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19AIE104 END-SEM PROJECT REPORT

DONE BY – GROUP_9

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SOLAR WIND POWER GENERATION

ACKNOWLEDGEMENT

I would like to express my special thanks of gratitude to my teacher DR UTSAV BHOWMIK as well as our principal Dr.P.SHANKAR who gave us the golden opportunity to do this project on the topic “SOLAR WIND GENERATION SYSTEM”, which also helped us in doing a lot of research and we came to know about so many things.

GROUP_9

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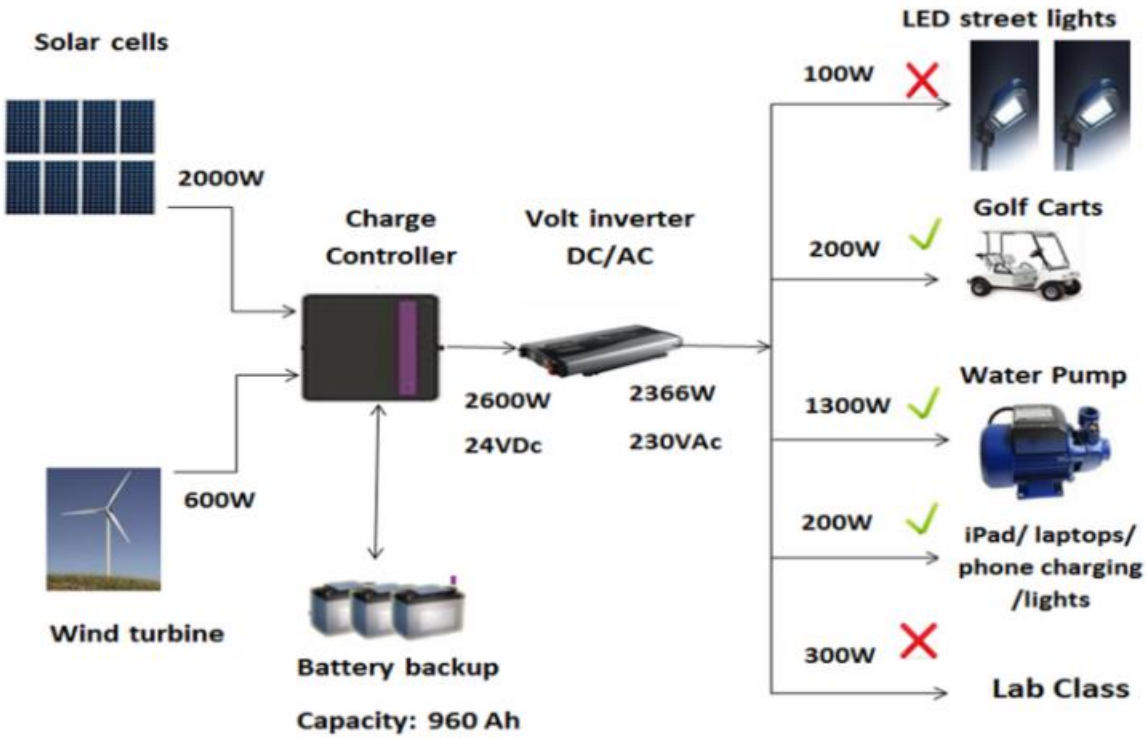
INTRODUCTION

Solar wind Hybrid Energy Systems are using solar panels and wind turbine generators to generate electrical power. Several hybrid wind/PV power systems with MPPT control have been proposed and discussed in works most of the systems in literature use a separate DC/DC boost converter connected in parallel in the rectifier. SWHES are more reliable and efficient energy-generating systems with less effect on the environment.



S.NO	COMPONENTS	No. OF COMPONENTS
1.	PV Array	1
2.	Constant parameter	7
3.	Bus selector	2
4.	Goto parameter	5
5.	Inductor	1
6.	DC voltage source	1
7.	Voltage measurement	2
8.	IGBT	1
9.	Diode	7
10.	Capacitor	2
11.	Current measurement	1
12.	Resistor	2
13.	Voltmeter	1
14.	Scope	8
15.	Display	6
16.	Pulse generator	6
17.	Mosfet	6
18.	Three-phase VI measurement	2
19.	Three-phase series RLC Branch	1
20.	Product parameter	4
21.	Inport	2
22.	Memory	2
23.	Sum	4
24.	Switch	2
25.	Repeating sequence	1
26.	Saturation	2
27.	Wind Turbine	1
28.	Gain	1
29.	PMC ports	2
30.	Permanent magnet synchronous machine	1
31.	Ground	1
32.	Power GUI	1

WORKING PRINCIPLE

WIND TURBINE

A wind turbine is installed on top of a tall tower, collects kinetic energy from the wind, and converts it to electricity that is compatible with a home's electrical energy.

