CHAPTER FOUR

TEST AND RESULTS

4.1 RESULT TESTS AND DISCUSSION

The following system tests were carried out, which included;

i. Solar panel testing
ii. Inverter testing
iii. Battery testing
iv. During loading
v. When on no-load

4.1.1 SOLAR PANEL TESTING

There are two things that needs to be measured in order to ensure the panel is functioning properly.
Manufacturers open circuit voltage: 65.2V

Open circuit voltage: 64.9V

Short circuit current: 6.46A

Manufacturers short circuit current rating: 6.75A

To measure open circuit voltage, the panels should not be under sunlight but care must be taken since the panel will be live when it is placed under sunlight and there is possibility of electric shock. The readings were taken using multimeter. The readings (open circuit voltage and short circuit current) should be compared with the rating of put in place by the manufacturers. The reading also gotten depends on the sun intensity as of the time reading was taking.

4.1.2 CHARGE CONTROLLER TESTING

A visual inspection testing was conducted to check how the voltage going to the battery was regulated at full charge.

The calculated battery voltage was=13.5V * 4

The total battery voltage=54V

The charge controller voltage displayed was 54V at full charge.

This value 54V was the practical value.

4.1.3 BATTERY TESTING

To determine the battery's capability to hold a charge, one would require the use of a charge controller. However, a physical inspection was carried out to determine the healthy condition of the battery. Things to look out for includes;

i. Leaking acid.
ii. Crystallization on the terminals.
iii. Physical damage like cracks on the battery.

The battery was connected in series and their respective voltage and current was obtained.

Battery rating =12V\230Ah

Total number of batteries = 4

Series connection:

Voltage = 48volts

Current = 230amps

4.2 SYSTEM DESIGN TESTING (UNDER NO-LOAD):

Here are specifications for the installation:

i. 1 x 5KVA inverter system
ii. 14 x 320 watts solar panel
iii. 4 x 12V/230AH
iv. 1 x 60A charge controller

Under no-load the 24V battery was carefully connected to the 5000w inverter and these readings was taken down.

i. The voltage was tested and it reads 230V
ii. The frequency meter reads 50Hz
iii. The battery voltages read 54.0V

4.3 SYSTEM DESIGN TESTING (ON-LOAD TEST)

This test was conducted by connecting loads to the inverter individually and adding an additional load to it (increasing the load by 200watts) and also another test was conducted by connecting all the loads incrementally without removing them until the inverter reaches its tripping point.

Table 4.1: Load analysis of the 5KVA hybrid power supply system (AC table)

Load	**AC(Voltage)**	**AC(Current)**	**AC(Power)**
150watts	235.47volts	0.61amps	143.64
300watts	239.72volts	1.20amps	287.66
450watts	246.89volts	1.87amps	461.68
600watts	253.17volts	2.49amps	630.39
750watts	256.25volts	3.20amps	820

900watts	261.22volts	3.86amps	1008.31
1050watts	269.11volts	4.52amps	1229.73
1200watts	276.03volts	5.17amps	1216.38
1350watts	280.01volts	5.81amps	1626.86

Table 4.2: Load analysis of the 5KVA hybrid power supply system (DC table)

Load	**DC(Voltage)**	**DC(Current)**	**DC(Power)**
150watts	54.04volts	11.56amps	624.70
300watts	57.03volts	22.11amps	1260.93
450watts	58.59	44.64amps	5551.60
600watts	59.53	87.02amps	5180.30
750watts	60.21	92.38amps	5562.20
900watts	60.44	96.13amps	5810.10
1050watts	61.57	98.99amps	6094.81
1200watts	62.46	105.74amps	6604.52
1350watts	62.73	106amps	6,649.38

Table 4.3: Bill of Engineering Measurement and Evaluation (BEME)

S/N	Item Description	Quantity	Amount (₦)
1	5kVA Hybrid Inverter	1	200,000
2	Monocrystalline Solar Panel (300W)	6	180,000
3	Deep Cycle Battery (200Ah)	2	120,000
4	Charge Controller (60A)	1	35,000
5	Cables, Breakers, and Accessories	Lot	45,000
6	Mounting Structure	1	30,000
7	Installation and Labour	1	70,000
TOTAL			₦680,000