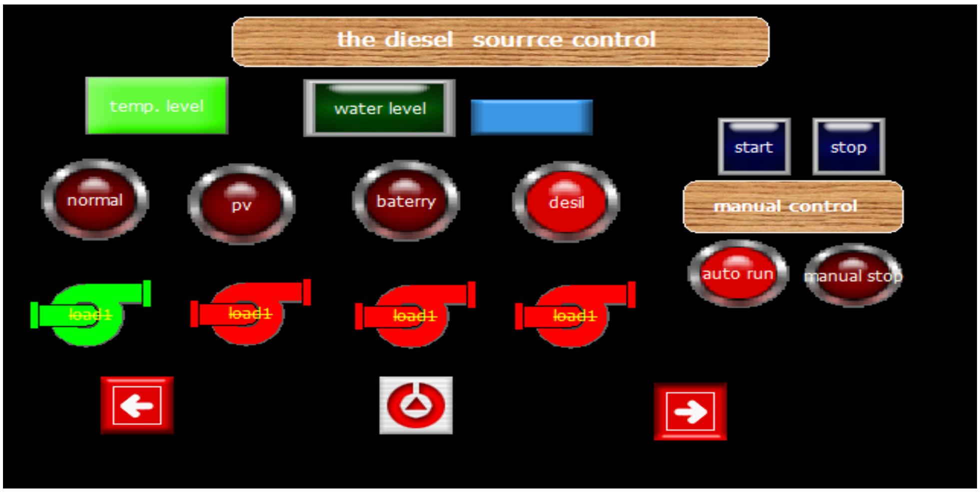
Figrue 2.16 Monitor Smart and control operation pv in case $Load \leq 100$

The result as shown in figure 2.16.the controller of the plc sensor the sun is good or voltage in the network under the condition and the load Load≤100 thePV work at the day.



Figrue 2.17 Monitor Smart and control operation battery in case $Load \leq 100$

The result as shown in figure 2.17.can you see the controller of plc fumble the voltage and charge /discharge in a battery under a condition at the night for the emergency and the load Load≤100 the battery work.



. Figrue 2.18 Monitor Smart and control operation diesel in case $Load \leq 100$

The result as shown in figure 2.18.the controller of plc fumble the water and oil in diesel under the condition and working diesel at emergency and the load Load≤100 the diesel work.

2.3.2 Study Cases 2

KW <Load≤300KW: Smart power management for microgrid systems under a 100 basic control system, which includes stability of the system from the voltage and frequency and charge batteries for operation MG during pregnancy change. In this

case controls the control of the load ranges between(100kw <Load≤300kw). The stations working with the other to skip pregnancy and electricity quality as high as shown in table 2.3

Table 2.3 Operation microgrid in case $load$≤100kw

CASES	P.N	PV	BATTERY	DESIL	CASES
NORMAL+PV	ON	ON	OFF	OFF	$100kw < Load \leq 200kw$
NORMAL+BATTERRY	ON	OFF	ON	OFF	$100kw < Load \leq 200kw$
NORMAL+DIESEL	ON	OFF	OFF	ON	$100kw < Load \leq 200kw$
BATTERY +DIESEL	OFF	OFF	ON	ON	$100kw < Load \leq 300kw$
PV+ Diesel	OFF	ON	OFF	ON	$100kw < Load \leq 200kw$
NORMAL+BATTERY+DIESEL	ON	OFF	ON	ON	$200kw < Load \leq 300kw$
NORMAL+PV +DIESEL	ON	ON	OFF	ON	$200kw < Load \leq 300kw$

The result is clear from building simulator (HMI(cp builder programme) with XGT PLC) for the design and operation of the system (MG) as a regular and intelligent image management and display cases to work on screen and alarm monitoring and maintenance are simulators shown in the figure in below.

