

Model Curriculum

Solar PV Installer (Suryamitra)

SECTOR: GREEN JOBS
SUB-SECTOR: RENEWABLE ENERGY
OCCUPATION: INSTALLATION, OPERATION AND MAINTAINANCE
REF ID: SGJ/Q0101, V1.0
NSQF LEVEL: 4



Certificate

CURRICULUM COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

SKILL COUNCIL FOR GREEN JOBS

for the

MODEL CURRICULUM

Complying to National Occupational Standards of
Job Role/ Qualification Pack: '**Solar PV Installer (Suryamitra)**' QP No. '**SGJ/Q 0101 NSQF Level 4**'

Date of Issuance: **November 20th, 2015**

Valid up to: **October 1st, 2018**

* Valid up to the next review date of the Qualification Pack


Authorised Signatory
(Skill Council for Green Jobs)

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Solar PV Installer (Suryamitra)

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of a “Solar PV Installer (Suryamitra)”, in the “Green Jobs” Sector/Industry and aims at building the following key competencies amongst the learner

Program Name	Solar PV Installer (Suryamitra)		
Qualification Pack Name & Reference ID. ID	SGJ/Q0101, v1.0		
Version No.	1.0	Version Update Date	31 st December 2015
Pre-requisites to Training	10th pass + ITI / Diploma (Electrical, Electronics, Civil, Mechanical, Fitter, Instrumentation, Welder)		
Training Outcomes	<p>After completing this programme, participants will be able to:</p> <ul style="list-style-type: none"> • Carry out the site survey for installation of Solar PV system • Assess the customer’s Solar PV requirement • Procure the Solar PV system components • Identify and Use the Tools & tackles used for Solar PV system installation • Install the Civil/Mechanical and Electrical components of a Solar PV system • Test and Commission Solar PV system • Maintain Solar PV system • Maintain personal Health & Safety at project site 		

This course encompasses 9 out of 9 National Occupational Standards (NOS) of “Solar PV Installer (Suryamitra)” Qualification Pack issued by “Skill Council for Green Jobs”.

Sr. No.	Module	Key Learning Outcomes	Equipment Required
1	Introduction to Solar PV Installer (Suryamitra) Course Theory Duration (hh:mm) 03:00 Practical Duration (hh:mm) 03:00 Corresponding NOS Code SGJ/No101	<ul style="list-style-type: none"> • Demonstrate general Discipline in the class room and during the training program; • Understand the role of Solar PV Installer and job opportunities; • Understand the advantages of doing this course; • Acquire basic skills of communication; • Acquire basic reading capabilities to enable reading of signs, notices and/or cautions at site. 	
2	Basics of Solar energy and Electrical concepts. Theory Duration (hh:mm) 06:00 Practical Duration (hh:mm) 06:00 Corresponding NOS Code SGJ/No101	<ul style="list-style-type: none"> • Understand Ohm’s Law; • Understand the basics of electricity and electrical concepts; • Perform simple calculations to derive power and energy • Explain and understand DNI, GHI and Diffused Irradiance & Irradiation; • Assess the movement of the sun and its effect on the performance of the plant; 	Pyranometer, Multimeter, Clamp meter,
3	Basics of Solar Photovoltaic systems and its components. Theory Duration (hh:mm) 24:00 Practical Duration (hh:mm) 24:00 Corresponding NOS Code SGJ/No101, SGJ/No102	<ul style="list-style-type: none"> • Understand Terminology used in the Solar Industry; • Identify the different components of a Solar PV system and its basic operation; • Identify and understand the working of different types of Solar PV systems • Understand and acquire know-how of different Types, sizes and specifications of , Modules, Solar Inverters, Charge Controllers, Cables, Conduits, Junction Boxes, Solar Batteries and allied accessories • Read and Interpret the manufacturing data specification sheets of different Types, sizes and specifications of , Modules, Solar Inverters, Charge Controllers, Cables, Conduits, Junction Boxes, Solar Batteries and allied accessories 	Pyranometer, Multimeter, Clamp meter,,1 kWp Solar PV system with 2 number of solar batteries