Wind power is the natural source of energy. Wind flows from high pressure to low pressure. This is due to solar radiation falling on the earth's surface. Power generation is done only in half of the day next half of the day (night time) the unit has to be off mode. To overcome this difficulty wind generation is integrated with solar power generation.

Wind power can be computed by the kinetics related to the object in motion.

Kinetic energy KE Where, m-mass of the particle (kg),

v-velocity of the particle (m/s),

m= ρAd, We can write the Kinetic energy as below Kinetic Energy KE ρ Power (P_w) = energy per unit time.

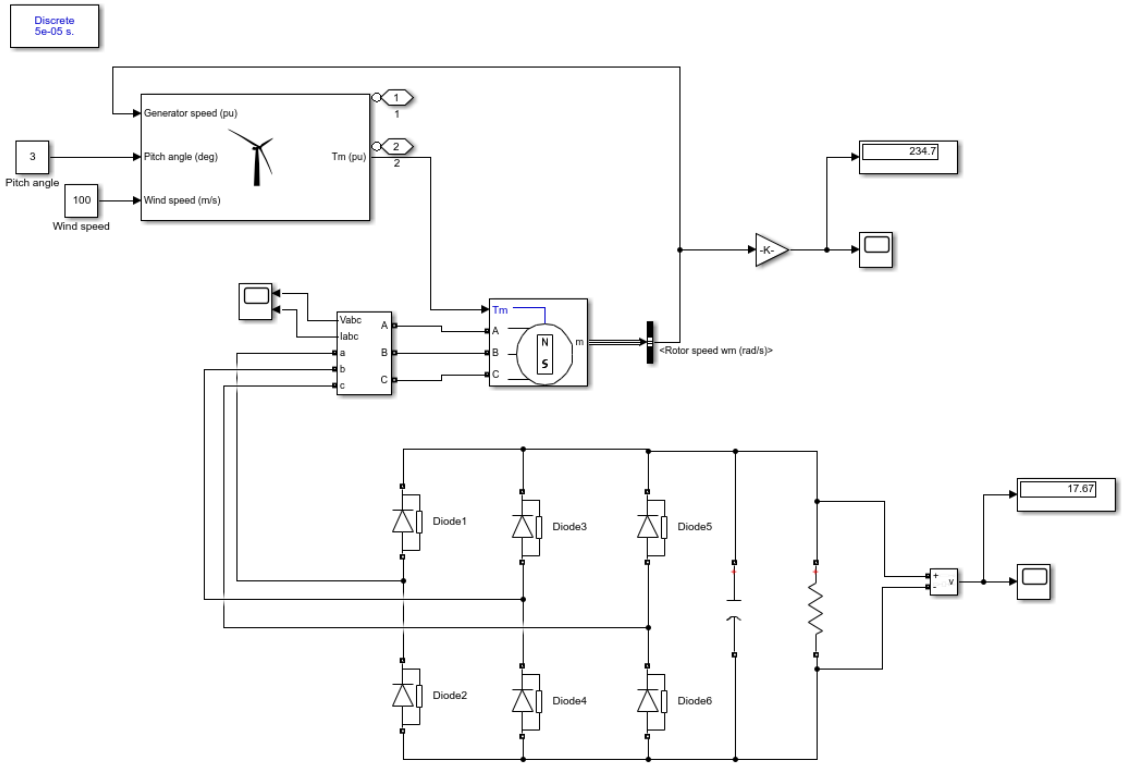
Power (P_w) = $1/2*A\rho V^2/t$

$=1/2* A\rho V^2(d/t)$

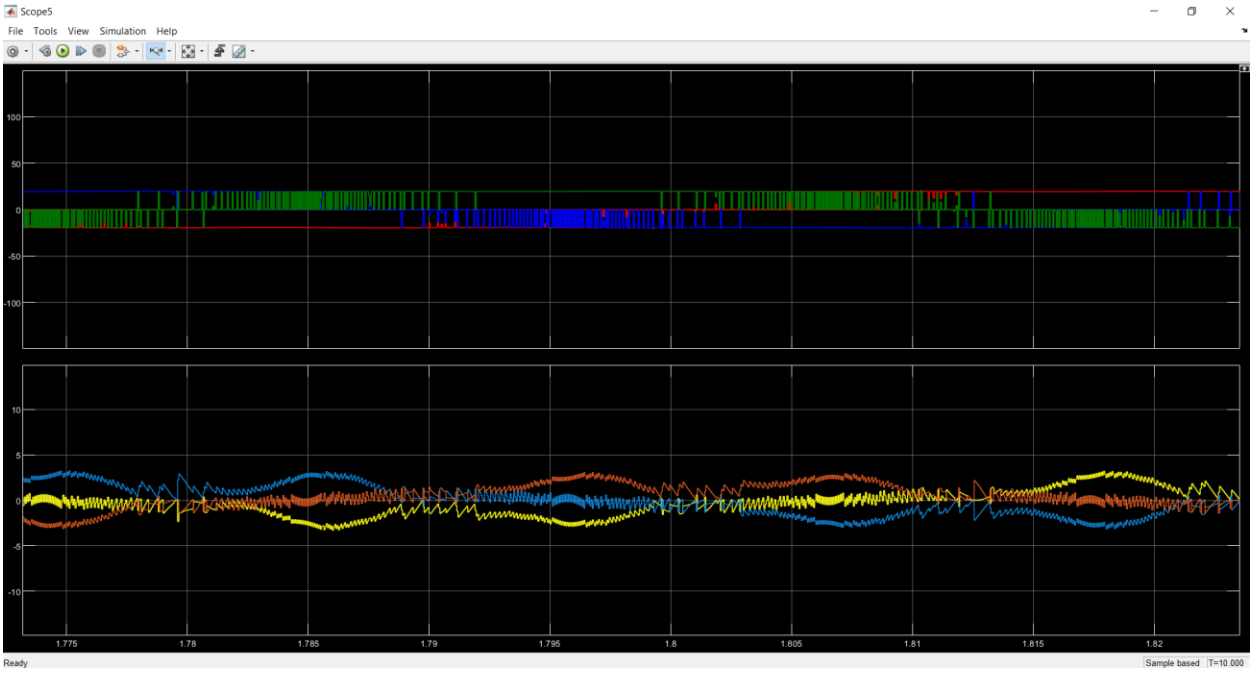
$=1/2* A\rho V^3$

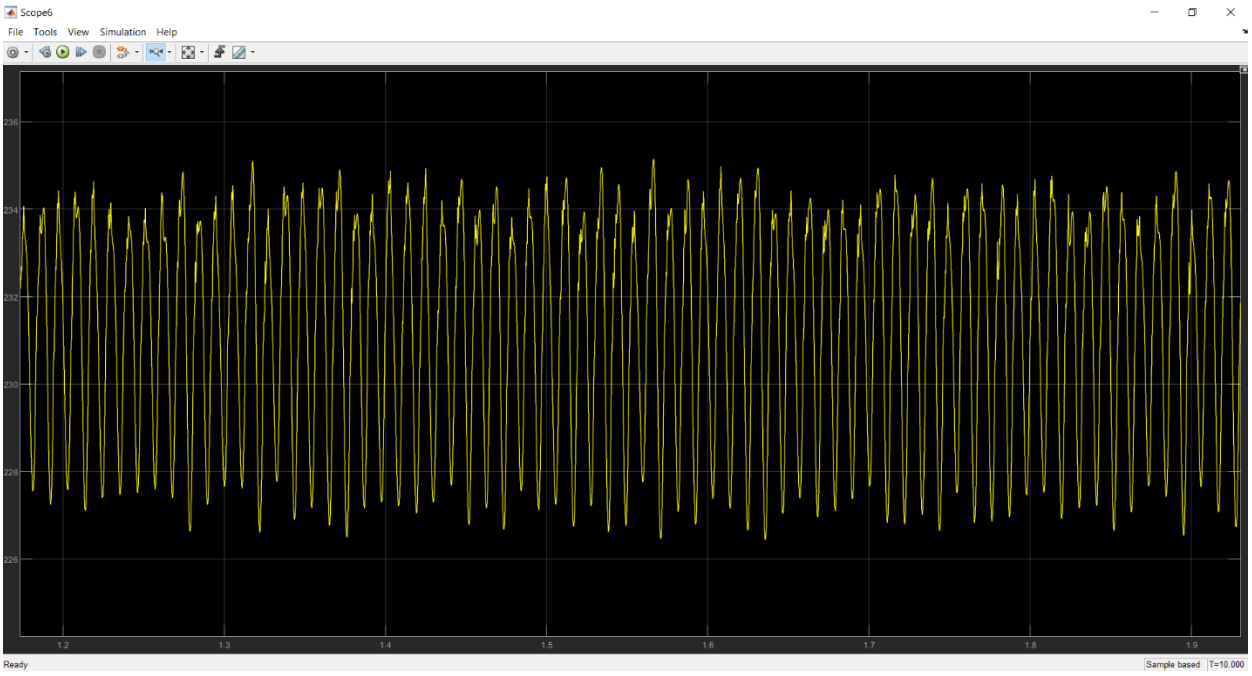
From this we can observe that amount of power depends on the cube of the velocity of the wind.

