St. Xavier's Technical Institute

Mahim West, Mumbai, Maharashtra 400016

Training on skill development of
PV Solar Power Plant installation, Operation & Maintenance

The certificate will Compliance to
QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

Duration of the programme: **The duration of program is six months (residential)/600 hours including classroom training, lab practical, SPV plant exposure, on the job training, soft skills and entrepreneurship skills etc.**

Funding Pattern: **Funding for trainings would be as per Ministry of Skill and Entrepreneur Development (MSDE) and the periodical changes will be in accordance with MSDE revision of the norms.**

Target participants: **Min. 10th Pass + ITI in Electrician/ Wireman/ Electronics Mechanic/Fitter/Sheet Metal**

Assessment and certification:

Certificate

COMPLIANCE TO
QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

St. Xavier's Technical Institute

Complying to National Occupational Standards of
Job Role/ Qualification Pack: '**Solar PV Installer**'

Date of Issuance:

Authorised Signatory

Industrial collaboration for training and placement : **SC SOLAR SOLUTION PVT LTD , WEBSOL ENERGY SYSTEM LTD, SUDHIR ENGINERING PVT LTD…**

About program

Government of India is aiming towards a capacity of about 300,000 MW to come from Solar Energy by the year 2026. This includes a capacity of 100,000 MW to come up on the rooftops of various buildings and houses spread throughout the country. The country is looking for technician about 50,000in next 3 years Considering the huge technically trained manpower requirement to meet this ambitiousgoal, Skill Council for Green Jobs is targeting a special skilling course on Solar PV Installer. The Solar PV Installer would be specialized for mechanical, civil and electrical installations of rooftop Solar Photovoltaic systems as well as maintaining them.

This Participant course is designed to enable theoretical and practical training on Rooftop Solar PV Installation, Operation and Maintenance.

This course is designed considering the minimum education qualification. However, as part this efforts have been made to revise their knowledge of electrical and civil concepts required for this job. The contents of this book are in simple language, without going into too much theoretical details and calculations. It is envisaged that this training manual will provide the participants with the knowledge and skills required for installing and maintaining a rooftop Solar Photovoltaic System, complying with all applicable codes, standards, and safety requirements; and enable them to actively participate in the growing solar rooftop market.

Units and symbols used in the course have been listed below.

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Detail Syllabus

S.No.	Modules
1.	Introduction to Solar PV Installer -
2.	Basics of Solar Energy and Electrical Energy
3.	Basics of Solar Photovoltaic Systems
4.	Tools and Equipment Used for Solar PV Installation
5.	Site Survey for Solar PV Installation
6.	Procure Solar PV System Components
7.	Install Civil and Mechanical Parts of Solar PV System
8.	Installation of Electrical Components of Solar Photovoltaic Systems
9.	Test & Commission Solar PV System
10.	Maintain Solar Photovoltaic System
11.	Maintain Personal Health and Safety at project site
12.	Customer Orientation for a Solar PV System
13.	Employability and Entrepreneurship Skills

Key Learning Outcomes

At the end of this module, you will be able to:

1. Demonstrate general discipline in the class room and during the training program
2. Explain the role of Solar PV Installer and job opportunities
3. Explain the advantages of doing this course
4. Acquire basic skills of communication

Introduction to the Program

Unit Objectives

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The Solar PV Installer Classroom – Discipline and Code of Conduct

This course has been designed to introduce you to the concepts of solar photovoltaic power plants from an installation technician's perspective. The delivery of this training is divided into both practical and theoretical components. In order to derive the maximum benefit of undergoing this training program, you are encouraged to adopt a code of conduct during lectures, workshops and industry visits. Imbibing values of discipline, integrity and core professional skills will help you obtain a satisfactory outcome at the end of the program. Moreover, it will help you integrate better with your future employers and co-workers.

In the Classroom:

- Be punctual and regular in attending lectures. It will help maintain your pace with the entire class.
- Minimize distractions by keeping mobile phones and music devices turned off during training delivery. Participating in the classroom can be very interesting, and it reflects your commitment to the program.
- Interact with your trainer to find out more about the course and clarify concepts
- Engage in discussions with your batch mates to become a team player and actively participate in group activities to clear concepts and fill knowledge gaps
- Take this opportunity to freely ask your trainer any kind of questions related to the course. Clear understanding of practical and theoretical concepts is very critical to carry out the installation of solar PV plants.
- You must complete assignments and submissions on time with honesty and integrity. This will help you truly assess yourself and develop confidence to independently handle projects.