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<ul style="list-style-type: none"> Understand and acquire know-how of different Types, sizes and specifications of foundations/ footings; Select the right footing/foundation as per site location including suitability of roof condition or suitability of soil 	
4	<p>Identification and Use of different tools and tackles used for installation of solar PV system</p> <p>Theory Duration (hh:mm) 04:00</p> <p>Practical Duration (hh:mm) 08:00</p> <p>Corresponding NOS Code SGJ/NQ0103, SGJ/Q0104</p>	<ul style="list-style-type: none"> Identify and acquire the know-how of the different tools & tackles used for specific purpose in an installation of Solar PV system 	Tool kit, Double ended flat spanner, Double ended ring spanner, Combination pliers, Side cutting pliers, Nose pliers, Hack saw ,frame with blade, Screw driver, Water level Measuring tape, Centre punch, Standard wire gauge, Vanier calliper, Line Dori, Chisel, Drill m/c, Plumb bob, Sprit level, Flat file, Round file, Triangle file, Hand saw, PVC mallet, Ball pin, hammer, Safety helmet, Safety souse, Safety belt, Nose mask, Safety goggles, Ear plug, PVC hand glove, Cotton hand glove, Reflective jacket, Safety Gloves

Sr. No.	Module	Key Learning Outcomes	Equipment Required
5	<p>Site Survey for Installation of Solar PV System and assess the customer's Solar PV Requirement.</p> <p>Theory Duration (hh:mm) 10:00</p> <p>Practical Duration (hh:mm) 14:00</p> <p>Corresponding NOS Code SGJ/No101, ELE/N5903</p>	<ul style="list-style-type: none"> Understand how to observe Sun path diagram and shading analysis; Understand and assess the site conditions for safe installation of Solar PV system; Identify the load to be connected to the Solar PV system; Prepare load profile Engage with customers for any specific requirement and budget constraints; Calculate size of the system with basic mathematical tools; 	<p>Tool kit, Measuring tape, wire gauge, Line Dori Water testing instrument (TDS meter),</p>
6	<p>Interpretation of Drawings , Material Handling and storage of components on-site</p> <p>Theory Duration (hh:mm) 09:00</p> <p>Practical Duration (hh:mm) 09:00</p> <p>Corresponding NOS Code SGJ/No102</p>	<ul style="list-style-type: none"> Read and Interpret the Single Line Diagram, Layout Diagrams, Civil/Mechanical and Electrical Drawings Understand the DO's and Don'ts of material handling; Read and interpret the Bill of Material to verify with the delivery of components on-site. 	<p>1 kW Solar PV system and tool kit</p>
7	<p>Installation and mounting structure and photovoltaic modules, battery stand and inverter stand as per drawings</p> <p>Theory Duration (hh:mm) 09:00</p> <p>Practical Duration (hh:mm) 21:00</p> <p>Corresponding NOS Code SGJ/No103</p>	<ul style="list-style-type: none"> Understand and acquire know-how of installing the mounting structure along with structural supports and accessories for safe & weatherproof installation as per site conditions; Identify Tools & Tackles used for civil/mechanical installation 	<p>Tool kit, 1kWp Solar PV system, Double ended flat spanner, Double ended ring spanner, Combination pliers, Side cutting pliers, Nose pliers, Hack saw ,frame with blade, Screw driver, Water level Measuring tape, Centre punch, Standard wire gauge, Vanier calliper,</p>

Sr. No.	Module	Key Learning Outcomes	Equipment Required
			Line Dori, Chisel, Drill m/c, Plumb bob, Sprit level, Flat file, Round file, Triangle file, Hand saw, PVC mallet, Ball pin, hammer, Safety helmet, Safety souse, Safety belt, Nose mask, Safety goggles, Ear plug, PVC hand glove, Cotton hand glove, Reflective jacket, Safety Gloves
8	Installation of Electrical components of a Solar PV System. Theory Duration (hh:mm) 12:00 Practical Duration (hh:mm) 30:00 Corresponding NOS Code SGJ/No104	<ul style="list-style-type: none"> Understand and acquire the know-how of installing the electrical components including inverter, batteries, junction boxes, energy meters, cables and conduits other electrical components Understand the Do's and Don'ts of DC wiring; Identify Tools & tackles used for cable and conduit installation Identify and acquire knowledge of different types of Earthing and its installation; Understand significance and types of earth faults as per standards 	Tool kit, 1kWp Solar PV system, Side cutting pliers, Nose pliers, Wire stripper, Electrician knife, Hand crimping tools, Cable cutter, Screw driver, Water level Measuring tape, Centre punch, Standard wire gauge, Vanier calliper, Line Dori, Fuse puller, Safety helmet, Safety shoe, Safety belt, Nose mask, Safety goggles, Ear plug, PVC hand glove, Cotton hand glove, Reflective jacket, Clamp meter, MULTIMETER, Megger, Earth tester, Earthing Rod, Soldering Iron & Flux, Phase, Sequence Meter, Safety Gloves, Pyranometer.