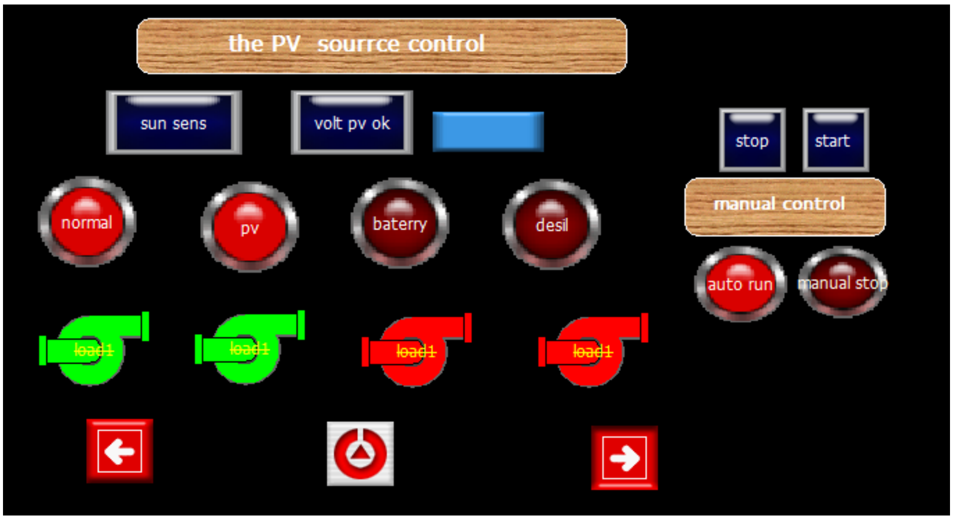
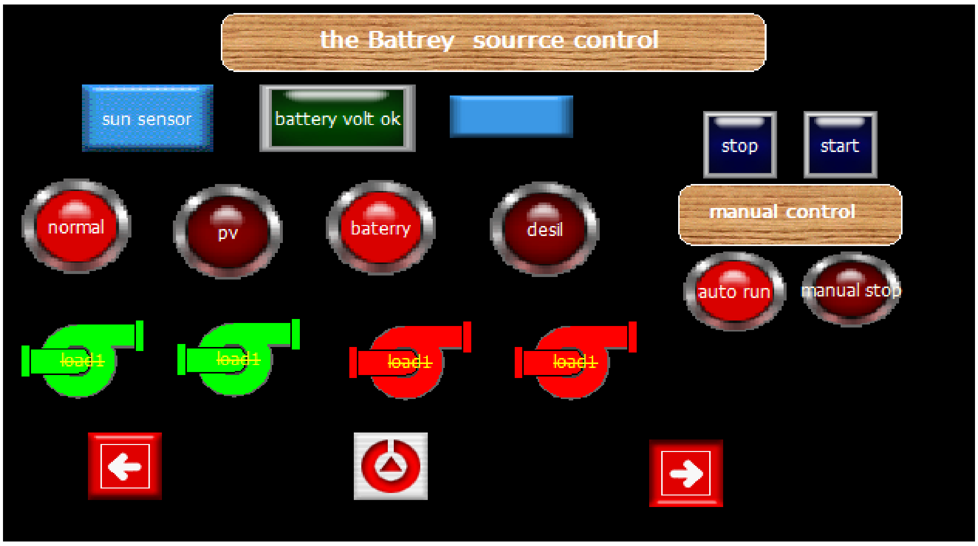


Figure 2.19 Monitor1 Smart and control operation in case $100kw < Load \leq 200kw$

The result as shown in figure 6.19.the controller sense the voltage and frequency in a grid under conditions for grid and plc also sense the sun is good or voltage in PV under the condition and the case 100kw <Load≤200kw the smart management arrangement this shown in this monitor operation.



Figrue 2.20 Monitor2 Smart and control operation in case 100kw $< Load \leq$ 200kw

The result as shown in figure 2.20.the controller sense the voltage and frequency under conditions for grid see the controller of plc fumble the voltage and charger /discharger in the battery under the condition and the case 100kw <Load≤200kw the smart management arrangement this shown in this monitor operation