During practical training:

- Keeping in mind your personal safety, always wear Personal Protective Equipment (PPE) while handling electrical and mechanical tools, devices and equipment. This will protect you from electric shocks, physical damage to yourself and your team members. PPE and safety guidelines are extensively covered in later chapters of the book.

Personal Attributes

As a solar installer, you are required to concentrate on the job at hand and complete it without any accidents, so diligence and hardworking are desired attributes for performing this role. You should be able to demonstrate strong work ethics, an ability to communicate courteously with co-workers, and effectively carry out or follow the instructions of your supervisor.

Role of Solar PV Installer

Brief Job Description

Solar PV Installer checks, adapts, implements, configures, installs, inspects, tests, and commissions different components of photovoltaic systems, that meet the performance and reliability needs of customers by incorporating quality craftsmanship and complying with all applicable codes, standards, and safety requirements.

The Solar PV Installer has the following tasks to be carried out for a successful installation of a Rooftop Solar PV Power Plant. The first two modules on 'Basics of Solar Energy and Electrical Energy' and 'Basics of Solar Photovoltaic systems) will cover fundamental concepts.

The module on **'Site Survey for Installation of Solar PV System'** is about Solar Photovoltaic Technology and Plant Components. The aim is to understand the customer's requirement for solar PV system. This task covers the following:

- Assess the site condition
- Understand the work requirement
- Engage with customers to understand their requirement
- Visit and evaluate the site for installation
- Identify load to be connected to Solar PV System
- Assess the photovoltaic system required
- Assess the cost of system installation
- Ensure quality, standards and regulatory requirement are adhered

The module on **'Procure Solar PV system components'** is about confirming and adapting system design. This task covers the following:

- Prepare Bill of Material
- Procure the components
- Verify the components On-site

The module on '**Install Civil and Mechanical parts of Solar PV system'** is about installation of civil and mechanical components of the Solar Photovoltaic systems (for rooftop installations). This task covers the following:

Get Equipment Foundation constructed

- Install Mounting System
- Install Photovoltaic modules.
- Install Battery Bank Stand and Inverter Stand.

The module on **'Install electrical components of Solar PV system'** is about installation of electrical components of the Photovoltaic system. This task covers the following:

- Prepare for Solar Installation.
- Install Electrical Components.
- Install Conduits and cables.
- Get the Grounding Systems installed
- Install Battery bank (as required)

The module on **'Test and Commission Solar PV System'** is about Testing and Commissioning of electrical components of Photovoltaic System. This task covers the following:

- Test the System.
- Commission the System.

The module on **'Maintain solar photovoltaic system'** is about maintenance of solar photovoltaic system for effective functioning to achieve the specified energy output. It also includes troubleshooting of the system. This task covers the following:

- Clean the solar panels periodically
- Inspect the system periodically
- Troubleshoot to identify faults in the system
- Report and document completion of work
- Follow quality and safety procedures

The module on **'Maintain Personal Health & Safety at project site'** is about maintaining Work Safety for the technicians, customers, and site safety at the location of Solar Photovoltaic Power Plants. This task covers the following:

- Establish and follow safe work procedure
- Use and maintain personal protective equipment.
- Identify and mitigate safety hazards.
- Demonstrate safe and proper use of required tools and equipment.
- Identify work safety procedures and instructions for working at height.

The module on **'Customer Orientation for Solar PV System'** is about orientation of customer towards Solar PV System and handling over the completion documents. This task covers the following:

- Handover System Completion Documentation.
- Demonstrate Working Procedure of Solar PV system

Market Demand

The demand of skilled manpower in the Solar Photovoltaics Industry in India and worldwide is a subject under study which has been undertaken by various organizations. As of the time that this Participant Handbook was prepared, several reports have emerged that establish the imperative as well futuristic demand of Solar Photovoltaic Installers in the solar energy market.

As per the 'Human Resource Development Strategies for Indian Renewable Energy Sector', by Ministry of New and Renewable Energy and Confederation of Indian Industry, October 2010, 23 lakh persons were employed in the renewable energy sector globally in 2008. There is a huge job opportunity for solar installers since not many skilled installers are available in the market.

