CHAPTER ONE

1.0 GENERAL INTRODUCTION

1.1 ABOUT INDUSTRIAL TRAINING FUND (ITF)

The Industrial Training Fund (ITF) was established in the year 1971 under Decree 47 of 8th October 1971. The provision of the decree empowers the ITF to promote and encourage the acquisition of skills in industry and commerce with a view to generating a pool of indigenous trained manpower sufficient to meet the needs of the Nigerian economy. The main purpose of the ITF services is to stimulate human performance, improve productivity, and induce value-added production in industry and commerce. The Fund through its SIWES, Vocational and Apprentice training programs, also builds capacity for graduates and youth self-employment, in the context of small scale industrialization, in the economy.

1.2 ABOUT STUDENT INDUSTRIAL WORK EXPERIENCE (SIWES)

- The Student Industrial Work Experience (SIWES) was established by the ITF in 1973. The scheme was established to solve the problem of poor practical skills preparatory for employment in industries by Nigerian graduates of tertiary institutions. The scheme was designed to give undergraduates the skills needed to cope in the labour market after graduation and designed for duration of 4 months for Polytechnics and Colleges of Education students and 6 months for University students. During this period, students are expected to acquire all necessary practical skill, together with theoretical knowledge gained from their respective institutions and put them into field practice to solve real life problems. In addition, the scheme also gives students the basis of technological advancement and development of Engineering in the economy. Participation in the SIWES program has become a necessary pre-requisite for the award of Diploma and

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Degree certificates in specific disciplines in most institutions of higher learning in the country, in accordance with the Education policy of the government.

1.2.1 OBJECTIVE OF SIWES

Some of the objectives of the scheme are listed below:

- It exposes students to industry based skills needed for smooth transition from the classroom to work environment.
- It enables students of tertiary institutions to be exposed to the needed experience in handling equipment and machinery that are not available in schools.
- It gives firms the avenue to assess the quality of graduates of tertiary institutions both practically and theoretically.
- The scheme helps the students in building their communication skills with staffs at work and in human inter-relationship.
- It exposes students to work ethics in their chosen profession.
- It gives students the opportunity to implement practical ideas gained from laboratories in institutions to solve real life problems.

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CHAPTER TWO

2.0 COMPANY PROFILE

STANDARD FOCUS VENTURE (SFV)

Standard focus Venture has its headquaters located at 171, Ibrahim Taiwo road, opposite Kwara state stadium Ilorin, Kwara state.

2.1 BRIEF HISTORY OF STANDARD FOCUS VENTURE

Standard Focus Venture was found by two Engineers(Engineer Olatunji and Engineer Abdulrasheed). It Is a well established firm that speciallized in the Design, installation, and maintainance of Solar power systems for both reidential and comercial properties. The company had been in operation for over a decade and had built a solid reputation for providing high-quality solar solution to its consumers. Both founders bring years of experience in Engineering and a deep understanding of the latest technologies in the field.

2.2 VISION OF STANDARD FOCUS VENTURE

Standard focus Venture is a company envisioned

- Towards providing a 24/7 electricity for people and tackle the problems of electricity in the country.
- To make the inverter and solar amongst the best source of electricity in the country
- Installation and effective maintenance of inverter and solar
- Security systems

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2.3 THE COMPANY'S SCOPE OF WORK

In area of specialization SFV has the capacity of providing the following services

- ✓ Solar inverter system
- ✓ Configuration of CCTV camera
- ✓ Motorized gate
- ✓ Automatic change over switch
- ✓ Electrical and sound system installation both in conduit and surface
- ✓ Maintenance of solar power system

2.4 SOME OF THE OBJECTIVE OF THE COMPANY

- One of the major objectives of the company is to provide a reliable renewable power system.
- They also serves as a great source of employment for both skilled and unskilled workers.
- They also create changes to the improvement of technologies world wide.