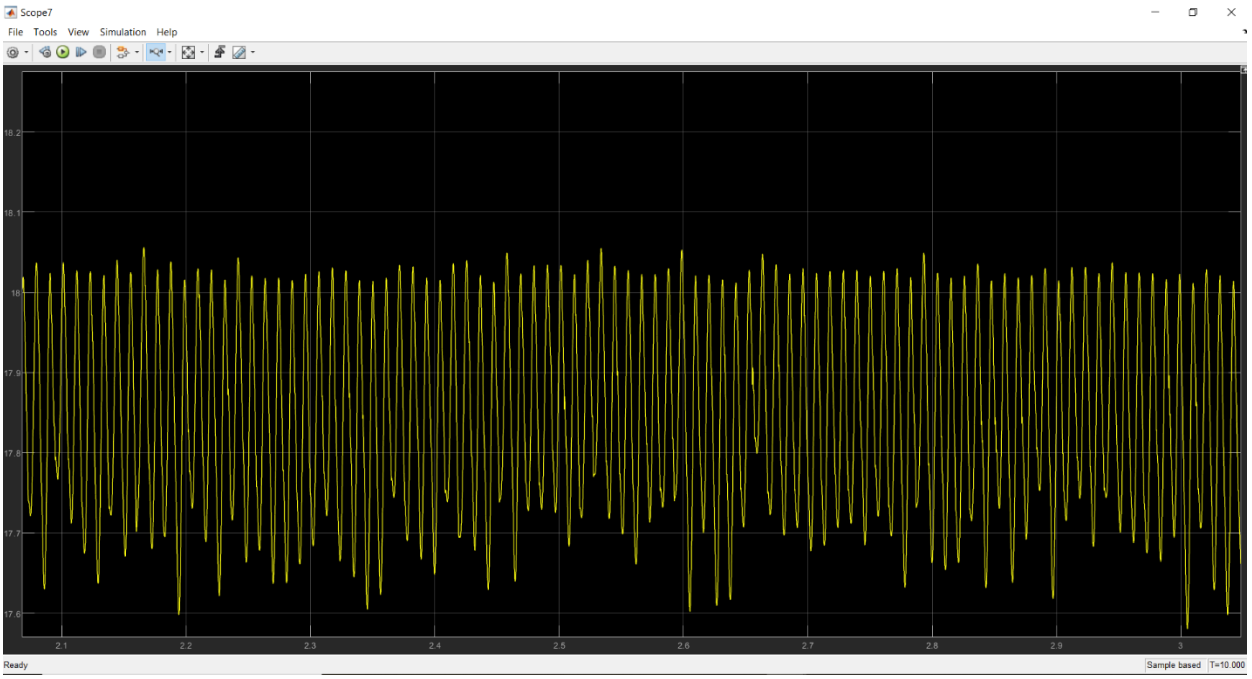
WIND TURBINE MODELLING



OUTPUT:




Scope6
File Tools View Simulation Help
236
234
232
230
228
226
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
Ready
Sample based
T=10.000


Scope7
File Tools View Simulation Help
18.2
18.1
18
17.9
17.8
17.7
17.6
2.1
2.2
2.3
2.4
2.5
2.6
2.7
2.8
2.9
3
Ready
Sample based
T=10.000

SOLAR PANNEL'S WORKING PRINCIPLE

The solar panel is made up of solar cells; it is used to convert solar energy to electrical energy. Its working principle of solar cell is similar to PN junction diode operation. These solar panels are designed with different output power, we can choose appropriate solar panels.

