

NATIONAL SKILL QUALIFICATION FRAMEWORK QUALIFICATION FILE

Version 6: Draft of 01 September 2016

CONTACT DETAILS OF THE BODY SUBMITTING THE QUALIFICATION FILE

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List of documents submitted in support of the Qualifications File

1. Qualifications Pack
2. Industry Validations letters
3. Industry Endorsement tracker
4. Integrated Occupational Map
5. Summary Sheet

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SUMMARY

Qualification Title	Solar PV Maintenance Technician- Electrical (Ground Mount)
Qualification Code	QP SGJ/ Q0115
Nature and purpose of the qualification	Nature of the qualification - Working independently without any supervision The main purpose of the qualification - This Qualification will enable the individual to familiarize oneself in an Training Academy
Body/bodies which will award the qualification	Skill Council for Green Jobs
Body which will accredit providers to offer courses leading to the qualification	Skill Council for Green Jobs
Body/bodies which will carry out assessment of learners	Affiliated Assessment Agency of SCGJ
Occupation(s) to which the qualification gives access	Solar PV Maintenance Technician- Electrical (Ground Mount)
Licensing requirements	N/A
Level of the qualification in the NSQF	Level 4
Anticipated volume of training/learning required to complete the qualification	200 hours
Entry requirements and/or recommendations	ITI - Electrical and Electronics and ability to read/write and communicate effectively on the job role occupationally competent in the area of Solar PV relevant to the training. No experience in the Solar PV sector is required
Progression from the qualification	Vertical Progression: Solar PV O&M Engineer (Level 5) Horizontal Progression: Solar PV Maintenance Technician (Civil)
Planned arrangements for the Recognition of Prior learning (RPL)	SCGJ recognizes that there may be candidates who have prior learning experience in the Renewable Energy Sector and are desirous of being certified. - Propose to carry out RPL for candidates working in Solar and Power Sector - A bridge course would be conducted for people who are working in solar industry. - Linking of this Qualification to Start Up India
International comparability where known	N/A
Date of planned review of the qualification.	30 th September 2019

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Formal structure of the qualification			
Title and identification code of component.	Mandatory/ Optional	Estimated size (learning hours)	Level
SGJ/ N0137 Carry out electrical maintenance of the ground mount solar PV power plant	Mandatory	160	4
SGJ/ N0121 Maintain personal health & safety at solar PV power plant	Mandatory	20	2
SGJ/ N0120 Work effectively with others	Mandatory	20	4

Please attach any document giving further detail about the structure of the qualification – e.g. a Curriculum Document or a Qualification Pack.

Give the titles and other relevant details of the document(s) here. Include page references showing where to find the relevant information.

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SECTION 1 **ASSESSMENT**

Body/Bodies which will carry out assessment:

Affiliated Assessment Agency of SCGJ

How will RPL assessment be managed and who will carry it out?

The RPL assessment will be carried out through pre assessment, identifying the skills gaps, provide bridge training to cover the competency gap, where required, and then conduct final assessment of the candidates.

Confederation of Indian Industry (CII) or any other Affiliated Assessment Agency of SCGJ, as per RPL Policy and Guidelines

Describe the overall assessment strategy and specific arrangements which have been put in place to ensure that assessment is always valid, reliable and fair and show that these are in line with the requirements of the NSQF.

The emphasis is on examination of existing businesses through case study analysis and practical demonstration of skills and knowledge based on the performance criteria.

The assessment papers are developed by Subject Matter Experts (SME) available with the Assessment Agency, in collaboration with Skill Council for Green Jobs, as per the performance and assessment criteria mentioned in the Qualification Pack. The assessments papers are also checked for the various outcome based parameters such as quality, time taken, precision, tools & equipment requirement etc. The assessment sets are then reviewed for consistency. The technical limitations at the training centres are taken care in theory and viva.

The assessment agencies are instructed to hire assessors with integrity, reliability and fairness. Each assessor shall sign a document with its assessment agency by which they commit themselves to comply with the rules of confidentiality and conflict of interest, independence from commercial and other interests that would compromise impartiality of the assessments. The assessment agencies are instructed to identify assessors as per the Assessment Policy and Guidelines established by Skill Council for Green Jobs relevant for that Qualification.

The assessors selected by Assessment Agencies are scrutinized and made to undergo training and introduction to SCGJ Assessment Framework, competency based assessments, and assessors guides. The assessors are provided with assessors guide developed by the Subject Matter Expert of the assessment agency in collaboration with SCGJ as per the assessment framework. The assessment guides are developed to ensure the maximum possible consistency in the assessment by different assessors and elaborate on the following

- Qualification Pack Structure
- Guidance for the assessor to conduct theory, practical and viva assessments
- Guidance for trainees to be given by assessor before the start of the assessments.
- Guidance on assessments process, practical brief with steps of operations practical observation checklist and mark sheet
- Viva guidance for uniformity and consistency across the batch.