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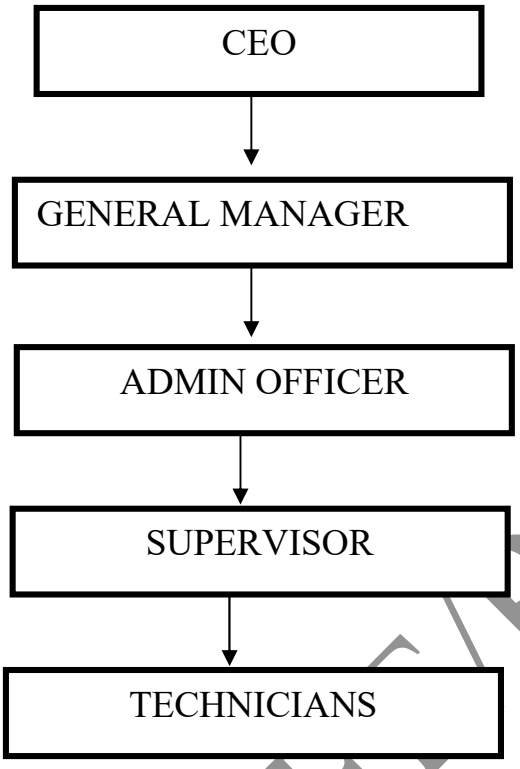
2.5 ORGANIZATIONAL CHART



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CHAPTER THREE

3.0 EXPERIENCE GAINED

INTRODUCTION TO SOLAR SYSTEM

Solar Power is produced by converting energy from sunlight into electricity, either directly using solar cells (photovoltaic or PV) or indirectly using concentrating Solar power systems(CPS)

PV Power plant

The solar modules of a PV power plant convert sunlight into electric current.

CPS Power plant

A CPS Plant uses lense or mirrors and tracking system to focus sunlight onto a fluid. The fluid is heated to 250degrees to 1000degrees Celsius and used to generate steam. Electricity is produced by the steam turbine.

SOLAR PANEL

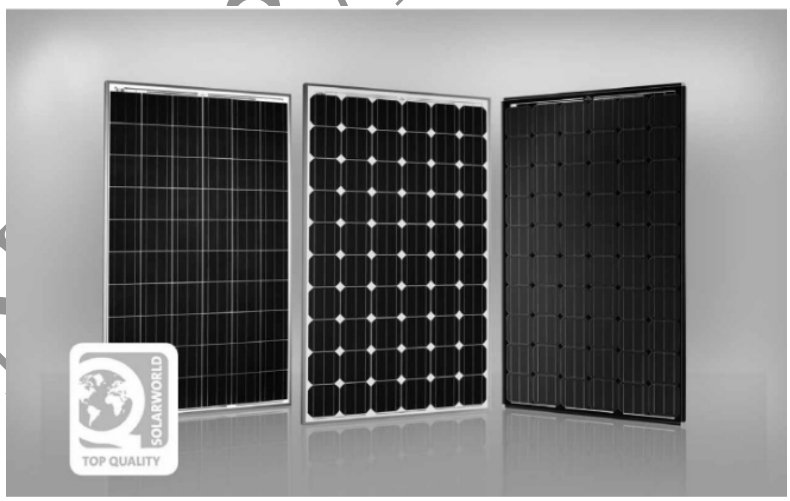

Figure: 1 solar panel

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Solar systems are an environmentally friendly way of producing electricity for domestic usage, the technology relies on photovoltaics (PV) cells to turn sunlight into electricity

Types of solar panel

1. Mono-crystalline: - mono crystalline are solar panel that is made entirely of a single crystal structure, it is usually made of silicon which are form into bars and are cut into wafer. It is usually dark in colour

2. Poly-crystalline: - poly crystalline is produced by making use of a crystal of silicon manufactured by melting many fragment of silicon and other material together to form the wafers for the solar panel example of material used are: - copper indium gallium selenide(CGIS). It is blueish in colour.

3. Amorphous silicon solar panel (also known as thin-film solar panel): They are created by depositing thin layers of photovoltaic silicon on a suitable substrate such as plastic, stainless steel, glass, or another transparent materials.

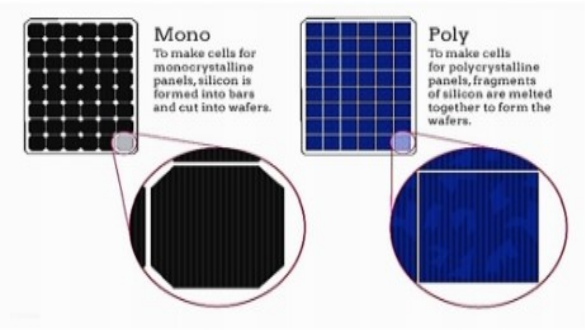

Figure: 2 Different types of solar panel

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The two (2) common connections type of photovoltaic system design

1. The system is connected to the utility grids and has battery storage to provide the power need for consumption (HYBRID)
2. The system is connected to a battery storage to provide emergency power back up (OFF-GRID).