Sr. No.	Module	Key Learning Outcomes	Equipment Required
9	Test and Commission Solar PV system Theory Duration (hh:mm) 08:00 Practical Duration (hh:mm) 16:00 Corresponding NOS Code SGJ/No105	<ul style="list-style-type: none"> Describe and conduct the testing of all the solar components of the Solar PV system including fault finding and analysis including continuity checks, polarity check and other commissioning activities; Understand Regulations & Standards for interconnection; Describe the Commissioning process for the Solar PV System 	Tool kit, 1kWp Solar PV system, Side cutting pliers, Nose pliers, Wire stripper, Electrician knife, Hand crimping tools, Cable cutter, Screw driver, Water level Measuring tape, Centre punch, Standard wire gauge, Vanier calliper, Line Dori, Fuse puller, Safety helmet, Safety shoe, Safety belt, Nose mask, Safety goggles, Ear plug, PVC hand glove, Cotton hand glove, Reflective jacket, Clamp meter, MULTIMETER, Megger, Earth tester, Earthing Rod, Soldering Iron & Flux, Phase, Sequence Meter, Safety Gloves, Pyranometer.
10	Maintain Solar Photovoltaic System Theory Duration (hh:mm) 18:00 Practical Duration (hh:mm) 36:00	<ul style="list-style-type: none"> Carry out maintenance activities required for each component; Prepare and execute Preventive maintenance schedule and reactive maintenance activities; Understand the Typical faults, their causes and resolution for all components; 	Tool kit, 1kWp Solar PV system, Side cutting pliers, Nose pliers, Wire stripper, Electrician knife, Hand crimping tools, Cable cutter, Screw driver, Water level Measuring tape,

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Corresponding NOS Code ELE/N6001		Centre punch, Standard wire gauge, Vanier calliper, Line Dori, Fuse puller, Safety helmet, Safety shoe, Safety belt, Nose mask, Safety goggles, Ear plug, PVC hand glove, Cotton hand glove, Reflective jacket, Clamp meter, MULTIMETER, Megger, Earth tester, Earthing Rod, Soldering Iron & Flux, Phase ,Sequence Meter, Safety Gloves, Pyranometer.
11	Maintain Personal Health & Safety at project site Theory Duration (hh:mm) 06:00 Practical Duration (hh:mm) 06:00 Corresponding NOS Code SGJ/No106	<ul style="list-style-type: none"> Identify the requirements for safe work area; Administer first aid; Identify the personal protective equipment used for the specific purpose; Identify the hazards associated with photovoltaic installations; Identify work safety procedures and instructions for working at height; Understand Occupational health & Safety standards and regulations for installation of Solar PV system 	Safety helmet, Safety souse, Safety belt, , Ear plug, PVC hand glove, Cotton hand glove, Reflective jacket, Safety Gloves
12	Completion and Handover Documentation Theory Duration (hh:mm) 03:00	<ul style="list-style-type: none"> Understand and prepare the Checklist for handover of the plant; Prepare complete and final documentation including commissioning forms and operation procedure; Acquire a thorough understanding of Start-up and shutdown procedure of a Solar PV system; 	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Practical Duration (hh:mm) 03:00 Corresponding NOS Code SGJ/No107		
	Total Duration Theory Duration 115:00 Practical Duration 185:00	Unique Equipment Required: Tool kit, Double ended flat spanner, Double ended ring spanner, Combination pliers, Side cutting pliers, Nose pliers, Wire stripper, Electrician knife, Hack saw frame with blade, Hand crimping tools, Cable cutter, Screw driver, Water level, Measuring tape, Centre punch Standard wire gauge ,Vanier calliper, Line Dori, Chisel, Drill m/c , Plumb bob, Sprit level , Flat file, Round file, Triangle file, Hand saw, PVC mallet, Ball pin hammer, Fuse puller, Safety helmet, Safety souse, Safety belt, Nose mask, Safety goggles, Ear plug, PVC hand glove, Cotton hand glove, Reflective jacket, Clamp meter, MULTIMETER, Megger, Earth tester, Water testing instrument (TDS meter), Earthing Rod, Soldering Iron & Flux, Phase Sequence Meter, Safety Gloves , Pyranometer	