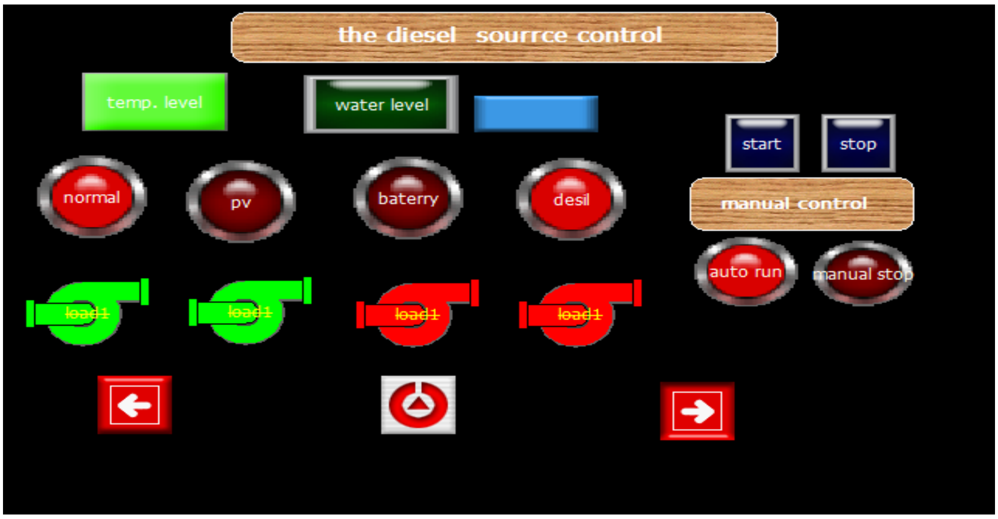
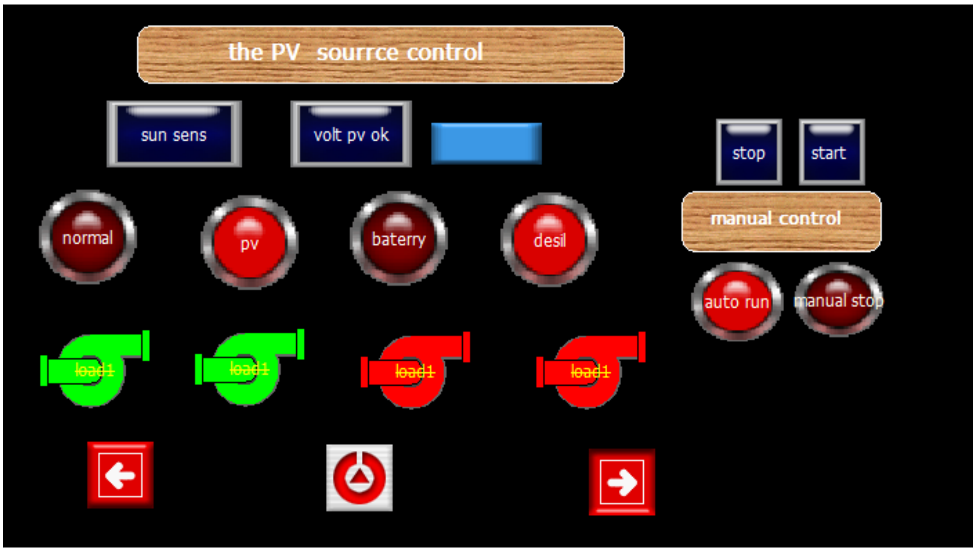


figure 2.21 Monitor3 Smart and control operation in case 100kw $< Load \leq$ 200kw

The result as shown in figure 2.21.the controller sense the voltage and frequency under conditions for in the grid and the controller of plc fumble the water and oil in diesel under the condition and the load ranged between case 100kw <Load≤200kw the smart management arrangement this shown in this monitor operation



Figrue 2.22 Monitor4 Smart and control operation in case 100kw $< Load \leq$ 200kw

he result as shown in figure 2.22 and plc also sense the sun is good or voltage in PV under condition and the controller of plc fumble the water and oil in diesel under condition and the load ranged between case 100kw <Load≤200kw the smart management arrangement this shown in this monitor operation