Solar panel installation accessories include ;

1. Aluminium solar rack
2. Bot and nut
3. Nail
4. Connecting wires
5. Binding wire

3.1 IMPORTANT FACTOR TO CONSIDERED WHEN INSTALLING SOLAR PANEL

The following factor are considered before installing a solar panel are as follows

1. Location: - when installing the solar panel, it must not face the direction of either sunrise or sunset, in order to achieve an optimized energy, form the solar panel, therefore the solar panel must face the direction of the sun path
2. Seasons: - solar panels receive more direct ultra-violet ray of the sunlight during the summer (dry season) than in the rainy season even though the panel was often set to the latitude of an angle equal to the latitude.

3. Climate: - solar arrays are most efficient in the brightest day. Direct sunlight efficiency can dramatically be reducing if the sky is overcast.
4. Obstacle or shade: - anything that blocks the sunlight from falling on the solar panel will reduce the efficiency of the array, which include shadows from nearest

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building, tree branches, leaves, dust and other debris

3.2 CONNECTIONS OF SOLAR PANEL

- SERIES CONNECTION OF MODULES: Solar panels are connected in series by connecting the positive Cable of one panel to the negative cable of another solar panel whereby, the first negative cable and the second positive Cable of the panel will be the output supply to the charge controller. The aim of this connection is to add up the voltage of the modules while there current remains the same.

- PARALLEL CONNECTION OF MODULES : Solar panel are connected in parallel by connecting the positive Cable of the one panel to the positive of the next panel also connecting the negatives of the two oanel, in this case the positive of the first panel and the negative of the other panel will be the output supply or vice versa. The aim of this connection is to add up the current and there voltage remains the same.

- SERIES-PARALLEL CONNECTION OF MODULES (MIXED COMBINATION) : In a series-parallel connection of modules, multiple modules are arranged both in series and in parallel to create a larger system. When modules are arranged in series, their voltage adds up; when arranged in parallel, their current adds up.

To connect modules in a series-parallel configuration, modules are first grouped in parallel. Each parallel group is then connected in a series chain. The overall voltage of the system is the sum of the voltages of the modules in each series chain, while the overall current is the sum of the currents of the modules in each parallel group.

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3.3 BATTERY BANKS

The solar panel generates electricity that is stored in the batteries to prevent blackout. The battery is connected to the inverter via DC cabling.

Fig 3: A 12v- 200AH Litum-ion Battery and a Battery Rack

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3.4 TYPES OF BATTERY

Tubular Battery

A tubular battery is a type of lead-acid battery that uses a tubular positive plate along with a flat negative plate. It is designed to deliver high current, making it ideal for applications that require a constant power supply, such as inverters and UPS systems. The tubular design allows for a longer life span and better performance compared to other lead-acid batteries.

Dry Cell

A dry cell is a type of electrochemical cell that uses a paste electrolyte instead of a liquid. It is commonly used in portable electronic devices and household items like flashlights and remote controls. The paste electrolyte is immobilized, preventing

any leakage and making it more convenient to use. Dry cells have a longer shelf life and can provide a steady output of energy.

Lithium-Ion Battery

A lithium-ion battery is a type of rechargeable battery that uses lithium ions to store and release electrical energy. It is widely used in various applications, ranging from smartphones and laptops to electric vehicles and renewable energy storage systems. Lithium-ion batteries offer high energy density, long life cycles, and low self-discharge rates. They are known for their lightweight design and fast charging capabilities, making them a popular choice for many modern electronic devices.

Three (3) major ways in which batteries are connected are: -

- SERIES CONNECTIONS: This is the type of connection in which the configuration of the battery is added up in the end to end (positive terminal to negative terminal), Series configuration If the goal is to increase the overall voltage of the inverter.
- PARALLEL CONNECTIONS: - this is the type of connection in which the configuration of the battery is added up in the linear end to end (positive terminal to positive terminal and negative terminal to negative terminal) parallel configuration If the goal is to increase theoverall ampere hour of the inverter
- INTER SERIES AND PARALLEL CONNECTION: - this is the type of connection in which the configuration of the batteries is inter woven between series and parallel connection, this configuration is made to either increase voltage and current.