Grand Total Course Duration: **300Hours, 0 Minutes**

(This syllabus/ curriculum has been approved by [Skill Council for Green Jobs](#))

Trainer Prerequisites for Job role: “Solar PV Installer (Suryamitra)” mapped to Qualification Pack: “SGJ/Q0101, v1.0”

Sr. No.	Area	Details
1	Description	To deliver accredited training service, mapping to the curriculum detailed above, in accordance with the Qualification Pack “SGJ/Q0101, Version 1.0”.
2	Personal Attributes	Aptitude for conducting training, and pre/ post work to ensure competent, employable candidates at the end of the training. Strong communication skills, interpersonal skills, ability to work as part of a team; a passion for quality and for developing others; well-organised and focused, eager to learn and keep oneself updated with the latest in the mentioned field.
3	Minimum Educational Qualifications	ITI /Diploma Electrical, Electronics, Civil, Mechanical, Fitter, Instrumentation or B.Tech (Civil/Mechanical /Electrical/ Instrumentation / Electronics / Electrical and Electronics Eng.) or MSc Physics or The education qualification can be relaxed in case of extraordinary relevant field experience.
4 ^a	Domain Certification	Certified for Job Role: “Solar PV Installer (Suryamitra)” mapped to QP: “SGJ/Q0101, Version 1.0”. Minimum accepted score as per SCGJ is 80%.
4 ^b	Platform Certification	Recommended that the Trainer is certified for the Job Role: “Trainer”, mapped to the Qualification Pack: “SSC/1402”. Minimum accepted score as per SCGJ is 70%.
5	Experience	<ol style="list-style-type: none"> 1. Minimum 3 years of relevant industry experience for ITI /Diploma (Electrical, Electronics, Civil, Mechanical, Fitter, Instrumentation) Or <ol style="list-style-type: none"> 2. Minimum 2 years of relevant industry experience for B.Tech (Civil/Mechanical /Electrical/ Instrumentation / Electronics / Electrical and Electronics Eng.)

Annexure: Assessment Criteria

Assessment Criteria for Solar PV Installer (Suryamitra)	
Job Role	Solar PV Installer (Suryamitra)
Qualification Pack	SGJ/Qo101, Version 1.0
Sector Skill Council	Green Jobs

Sr. No.	Guidelines for Assessment
1	Criteria for assessment for Qualification Pack has been created based on the NOSs and performance criteria by SCGJ. Each Performance Criteria (PC) has been assigned marks proportional to its importance within NOS and weightages have also been given among the NOSs accordingly. SCGJ has laid down the proportion of marks for Skills, Theory/Knowledge and Behaviour / Attitudes for each PC.
2	The assessment of the theory/knowledge will be based on written test/viva-voce or both while skill test shall be hands on practical. Behaviour and attitude will be assessed while performing the task.
3	The assessment shall be done as per the assessment sheets devised by SCGJ and accordingly the assessment agencies in consultation with SCGJ will create unique question papers for theory/knowledge and attitude for each candidate at each SCGJ accredited testing centres (as per assessment criteria below)
4	The assessment agencies will conduct the assessment as per the guidelines given by SCGJ having unique evaluations for skill practical for every student at each SCGJ accredited testing centre based on this criteria
5	To pass the Qualification Pack, every trainee should score a minimum of 70% in the overall assessment.
6	The marks are allocated PC wise; however, every NOS will carry a weight age in the total marks allocated to the specific QP