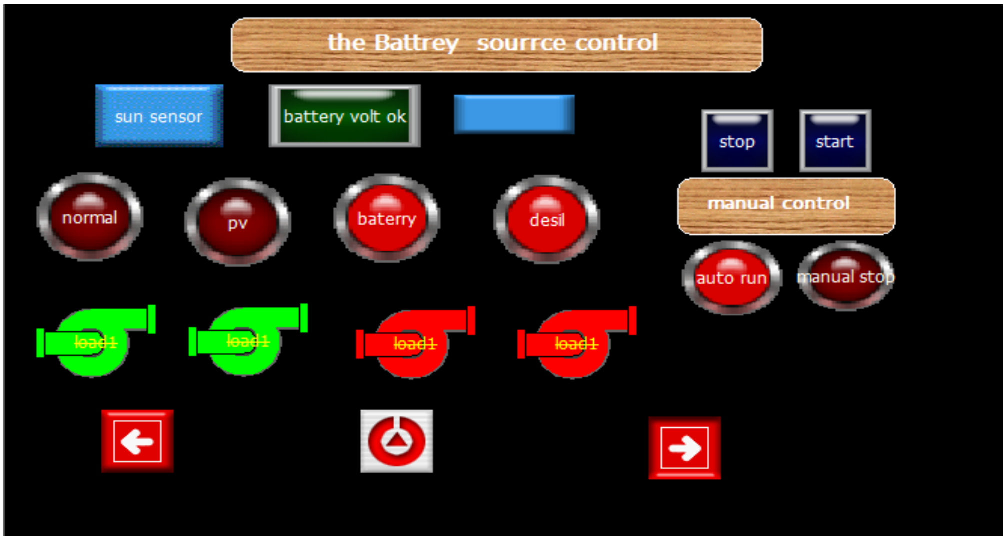
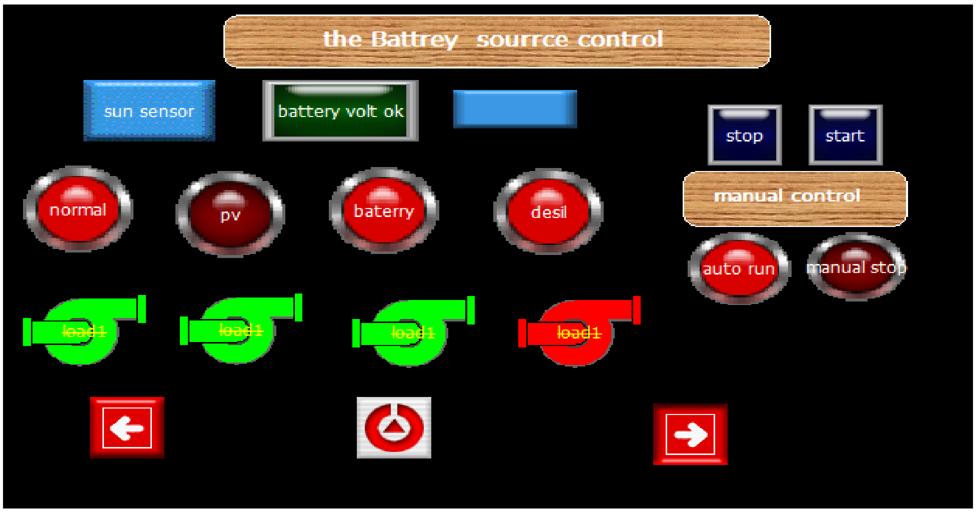


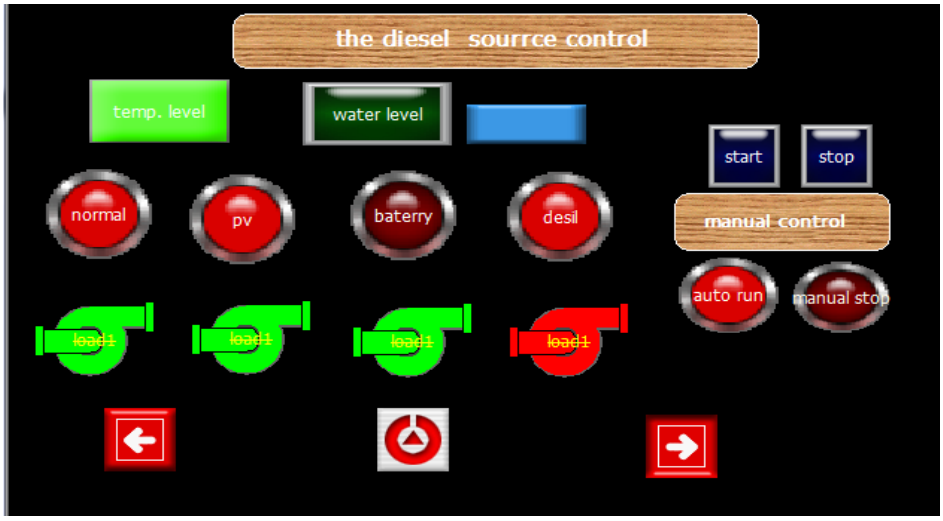
Figure 2.23 Monitor5 Smart and control operation in case 100kw $< Load \leq$ 200kw