As per this report, the future projections for employment in Solar PV On/Off-Grid Sub-sector are as follows:

Table 1.1: Future projections for employment in Solar PV On/Off-Grid Sub-sector

Year	Estimated Employment		
	Direct	**Indirect**	**Total**
2010	24,000	48,000	72,000
2017	47,000	93,000	1,40,000
2022	75,000	1,50,000	2,25,000
2030	**150,000**	**3,00,000**	**4,50,000**

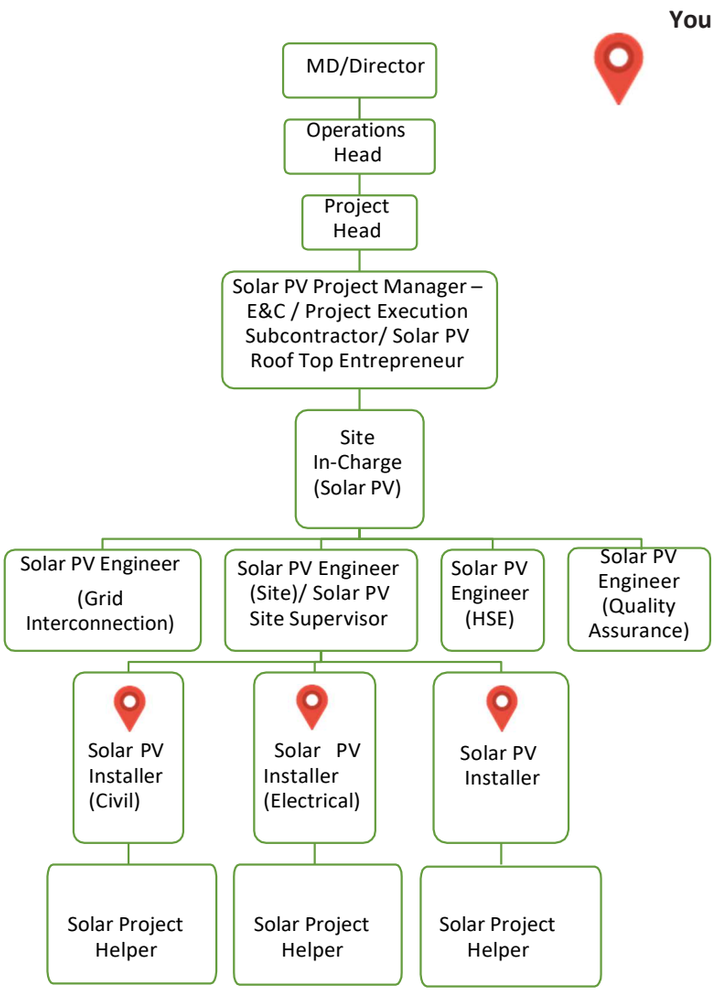
As per the report on 'Filling The Skill Gap in India's Clean Energy Market: Solar Energy Focus', by Natural Resources Defense Council (NRDC) and the Council on Energy, Environment and Water (CEEW), February, 2016, India would need a large number of skilled manpower to meet the 300 GW target of Solar Installations by 2030. The availability of appropriately skilled manpower has been identified as one of the most prominent challenges in hiring required personnel.

Table 1.2: Scale of skilled workers needed to achieve Solar targets

Function	Key Skills	Trained Manpower to achieve 100 GW of RooftopSolar by 2024	Trained Manpower to achieve 300 GW of Utility Scale Solar by 2030
Business development	Tracking the market, Drafting Bids, land selection, project finance	15,000	24,000
Design and Pre-Construction	Plant Design engineering	50,000	100,000
Construction and Commissioning	Site engineering	1,50,000	300,000
	Electricals training and PV installation	3,00,000	6,00,000
Operations and maintenance	Performance data monitoring and troubleshooting	1,50,00	3,00,000

Career Progression

Apart from existing reports and analysis carried out, Skill Council for Green Jobs, through collaboration industry interactions, has conducted an Occupational Mapping and Skill Gap Analysis to identify the employment patterns in the Solar Industry. As part of this exercise, an Occupational Map has been prepared to show the career progression for the installers.



Exercise

1. Briefly introduce yourself to your classmates telling them your name, age, address, educational background and any previous experience. Write down the purpose and expectations that you may have from this course and readit out to the class. You may like to frame this introduction in complete sentences.

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Contact :

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