Assessable Outcome (NOS)	Assessment Criteria	Total Mark	Out Of	Marks Allocation	
				Theory	Skills Practical
SGJ/N0101 Site Survey for Installation of Solar PV System	PC1. Understand the location of Installation and optimize the route plan.	30	4	1	3
	PC2. Asses the site level pre-requisites for solar panel installation		3	2	1
	PC3. Check for any shading obstacles.		2	1	1
	PC4. Decide the type of mounting to be constructed.		2	2	
	PC5. Inform the customer for any civil construction to be undertaken for installing the panels		2	1	1
	PC6. Prepare a site map of the location where installation has to be carried out.		5	2	3
	PC7. Assess the load to be run on Solar Power Plant		5	2	3
	PC8. Prepare a load profile		3	3	

Assessable Outcome (NOS)	Assessment Criteria	Total Mark	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC9. Document the site survey variables and complete the checklist/site survey form		4	2	2
	NOS Total Marks	TOTAL	30	16	14
ELE/N5903: Assess the customer's PV system requirement	PC1. understand the work requirement and areas of operation	100	2	1	1
	PC2. interact with the superior for specific instructions		2	1	1
	PC3. plan the day's activities based		2	1	1
	PC4. coordinate with stores and sales team		2	1	1
	PC5. coordinate with marketing executive to understand about the customer details and their expectations at a broad level		3	1	2
	PC6. visit the customer and understand their requirement		3	1	2
	PC7. ask both open ended and close end questions to customers to clearly understand their power requirement		3	1	2
	PC8. assess the area of installation, power output expectation, budget during discussion with customer		3	1	2
	PC9. understand any specific requirement of customers on choice of modules / inverters, place of mounting		3	1	2
	PC10. assess the location and its potential for solar power system, e.g., location with less clouds, number of days with sunlight		4	1	3
	PC11. analyze the layout of the area and check space for installation		4	1	3
	PC12. understand the type of installation i.e., roof mounting or in plain and its requirements		4	2	2
	PC13. analyze the civil structure of building and its strength for roof top mounting		4	2	2
	PC14. evaluate the place of solar module mounting and ensure it is free of shade from trees or from existing or potential taller buildings		4	2	2
	PC15. analyze the photovoltaic system requirement of the customer		4	2	2

Assessable Outcome (NOS)	Assessment Criteria	Total Mark	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC16. decide whether the power system will be connected to transmission grid		4	2	2
	PC17. analyze for producing alternate current or direct current and match customer requirement		4	2	2
	PC18. decide on battery backup for equipment as per customer expectation		4	2	2
	PC19. understand the functions and controls of different components of solar PV system such as modules, inverter, grounding equipment, meters, disconnect		4	2	2
	PC20. ensure the equipment and system specification matches the customer expectation		4	2	2
	PC21. prepare a costing sheet for installation based on the customer feedback on system requirement		3	1	2
	PC22. understand from customer for any budget constraints		3	1	2
	PC23. suggest for any alternatives and changes in design to suit customer's budget		3	1	2
	PC24. make understand the customer about market price of components of different models of power system		3	1	2
	PC25. prepare a cost benefit analysis and inform customers on savings while installing solar power system		3	1	2
	PC26. compare cost with other types of power generation and inform the benefits		3	1	2
	PC27. suggest for procurement of quality and best products available in the market		3	1	2
	PC28. evaluate the safety concerns for installation and address them		3	1	2
	PC29. arrange trained and qualified technicians for installation		3	1	2
	PC30. ensure the system and structure meets the local government and regulatory requirement		3	1	2
			3	1	2
	NOS Total Marks	TOTAL	100	40	60