The result as shown in figure 2.23 sees the controller of plc fumble the voltage and charger /discharger in battery under condition and plc fumble the water and oil in diesel under condition and the load ranged between 100kw <Load≤200kw the smart management arrangement this shown in this monitor operation



Figrue 2.24 Monitor6 Smart and control operation in case 200kw $< Load \leq$ 300kw

The result as shown in figure 2.24 sees the controller of plc fumbled the voltage and charger /discharger in battery under condition and plc fumbled the water and oil in diesel under and.the controller sense the voltage and frequency in national network under conditions and the load ranged between 200kw <Load≤300kw the smart management arrangement this shown in this monitor operation



Figrue 2.25 Monitor7 Smart and control operation in case 200kw $< Load \leq$ 300kw

The result as shown in figure 2.25 sees the controller of plc also sense the sun is good or voltage in PV under condition and plc fumble the water and oil in diesel under and.the controller sense the voltage and frequency on the grid under conditions and the load ranged between 200kw <Load≤300kw the smart management arrangement this shown in this monitor operation

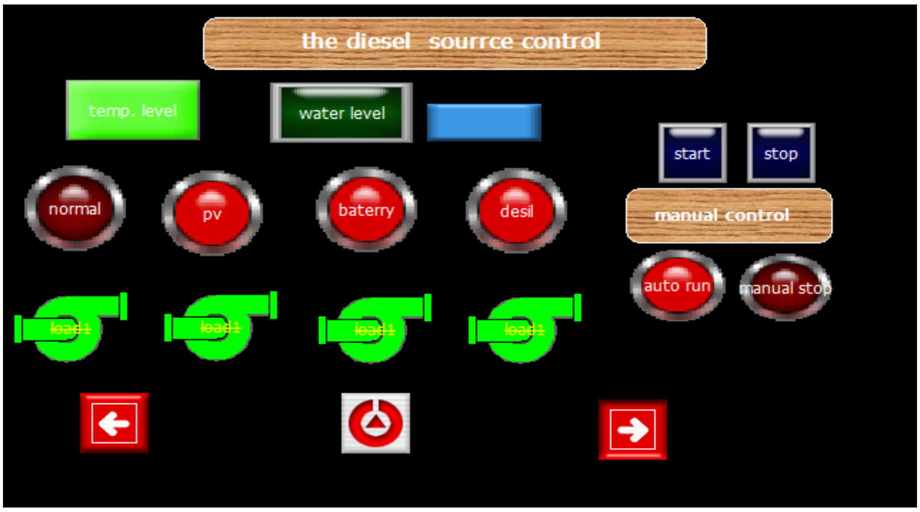
2.3.3 Study Cases 3:

load >300kw: In this case smart power management emergency for microgrid systems under the basic control system, which includes stability of the system from the voltage and frequency and charge batteries for operation MG during pregnancy change. In this case controls the control of the load over range (load>300kw) Work stations such as that a state of emergency by working all the units together, especially when working (PV and Battery) together with the other to skip pregnancy and electricity quality as high as shown in table 2.4