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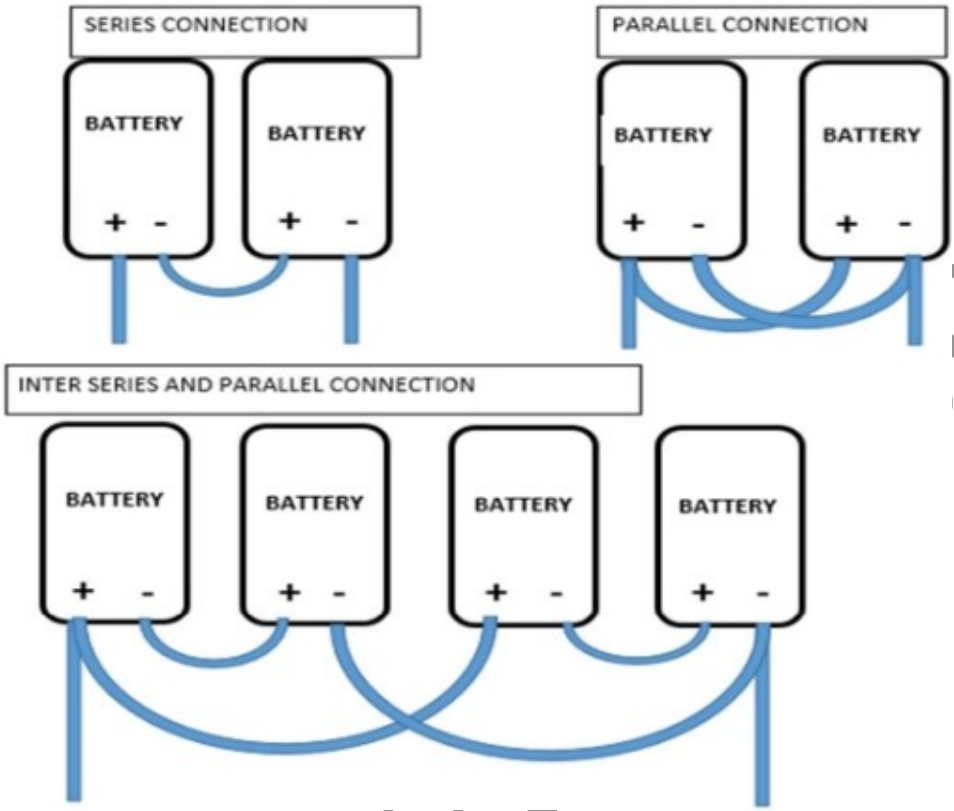

Fig 4: Connection Diagram

3.5 CHARGE CONTROLLER

The charge controller is used to regulate the charging of the battery bank which ensures that the battery is charged in a safe manner. This will prevent overcharging and extend the life of the batteries. They are rated in voltage and current depending on the products.

The main Types of charge controller include;

MPPT: which stands for Maximum Power Point Tracking, is an advanced technology used in solar charge controllers. Its primary function is to optimize the output of solar panels by continuously tracking and adjusting to the maximum power point of the panel's voltage-current curve. This allows MPPT controllers to harvest the maximum amount of energy from the solar panels, especially in varying weather conditions in any part of your region. They are available in 12v, 24v, and 48v and the available current ratings are 30A, and 69A, based on the frequently used in the site.

PWM: which stands for Pulse Width Modulation, is a simpler and more affordable technology used in solar charge controllers. PWM controllers regulate the charging process by rapidly switching the current flow to maintain a constant voltage. When the battery reaches the desired voltage, the PWM controller modulates the width of the charging pulses, reducing the power delivered to the battery. The available voltage rating are 12v,24v, band 48v while the current ratings are 30A and 60A.

Fig 5: Charge controllers

SYSTEM SIZE

MPPT controllers are more suitable for larger solar systems with multiple panels or high-voltage panels. PWM controllers are a cost-effective option for smaller systems with fewer panels.

EFFICIENCY

MPPT controllers have higher efficiency, leading to increased energy output and faster charging times. PWM controllers are less efficient but still provide reliable charging capabilities.