Assessable Outcome (NOS)	Assessment Criteria	Total Mark	Out Of	Marks Allocation	
				Theory	Skills Practical
SGJ/N0102 Procure Solar PV system components	PC1. Prepare Bill of materials from Single Line Diagram, civil/mechanical drawings and electrical drawings	50	10	5	5
	PC2. Approach stores of the company or the market to place the requirement for components as per BOM		2	1	1
	PC3. Ensure that the quantity of modules / panels, inverter and batteries match the voltage requirement of the system		4	2	2
	PC4. Identify and list variation in equipment specifications, if any.		2	1	1
	PC5. Document variation and submit to design team (if required) and obtain approval or revised drawings		1	1	
	PC6. Arrange for tools and consumables required for mounting the solar panels		6	2	4
	PC7. List the statutory and other requirements to dispatch the equipment at site		3	2	1
	PC8. Ensure that all materials are QC passed		8	4	4
	PC9. Complete all documentation w.r.t. Procurement		4	2	2
	PC10. Plan and receive the equipment at site.		2	1	1
	PC11. Ensure that all the components are handled and stored properly as per standard operating procedures		2	1	1
	PC12. Check materials received as per final BOM and ensure that the correct material for the job arrives on site and is damage free		4	2	2
	PC14. Report and document the status of material received at site and take appropriate action for replacements, if any.		2	1	1
NOS Total Marks		TOTAL	50	25	25
SGJ/N0103 Install Civil and Mechanical parts of Solar	PC1. Identify type of footing required	60	3	2	1
	PC2. Locate structural footings		1	1	
	PC3. Arrange for tools and consumables required for civil/mechanical installation		4	2	2
	PC4. Get the concrete forms constructed to design specifications		4	1	3

Assessable Outcome (NOS)	Assessment Criteria	Total Mark	Out Of	Marks Allocation			
				Theory	Skills Practical		
PV Power Plant	PC5. Install mounting posts, roof attachments and anchors		1	1			
	PC6. Locate structural roof members and install structural attachments		1	1			
	PC7. Install module support/racking frame		4	1	3		
	PC8. Plumb and Level array structure		2	1	1		
	PC9. Install supplementary structural supports		2	1	1		
	PC10. Apply corrosion protection to cut surfaces		2	1	1		
	PC11. Apply Weatherproofing to avoid any seepage and penetrations		2	1	1		
	PC12. Install tracking Power Plant		4	2	2		
	PC13. Unpack photovoltaic modules		2	1	1		
	PC14. Inspect module for physical damage		2	1	1		
	PC15. Test photovoltaic modules' electrical output		2	1	1		
	PC16. Install the modules as per layout diagrams		7	2	5		
	PC17. Secure module wiring		4	1	3		
	PC18. Fasten modules to structure		2	1	1		
	PC19. Torque module fasteners		2	1	1		
	PC20. Install battery bank stand and battery spill containment as per drawings / manuals		6	2	4		
	PC21. Install inverter stand as per drawings / manuals		3	1	2		
	NOS Total Marks		TOTAL	60	26	34	
	SGJ/N0104 Install Electrical Components of Solar PV System		PC1. Implement the site safety plan and Maintain clear work area.	90	2	1	1
			PC2. Clarify the maximum working voltage		1	1	
			PC3. Select required Personal Protective Equipment (PPE)		2	1	1
PC4. Measure current and voltage on equipment before proceeding with work		2	1		1		
PC5. Inspect and demonstrate the use of electrical installation toolkit		4	1		3		
PC6. Demonstrate situational awareness		3	1		2		
PC7. Select the location of DC combiner box		2	1		1		
PC8. Install DC combiner box along with disconnect protections		4	1		3		
PC9. Install DC energy meters		2	1		1		

Assessable Outcome (NOS)	Assessment Criteria	Total Mark	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC10. Confirm battery bank location and Install batteries.		2	1	1
	PC11. Prepare battery terminals and Install battery interconnection cables.		2	1	1
	PC12. Terminate fine stranded cables.		2	1	1
	PC13. Test final assembled battery polarity and voltage.		2	1	1
	PC14. Install charge controller (if required)		2	1	1
	PC15. Install inverter		4	1	3
	PC16. Install utility required disconnects		3	1	2
	PC17. Install AC combiner box		2	1	1
	PC18. Connect the solar Power Plant to the Distribution box or Transformer.		4	1	3
	PC19. Proper labelling of the components		2	1	1
	PC20. Prepare conduit and cable routing plan		4	2	2
	PC21. Select the correct cable type, color, and gauge.		4	2	2
	PC22. Ensure that the conduits are properly supported and secured		2	1	1
	PC23. Install the cables for modules, inverter and other components		4	1	3
	PC24. Terminate cables.		3	1	2
	PC25. Check cables for continuity		2	1	1
	PC26. Proper labelling of conduits and cables		2	1	1
	PC27. Locate underground hazards, if any		2	1	1
	PC28. Get the grounding Power Plant installed for modules/mounting Power Plant and inverters		4	2	2
	PC29. Get the Bonding done for all electrical equipment and apply anti – oxidant material		4	2	2
	PC30. Confirm and install battery bank enclosure/racks.		4	2	2
	PC31. Install battery spill containment (if required).		2	1	1
	PC32. Install batteries and Prepare battery terminals (e.g., clean).		4	2	2
	PC33. Install battery interconnection cables and apply anti-oxidant material		2	1	1
	NOS Total Marks	TOTAL	90	39	51