SOLAR PHOTOVOLTAIC CELLS WORKING

PV ARRAY

Solar photovoltaic cell consists of a P-type silicon layer that is placed in contact with an N-type silicon layer. With the influence of solar energy, these electrons in the N-type material move from N-TYPR TO P-type. Several PV panels connected in series and/or in parallel give a dc output. This output is converted to AC loads using an inverter that turns DC electricity into 120V AC electricity.

The solar photovoltaic effect is a process to convert solar energy to DC energy using an array of solar panels.

Specification of solar panel:

- Module – Trina solar TSM-250PA05.08
- Cells per module – 60
- Parallel strings – 4
- Series-connected modules per string – 10
- Open circuit voltage – 37.6
- Short-circuit voltage – 8.55
- Voltage at maximum power point V_{mp} – 31

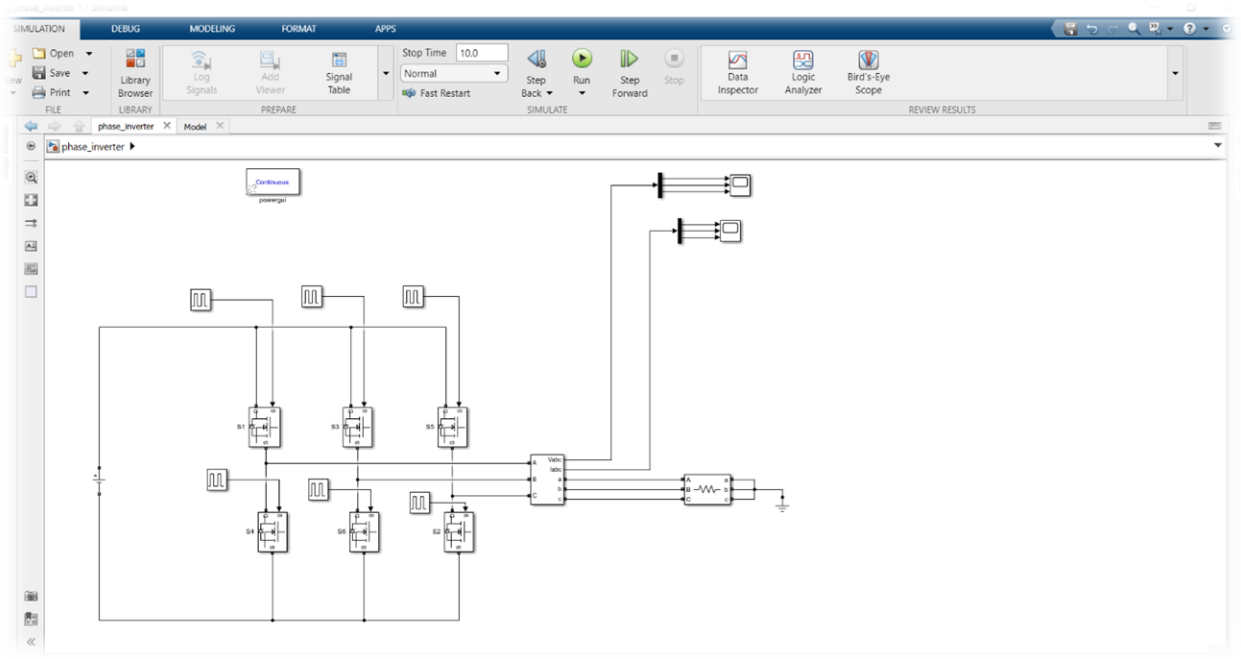
- Current at maximum power point I_{mp} – 8.06
- Temperature coefficient of V_{oc} – -0.35
- Temperature coefficient of I_{sc} – -0.06

BOOST CONVERTER

A boost converter is a step-up converter. It is a DC-DC power converter that steps up the voltage from its input to its output. The ability of the boost converter is to steal the remaining energy in a battery.