COST

MPPT controllers are generally more expensive due to their advanced technology and increased efficiency. PWM controllers offer a more budget-friendly option.

- AC BREAKER: An AC breaker is a device that is used to protect electrical circuits from Overcurrents or short circuits in alternating current (AC) systems. It interrupts the flow of AC current to prevent damage or fire hazards. The current rating of an AC breaker typically ranges from 15 amps to several hundred amps, depending on the application. The voltage rating of an AC breaker is typically between 120V and 600V. The frequency of an AC breaker is typically 50 Hz or 60 Hz, depending on the region.
- DC BREAKER: A DC breaker is a device that is used to protect electrical circuits from Overcurrents or short circuits in direct current (DC) systems. It interrupts the flow of DC current to prevent damage or fire hazards. The current rating of a DC breaker varies depending on the application but can range from a few amps to several thousand amps. The voltage rating of a DC breaker can range from a few volts to several kilovolts. The frequency of a DC breaker is usually not applicable since DC current does not have a frequency.

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- AC SURGE: An AC surge refers to a sudden increase in voltage in an alternating current (AC) system. It occurs due to events such as lightning strikes, power line faults, or switching operations. AC surge can cause damage to electrical equipment, and surge protection devices are used to suppress or divert excess voltage to protect the equipment. The voltage rating of an AC surge can vary significantly depending on the source and magnitude of the surge. The frequency of an AC surge is typically the same as the frequency of the AC system it occurs in, which is usually 50 Hz or 60 Hz.
- SURGE PROTECTOR DEVICE (SPD): A DC surge refers to a sudden increase in voltage in a direct current (DC) system. It can occur due to events such as switching operations, equipment failures, or lightning strikes. DC surge can cause damage to electrical equipment, and surge protection devices are used to suppress or divert excess voltage to protect the equipment. The voltage rating of a DC surge can vary widely depending on the source and magnitude of the surge. The frequency of a DC surge is not applicable since DC current does not have a frequency.
- CABLES: Cables are electrical conductors used for transmitting electrical power or signals from one point to another. They are composed of multiple strands of conductive material, typically copper or aluminum, surrounded by an insulating material such as PVC or rubber. Cables come in various types and sizes, depending on the application and the amount of current they need to carry. The current rating of a cable depends on its size, material, and insulation. The voltage rating of a cable is determined by its insulation and the intended usage. The frequency of cables depends on the frequency of the electrical power or signal they carry, which is typically 50 Hz or 60 Hz for AC systems.

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3.6 EXPERIENCE GAINED WITH THE TECHNICIANS

I was expose to different designs of solar panels, mounting of inverters and how they are wired from the solar panel, down to the battery banks.

3.7 INSTALLATION PROCESS

A client that wants to install solar power system in his three bedroom flat.

The steps to consider are stated below:

LOAD AUDIT

Sizing a solar power system: Solar power system is based on the loads of the building. The following operations were always carried out whenever we have a new client.

1. Power ratings of the appliances (w)
2. Run tune hours
3. Total daily energy consumption (whr/kwhr)
4. Load with starting power/surge power e.g water pump, ref, air conditional.
5. Load that uses electricity to generate heat e.g water heater, space heating, incandescent light.

Load analysis table

S/N	Description	Qty	Power (w)	Total power (w)	Runtime (hours)	Total daily energy consumption (wh)
1.	Television	1	60	60	4	240
2.	Decoder	1	18	18	4	72
3.	Ceiling fan	2	70	140	8	72
4.	Home thetre	1	50	50	8	1120

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5.	Security light	4	8	40	6	300
6.	Internal light	6	5	30	12	480
7.	Blender	1	300	300	6	180
					30.5	2542

Batterysizing

factors to be considered

1. Days of autonomy =2days

2 x 2542 =5,084WH

2. Depth of discharge (DOD)

I lithium DOD = 100%

Ii led Acid DOD =50%

Using load Acid battery

230AH – 12v =2760WH

$$\frac{5084WH}{2760WH} = 1.8 \cong 2 - 12v, 230AH\ battery$$

2 x 2760 = 5520WH

Solar panel sizing

Factors to be considered

Peak Sunshine in Nigeria is approximately 5hrs

$$\frac{5520WH}{5h} = 1{,}104\text{w}$$

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Tolerance of 25%

1,324.8w –Array

Charge controller

$$\frac{132VA}{12} = 110.33A$$

The required charge controller: 60A

Since the component needed and the materials are completed the rest are connections.