Assessable Outcome (NOS)	Assessment Criteria	Total Mark	Out Of	Marks Allocation	
				Theory	Skills Practical
SGJ/N0105 Test and Commission Solar PV system.	PC1. Perform visual inspection.	50	4	2	2
	PC2. Inspect mechanical civil and electrical installation components.		4	2	2
	PC3. Verify Power Plant grounding and measure insulation resistance		4	1	3
	PC4. Check continuity of the Power Plant and Verify polarity.		4	2	2
	PC5. Measure DC voltages and currents for each string and array for proper operation of the system		4	2	2
	PC6. Verify inverter operation including anti-islanding performance and measure AC system values.		6	3	3
	PC7. Verify calibration of Data Acquisition System.		1	1	
	PC8. Verify workmanship and demonstrate proficiency in using tools		6	2	4
	PC9. Preparation of the Inspection report and take appropriate action		3	2	1
	PC10. Verify labelling of Solar PV system.		2	1	1
	PC11. Initiate start up procedures as per manufacturer instructions and record energy meter reading at start up		6	3	3
	PC12. Measure and record voltage of energy storage system		2	1	1
	PC13. Record and repair any anomalous conditions.		2	1	1
	PC14. Document design changes, if any		2	1	1
NOS Total Marks		TOTAL	50	24	26
ELE/N6001 Maintain solar photovoltaic system	PC1. Understand the importance of cleaning the solar panel as dirt in panel could affect power generation	100	3	2	1
	PC2. Clean solar panels from dust, bird droppings, pollen, leaves, branches, snow		3	1	2
	PC3. Use water to clean the accumulated dust in the panel		3	1	2
	PC4. Wipe hard stains by wiping with sponge / cotton		3	1	2

Assessable Outcome (NOS)	Assessment Criteria	Total Mark	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC5. Undertake cleaning activity during when the sunlight is low (early morning or after sunset) to avoid interruption in power generation		3	1	2
	PC6. Use cleaning agents such as detergents to clean the stains / dust in the aluminium framing		3	1	2
	PC7. Clean without damaging the module by stepping on it, dropping objects, etc.		3	1	2
	PC8. Clean modules periodically as per specification and document the date of cleaning		3	1	2
	PC9. Regularly inspect the solar panel system, understand the check points and check for effective functioning		3	1	2
	PC10. Ensure that modules are clean and power output is not affected		3	1	2
	PC11. Ensure that modules are free of any tree shading, construction or other disruption from receiving sunlight		3	1	2
	PC12. Check all cables for loose connections and any mechanical damage		3	1	2
	PC13. Check the output voltage of the system and compare with the expected output voltage generation		3	1	2
	PC14. Check for any damage for the system by external elements		3	1	2
	PC15. Ensure that electrical connections are as per specifications		3	1	2
	PC16. Check for the conditions of mounting and its stability to hold solar panels		3	1	2
	PC17. Identify the faults in the system when there is an interruption in power generation		3	1	2
	PC18. Perform regular checks like looking for dust, shade, etc., which might interrupt power output		3	1	2
	PC19. Check current output for each string and identify the string which gives a low / undesired power output		3	1	2
	PC20. Identify the faulty module in the string by shading the modules and checking the output using ammeter reading		3	1	2