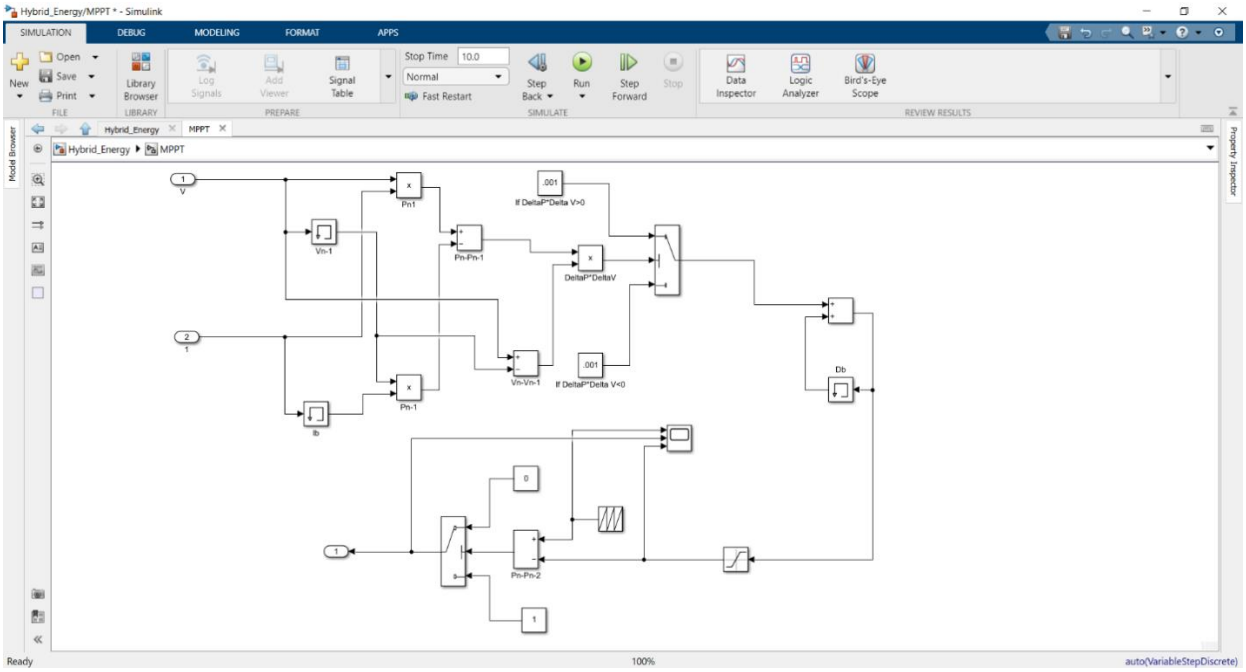
THREE-PHASE INVERTER

A three-phase solar inverter is used to convert a DC into an AC output. It can transmit three times as much power as a single-phase power supply.



MPPT

The MPPT (Maximum power point tracking) is used for extracting the maximum power from the solar PV to transfer to the load. It is an electronic DC-DC converter that optimizes the match between the solar array and the battery bank or utility grid.