Table 2.4 Operation microgrid in case emergency *load* >300kw

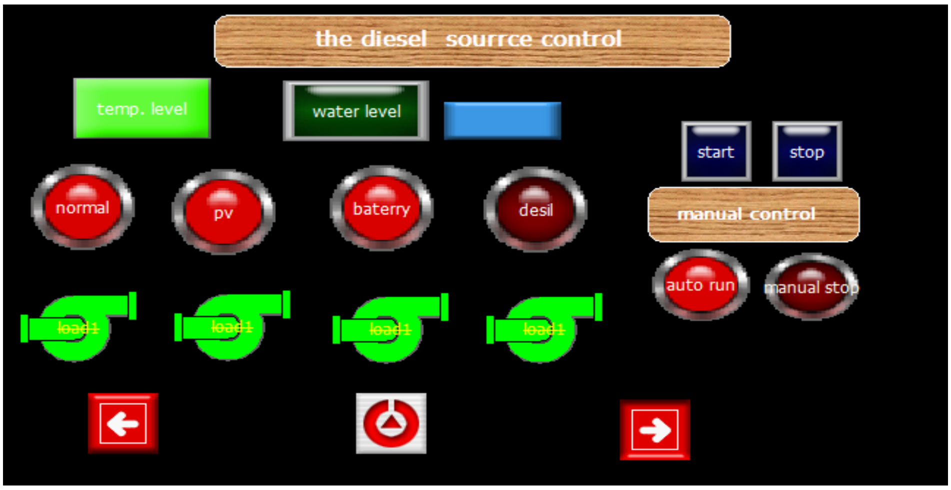
CASES	P.N	PV	BATTERY	DESIL	CASES	NOTES
NORMAL+PV+ BATTERY	ON	ON	ON	OFF	*load*>300kw	Emergency
PV+BAERTERY +DIESEL	OFF	ON	ON	ON	*load*>300kw	Emergency
NORMAL +PV+BATTERY +DIESEL	ON	ON	ON	ON	*load*>300kw	Emergency
PV +BATTERRY	OFF	ON	ON	OFF	*load*>300kw	Emergency

The result is clear from building simulator (HMI(XP builder programme) with XGT PLC) for the design and operation of the system (MG) as a regular and intelligent image management and display cases to work on screen and alarm monitoring and maintenance are simulations shown in the figures in below



Figrue 2.26 Monitor1 Smart and control in case $load$>300kw

The result as shown in figure 2.26 sees the controller of plc also sense the sun is good or voltage in photovoltaic under condition and plc fumble the water and in diesel l under and. see the controller of plc fumble the voltage and charger /discharger in battery under condition and load>300kw the smart management arrangement this shown in this monitor operation in emergency case.



Figrure 2.27 Monitor2 Smart and control in case $load$>300kw

The result as shown in figure 2.27 sees the controller of plc also sense the sun is good or voltage in PV under condition and.the controller sense the voltage and frequency in the network under conditions. see the controller of plc fumble the voltage and charger /discharger in a battery under condition and load>300kw the smart management arrangement this shown in this monitor operation in emergency case.

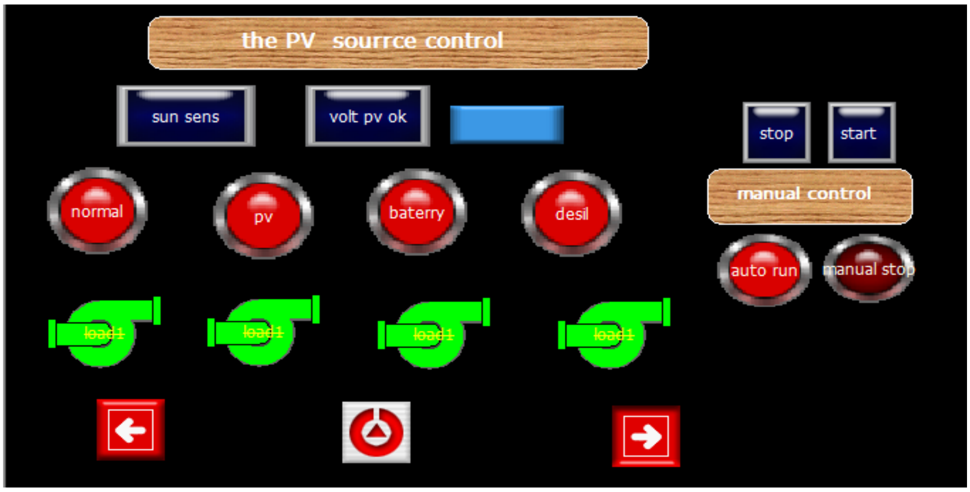


Figure 2.28 Monitor3 Smart and control in case $load>300$kw

The results as shown in figure 2.28 see the controller of plc also sense the sun is good or voltage in PV under condition and.the controller sense the voltage and frequency in a network under conditions. see the controller of plc fumbled the voltage and charger /discharger in a battery under condition and plc fumbled the water and in diesel with load>300kw the smart management arrangement this shown in this monitor operation in emergency case.