Assessable Outcome (NOS)	Assessment Criteria	Total Mark	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC21. Perform sequentially the standard troubleshooting activity to identify faults when there is power supply interruption in the grid		3	1	2
	PC22. Check for working conditions of fuses and circuit breakers		3	1	2
	PC23. Check the service panel connections		2	1	1
	PC24. Check the cables and ensure that there is no damage		2	1	1
	PC25. Check the wire connection to inverter and identify for any damage in wire connection		2	1	1
	PC26. Inform the inverter service technician if there is a circuit board level fault for further repair		2	1	1
	PC27. Escalate the issue to superiors if faults cannot be identified		2	1	1
	PC28. Clean the work area after completing the maintenance activity		2	1	1
	PC29. Remove all the tools, consumables used from the installation area		2	1	1
	PC30. Fill in the job completion form and get the signature of the customer		2	1	1
	PC31. Inform customers about maintenance of solar panels		2	1	1
	PC32. Follow company standards in documentation of maintenance activities performed		2	1	1
	PC33. Remove any metals or jewels to avoid possibility of current shock during maintenance activity		2	1	1
	PC34. Wear gloves while cleaning aluminium frame with sharp edges to avoid any accidents		2	1	1
	PC35. Ensure no material damage occurs during maintenance activity		2	1	1
	PC36. Take adequate precautionary measures while handling electrical system		2	1	1
	PC37. Keep work area clean and organized		2	1	1
	PC38. Adhere to relevant health and safety standards		2	1	1

Assessable Outcome (NOS)	Assessment Criteria	Total Mark	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC39. Dispose off any waste materials in accordance with safe working practices and procedures		2	1	1
	NOS Total Marks	TOTAL	100	40	60
SGJ/N0106 Maintain work Safety of Solar PV System	PC1. Identify corporate policies required for workplace safety.	50	2	1	1
	PC2. Identify requirements for safe work area and create a safe work environment.		3	2	1
	PC3. Identify contact person when workplace safety policies are violated.		1	1	0
	PC4. Provide information about incident/violation.		1	1	
	PC5. Identify the location of First Aid materials and administer first aid		2	1	1
	PC6. Identify the personal protection equipment required for specific locations on-site		3	2	1
	PC7. Identify expiry dates and wear & tear issues of specified equipment.		2	1	1
	PC8. Demonstrate safe and accepted practices for personal protection.		3	2	1
	PC9. Identify environmental hazards associated with photovoltaic installations.		2	1	1
	PC10. Identify electrical hazards.		4	2	2
	PC11. Identify personal safety hazards or work site hazards and Mitigate hazards.		4	2	2
	PC12. Select tools, equipment and testing devices needed to carry out the work.		4	2	2
	PC13. Demonstrate safe and proper use of required tools and equipment.		4	2	2
	PC14. Check access from ground to work area to ensure it is safe and in accordance with requirements.		2	1	1
	PC15. Reassess risk control measures, as required, in accordance with changed work practices and/or site conditions and undertake alterations.		2	2	0
	PC16. Inspect/install fall protection and perimeter protection equipment ensuring adequacy for work and conformance to regulatory requirements.		4	2	2

Assessable Outcome (NOS)	Assessment Criteria	Total Mark	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC17. Identify approved methods of moving tools and equipment to work area and minimize potential hazards associated with tools at heights		2	1	1
	PC18. Select and install appropriate signs and barricades		2	1	1
	PC19. Place tools and materials to eliminate or minimize the risk of items being knocked down.		1	1	
	PC20. Dismantle safety Power Plant in accordance with sequence and remove from worksite to clear work area.		2	1	1
	NOS Total Marks	TOTAL	50	29	21
SGJ/N0107 Customer Orientation for Solar PV System	PC1. Record Component serial numbers and file data sheet and complete equipment warranty registration.	20	2	1	1
	PC2. Record and document inspection & commissioning certificates/forms.		2	1	1
	PC3. Deliver as-built documents along with project photographs and permits.		1	1	
	PC4. Deliver O&M documentation and customer operation manual.		3	2	1
	PC5. Demonstrate Start-up and shutdown procedures		4	1	3
	PC6. Demonstrate maintenance procedures to the customers.		2	1	1
	PC7. Demonstrate maintenance procedures and provide basic training to maintain the system.		4	1	3
	PC8. Demonstrate normal operation procedure of solar PV system.		2	1	1
	NOS Total Marks	TOTAL	20	9	11
	QP Total Marks	TOTAL	550		