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The assessment by assessment agency is completely based on the assessment criteria as mentioned in the Qualification Pack. Each NOS in the Qualification Pack (QP) is assigned a relative weightage for assessment based on the criticality of the NOS. Therein each Performance Criteria in the NOS is assigned marks for or practical based on relative importance, criticality of function and training infrastructure.

The following tools are proposed to be used for final assessment:

Practical Assessment: This will comprise of a test to evaluate the individual's grasp on domain skills imparted.

Viva/Structured Interview: This tool will be used to assess the conceptual understanding and the behavioural aspects as regards the job role and the specific task at hand. It will also include questions to ascertain the soft skills of interacting with the customer or client.

Written Test: Under this test few key items which cannot be assessed practically will be assessed. The written assessment will comprise of:

- True / False Statements
- Multiple Choice Questions
- Problem Statements
- Case Study Analysis

Please attach any documents giving further information about assessment and/or RPL.

Give the titles and other relevant details of the document(s) here. Include page references showing where to find the relevant information.

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ASSESSMENT EVIDENCE

Complete a grid for each component as listed in “Formal structure of the qualification” in the Summary.

NOTE: this grid can be replaced by any part of the qualification documentation which shows the same information – i.e. Learning Outcomes to be assessed, assessment criteria and the means of assessment.

Title of Component: Solar PV Maintenance Technician – Electrical (Ground Mount)

CRITERIA FOR ASSESSMENT OF TRAINEES

Job Role Solar PV Maintenance Technician – Electrical (Ground Mount)

Qualification Pack SGJ/ 0115

Sector Skill Council Green Jobs

Guidelines for Assessment

1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
2. The assessment for the theory part will be based on knowledge bank of questions created by the SSC.
3. Assessment will be conducted for all compulsory NOS, and where applicable, on the selected elective/option NOS/set of NOS.
4. Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training center (as per assessment criteria below).
5. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training center based on this criterion.
6. To pass the Qualification Pack, every trainee should score a minimum of 70% of aggregate marks to successfully clear the assessment.
7. In case of *unsuccessful completion*, the trainee may seek reassessment on the Qualification Pack.

Assessment Outcomes	Assessment Criteria for outcomes	Total Marks	Marks allocation		
			Out of	Theory	Skills Practical
SGJ/N0137 Carry out electrical maintenance of solar PV power plant	PC1. Verify the connections, cables and junction boxes as per the design/ working drawings	100	4	2	2
	PC2. Measure the string current and verify the connections between modules in each string periodically, if no monitoring of the strings at junction box/combiner box level has been designed		6	2	4
	PC3. Check the integrity and working condition of all connections, fuses and circuit breakers within junction boxes/combiner boxes		6	2	4
	PC4. Check the continuity of cables and wires to ensure proper		6	3	3

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		electrical connections throughout the solar PV power plant upto the inverter input			
	PC5.	Troubleshoot the identified faults and escalate the issue to superiors if faults cannot be identified or rectified	8	3	5
	PC6.	Verify the earthing and lightening protection systems as per the as-built drawings and report in case of any discrepancies	6	2	4
	PC7.	Measure the resistance of earthing systems and identify the earth pits where the resistance exceeds design norms	6	3	3
	PC8.	Check the continuity of the earthing system	6	3	3
	PC9.	Troubleshoot the identified issues and escalate the issue to superiors if faults cannot be rectified	8	3	5
	PC10.	Ensure proper cleaning of modules as per schedule and standard procedure and remove any shadowing objects	2	1	1
	PC11.	Check the module frame for any de-formation or defect	6	2	4
	PC12.	Check the integrity of module terminal box and interconnections	6	2	4
	PC13.	Check and record any defects in the modules to report it to the supervisor	6	2	4
	PC14.	Measure and record the readings from the inverter and the monitoring system	6	2	4
	PC15.	Clean /replace inverter cooling fan filters, removal of dust from electronic components and any other maintenance activity recommended by the manufacturer	8	2	6
	PC16.	Inform the supervisor or the appropriate supplier if there is any abnormal functioning of the inverter or the monitoring system	4	2	2
	PC17.	Clean the work area after completing the maintenance activity	2	1	1
	PC18.	Remove all the tools, consumables used from the work area	2	1	1
	PC19.	Complete the documentation and get the signature of the superior/ client	2	1	1
		TOTAL	100	39	61
SGJ/N0121	PC1.	Identify corporate policies required for workplace safety	50	2	1
Maintain personal health & safety at solar PV power plant	PC2.	Identify requirements for safe work area and create a safe work environment		3	2