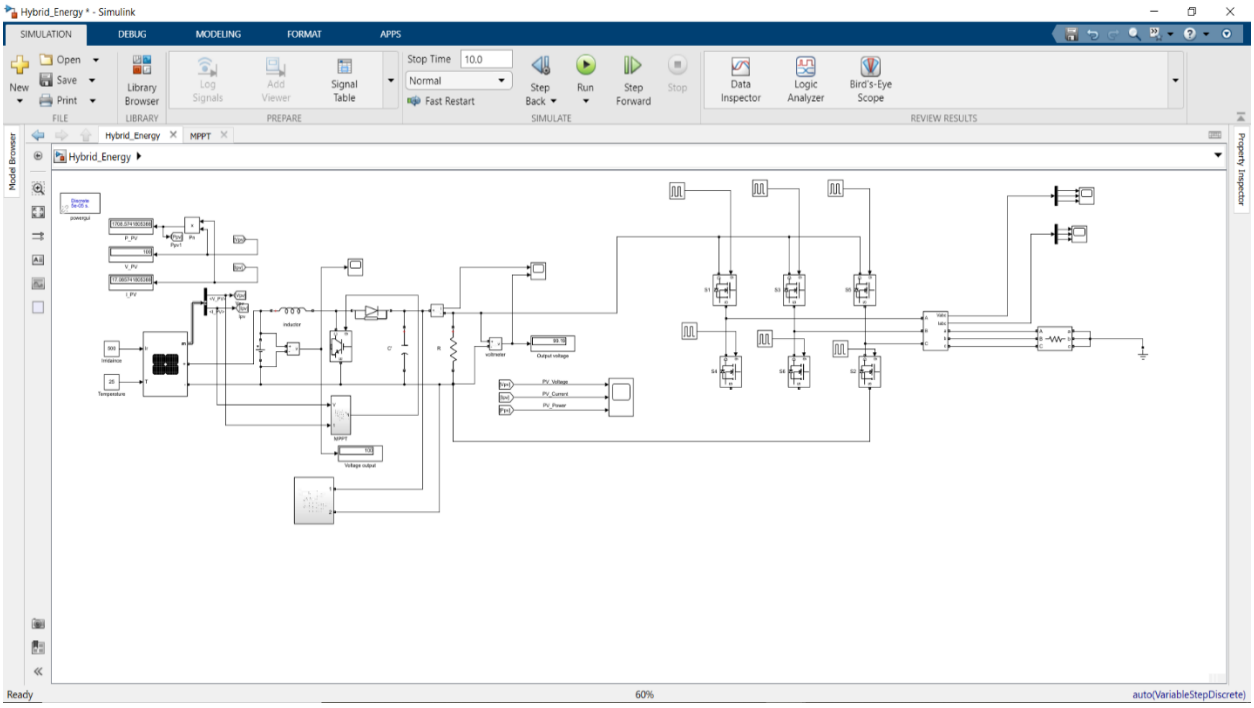


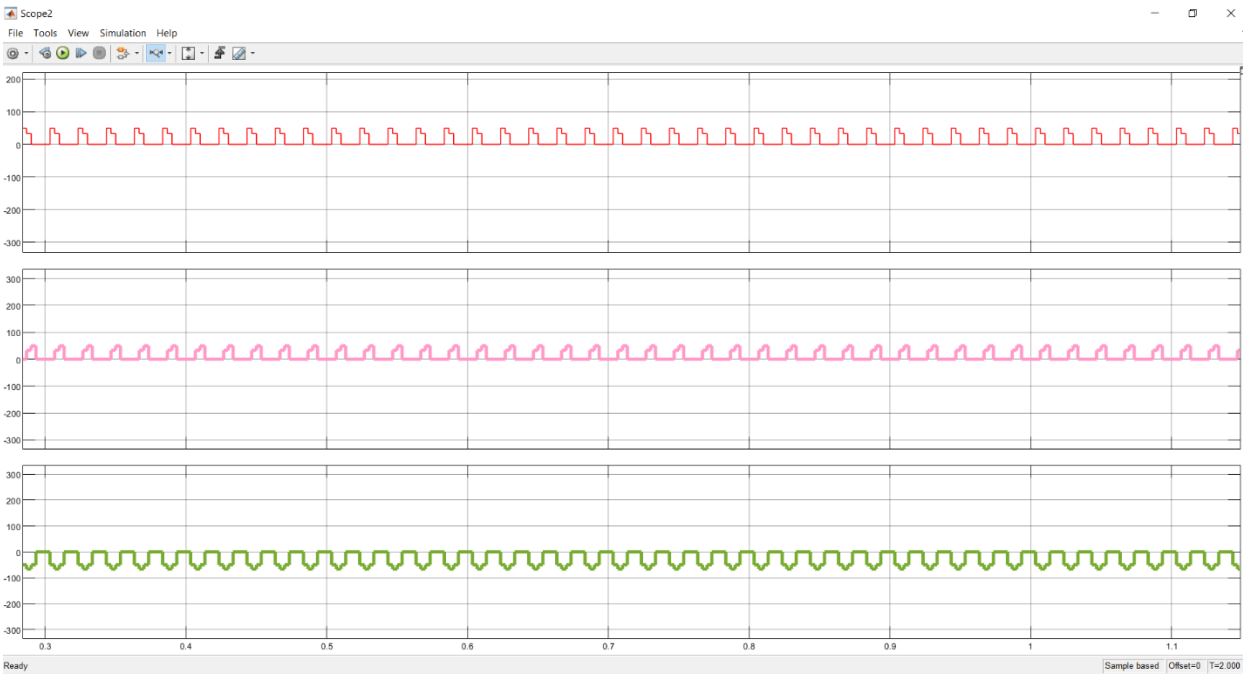
HYBRID SOLAR WIND ENERGY GENERATION SYSTEM

Hybrid refers to the combination of multiple energy generation, storage. It is a dynamic system that exhibits both continuous and discrete dynamic behavior. The energy sources supply the load simultaneously depending upon their availability.