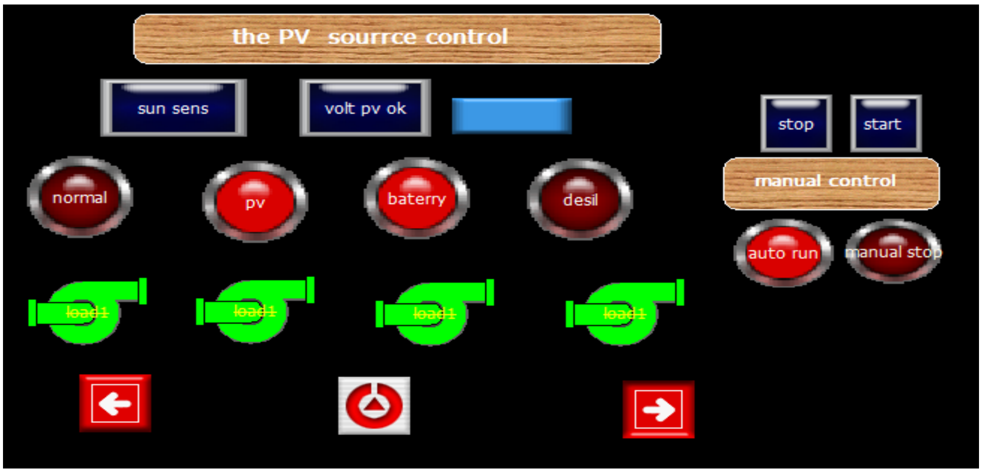


Figure 2.29 Monitor4 Smart and control in case $load>300$kw

The result as shown in figure 2.29 sees the controller of plc also sense the sun is good or voltage in PV under condition. see the controller of plc fumbled the voltage and charger /discharger in the battery under the condition with l>300kw the smart management arrangement this shown in this monitor operation in an emergency case in the day .

CHAPTER 3
CONCLUSION AND SUGGESTIONS FOR FUTURE WORK

3.1 Conclusion

In this study, for continuous power to water plants Garmain with stable regimes, high energy quality and without loss of energy that a group of energy management system (Photovoltaic, Storage Battery, Diesel, Network), called Microgrid for the management of these systems must be using smart technology to control running. To control the Microgrid. Administration designed a special scheme for its operation using the PLC programming builder / XP (HM). Through the application of this control and the process to solve energy and reduce the cost and interruption of electricity loss problems. A systematic program to manage the generation of power plants and the installation of an intelligent manner and under the control of the conditions imposed on the four stations to operate perfectly, like (voltage and frequency for each station and charge the batteries, but noted that fat and water generator). It is shown in the basic conclusion of the study by two points

- The first objective of this study is to show in the result to obtain the optimal energy for the water in the station "Garmin" (Iraq). This result is done by the process and controlled by "a small network." (Connected to the network with PV- diesel and battery). Implementation control applied to the inverter consists of two control. Usually, there fast inner loop control, which controls the current network and the external voltage loop that controls the DC link voltage. The current control loop is responsible for the power quality issues such as low THD factor good strength while the control loop voltage balances the flow of energy in the system and the flow of voltage as stable of a result obtained through application. This process control is called and can depend on the energy of different sources goal II of the study is the use of control Synchronous reference frame control also called d-q control and PI control.

- Main objective of this study shown in the result to obtain the optimal intelligent power management system by an external controller is shown the automatic control Microgrid to handle software interrupts power and economic dispatch using the PLC programming builder XP / (HMI) for clear and intelligent process in Accordance with the conditions and regulations of the operation of stations as ideal.

3.2 Suggestions for Future Work

The future work of this work can extend to design:

An implementation and application of SCADA for the control and operation pumping Stations

1- An implementation and application of SCADA for the control and operation of power Stations
2- Application of SCADA for the control and operation of Electrical power Systems and networks
3- An implementation and application of SCADA for optimal control and operation of water pumping Stations
4- An implementation and application of SCADA for optimal control and operation of water system
5- Wireless solutions by implementation and application of SCADA for optimal control and operation of water system

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