The tools that are used:

- Screw driver
- Bender spring
- Gloves
- Pliers
- Hammer
- Neo Tester
- Fixing tape
- Hack saw
- Center punch
- Bench vice
- Spanner
- Soldering iron
- Safety belt
- Raw plug drill
- Cutting pliers

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- ❖ Multi meter

3.1 USES OF ABOVE TOOLS AND INSTRUMENTS

i. **Screw Driver:** it is used for loosing and tightening screw.

ii. **Bending Spring:** it is made up of spring, it is used in Bending PVC pipe when working von conduit wiring system.

iii. **Gloves**: it is used to guide against Electrical and mechanical damages to hands.

iv. **Pliers** : it is used for cutting, disconnecting or removing installation material like rubber from a conductor. It is also used to hold material firmly in order to couple the material.

v. **Hammer**: it is used for clipping cable to a surface.

vi. **Tester**: it is used to check whether a conductor is live . It is also used to detect the flow of current in a conductor

vii. **Fixing tape**: it is used in passing wire into PVC pipe when working on conduit wiring system.

viii. **Hacksaw**: it is used for Cutting metal and PVC pipe when working on conduit wiring system.

ix. **Center punch**: it is used for making point on metal or concrete blocking before drilling .

x. **Bench vice** : for Viking metal for the purpose of cutting or threading.

xi. **Spanner:** for tightening and losing hexagonal headed bolt ad nuts.

xii. **Soldering iron**: for soldering cable conductor joints.

xiii. **Safety belt**: for prevention and holding the body when climbing concrete poles.

xiv. **Cutting pliers**: for Cutting conductors

xv. **Raw plug drill**: for forming holes inside the block or concrete.

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xvi. **Voltmeter**: it is used for measuring the amount of voltage that passes through a cable or which a Load posses.

Multi meter: is an instrument designed to measure electric current, voltage and usually resistance, typically over several range of value.

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CHAPTER FOUR

4.0: APPRAISAL, RELEVANCE TO EEE DISCIPLINE, & CONCLUSION

4.1 APPRAISAL AND CONCLUSION: -

My experience during the period of industrial attachment has been an enriching and innovative one. The SIWES scheme is indeed an innovative concept and looking back I am glad that worked at "STANDARD FOCUS VENTURE". The experiences have been far rewarding and the report summarizes the details. From the full details on the experience which I had during the training program which gave me the privilege to relate with senior professionals and other students from different institutions. The knowledge acquired is not only academic or technical skill as the case may be, I was also made to understand the importance of other fields of study and ultimately appreciate the roles they play to the success of any industry. The experience makes me appreciate the nature, benefits and intricacies of my chosen field of study both in the classroom and in the larger society.

4.2 RELEVANCE TO EEE DISCIPLINE:

The relevance of the experience gained can be linked to the following courses:

- Electrical service design
- Renewable energy
- Power electronics
- Electromagnetic field and wave

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CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION

The SIWES programmed has contributed positively to my exposure and training in the field of Electrical ad Electronics Engineering. It has also helped me to put into Practice the know gained in classroom with the actual industry experience. Also to develop a critical and realistic approach to problem with their solution in the Electrical field.

RECOMMENDATION:

In view of my experience during my industrial training, the following recommendations are made to the students, university, industrial training fund (I.T.F) and the companies:

- Students should personally ensure that they get a good placement for the program in time to commence and gain the best from the six-months.

  Students should make sure that the entire period for the attachment is completed before bowing out of the program.

  Also, student should have a focused mind and interest as it will help them get the maximum knowledge attainable from the company attached to.
- Not all students have the opportunity of getting good industrial training placement, so the university should ensure they establish good relationships with companies, firms and Organizations capable of assisting in the SIWES program on a yearly basis thereby helping the less privileged students.

  On the part of I.T.F, Student supervision should also be intensified to make the program more effective.

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- ❖ The firms should ensure that a well-structured program for the period of training is spelt out and be seriously adhered to, so that students can benefit.

Also, the firms should see their role in the program as one of contributing to the nation's educational system and not as a means of exploiting I.T students as cheap labor.

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