The combination of wind turbines and solar arrays generates electric power with the help of respective controllers. The generated power is supplied to the connected house load. Load sharing takes place in this system.

HYBRID SIMULATION MODELLING:

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File Tools View Simulation Help
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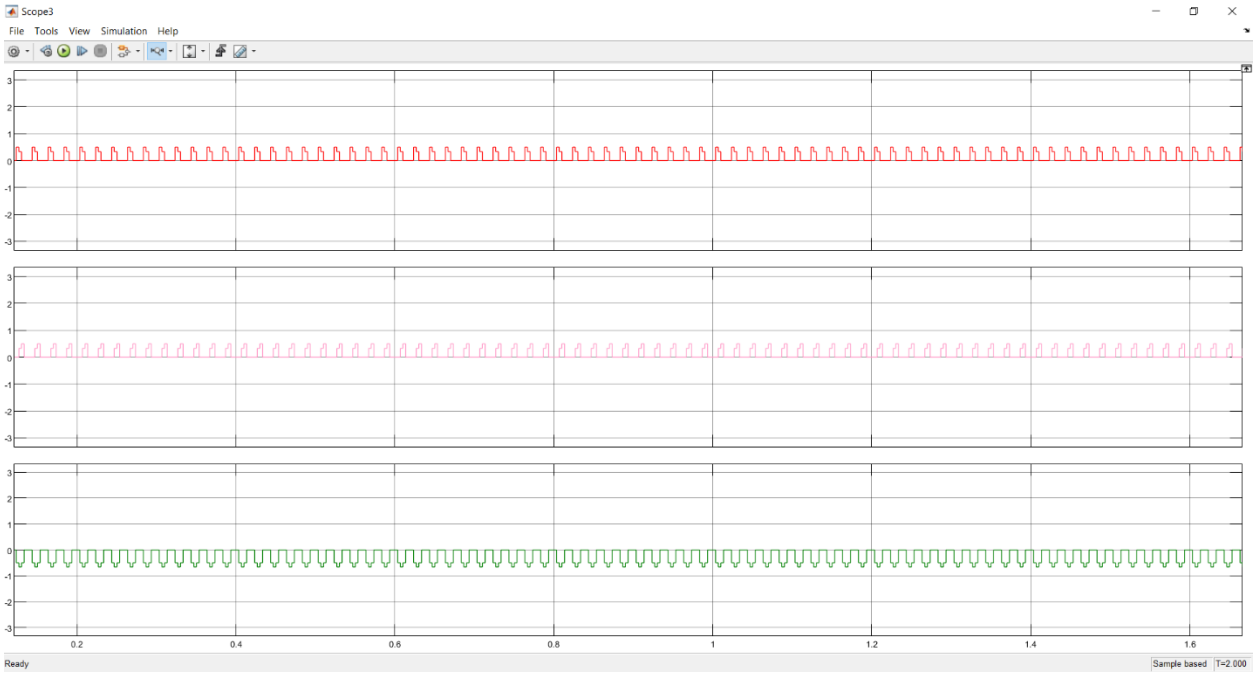
0
-100
-200
-300
300
200
100
0
-100
-200
-300
300
200
100
0
-100
-200
-300
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
Ready
Sample based
Offset=0
T=2.000


Scope3
File Tools View Simulation Help
3
2
1
0
-1
-2
-3
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
Ready
Sample based
T=2.000

CONCLUSION:

The combined power generation system improves the overall efficiency of the system. To improve the solar photovoltaic power generation efficiency, the wind turbine is integrated into a hybrid energy system. It provides the power to inaccessible convention power places. The addition of an extra power source helps in supplying continuous power. With this Hybrid Solar wind energy system, the overall system performance is increased and will get a continuous power supply.