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	PC3. Identify contact person when workplace safety policies are violated		1	1	0
	PC4. Provide information about incident/violation		1	1	0
	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		8	3	5
	PC7. Identify expiry dates and wear & tear issues of specified equipment		2	1	1
	PC8. Demonstrate safe and accepted practices for personal protection		8	3	5
	PC9. Identify environmental hazards associated with the project site		4	2	2
	PC10. Identify electrical hazards		4	2	2
	PC11. Identify personal safety hazards or work site hazards and mitigate hazards		6	3	3
	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		5	2	3
		TOTAL	50	24	26
SGJ/N0120 Work effectively with others	PC1. Accurately pass on information to the authorized persons who require it and within agreed timescale and confirm its receipt	50	4	2	2
	PC2. Assist others in performing tasks in a positive manner where required and possible		4	2	2
	PC3. Consult and assist others to maximize effectiveness and efficiency in carrying out tasks		4	2	2
	PC4. Display appropriate communication etiquette while working		6	3	3
	PC5. Display active listening skills while interacting with others at work		4	2	2
	PC6. Demonstrate responsible and disciplined behaviours at the workplace		4	2	2
	PC7. Escalate grievances and problems to appropriate authority as per procedure to resolve them and avoid conflict		3	1	2
	PC8. Identify the need for common grounds with clients, team members, etc. and negotiate in an effective manner to achieve the same		3	1	2
	PC9. Consider and respect the opinions, creativity, values, beliefs and perspectives of others		4	2	2
	PC10. Ensure collaboration and group participation to achieve common goals		6	3	3

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	PC11. Promote a friendly, co-operative environment that is conducive to employee's sense of belonging		4	2	2
	PC12. Facilitate an understanding and appreciation of the differences among team members		4	2	2
		TOTAL	50	24	26

Means of assessment 1

Means of assessment 2

Pass/Fail

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SECTION 2 **EVIDENCE OF LEVEL**

Awarding bodies will enter a proposed NSQF level for the qualification in the Qualification File Summary. This section asks for the evidence on which that proposal is based. The evidence must refer to the level descriptors of the NSQF.

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NSDA recommends an approach to working out the level of qualifications which starts with the level descriptor domains (Process, Professional knowledge, Professional skill, Core skill and Responsibility: see annex A). Two variants for providing the evidence of level are offered here: Option A and Option B in the following pages. Awarding bodies should choose the option which best suits the qualification.

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OPTION A

Title/Name of qualification/component: Solar PV Maintenance Technician – Electrical (Ground Mount)		Level: 4	
NSQF Domain	Key requirements of the job role	How the job role relates to the NSQF level descriptors	NSQF Level
Process	The individual is expected to periodically check and maintain all the electrical components of the solar PV power plant for proper electrical connectivity, incorporating quality craftsmanship and complying with all applicable codes, standards, and safety requirements	<p>The individual independently performs familiar, predictable, routine situation of clear choice such as periodically checking the integrity and working condition of all connection, fuses, cables, earthing and lightning protection systems, solar modules, inverters, etc. through visual inspection and by measuring parameters like current, voltage output etc. Hence, role qualifies as a Level 4 role.</p> <p>Since the role does not involve several choices to be made even in a familiar context like creating the maintenance schedule, choosing amongst various types of equipment or products, taking decisions regarding replacement equipment, etc., the role does not qualify for Level 5.</p> <p>This role requires the job holder to work in a familiar, predictable, routine of clear choice and the activities that h/she is expected to perform are not limited in range. For example, s/he is expected to inspect and interpret the integrity of various electrical components in the solar PV power plant, measure the compare the current and voltage parameters and take steps like regular cleaning, tightening of connections, cleaning of inverter fans to ensure proper functioning of electrical components, etc. S/he also has to ensure that the work area is safe and hygienic for working. Hence it cannot be placed at level 3.</p>	4
Professional knowledge	The individual is expected to exhibit the knowledge of basic electrical concepts, typical specifications, functioning, operating principle and maintenance procedures of various types of solar PV plant	The job holder is expected to exhibit an understanding factual knowledge of the field of electrical maintenance . For example, s/he is expected to know the various types of faults that can occur in any electrical component of solar PV	4

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Title/Name of qualification/component: Solar PV Maintenance Technician – Electrical (Ground Mount)			Level: 4
NSQF Domain	Key requirements of the job role	How the job role relates to the NSQF level descriptors	NSQF Level
	<p>components, working drawings of electrical equipment, maintenance and operations requirement and handling procedures of electrical components of solar PV power plant and common methods of identifying and rectifying common electrical faults that can occur in solar PV power plant</p>	<p>power plant, various types of tools, measuring equipment involved in maintenance and troubleshooting of electrical parts of solar PV power plant, various methods of fault prevention like regular cleaning of modules and inverter fans, periodical tightening and checking of connections. Further, s/he should know about the risks and hazards/ safe working practices/ materials and equipment needed/ tasks and activities to the required standard. S/he should also have the ability to speak read and write in the local vernacular language and English.</p> <p>Since all the above mentioned areas are related to factual knowledge in the field of electrical maintenance of solar PV power plant, the role qualifies for Level 4.</p> <p>The job holder is expected to know more than basic facts and principles, such as, understanding of the as built electrical drawings, the details of the manufacturer's instructions to use the equipment and tools, the various faults which can occur in the electrical equipment parts and their rectification, etc. Since this role requires factual knowledge of field of electrical maintenance of solar PV power plant, it cannot be pegged at level 3.</p> <p>Further, since the job holder is not expected to be aware of principles/ process & general concepts in the field of operation and maintenance as a whole, hence the role can't be pegged at level 5. For example, this role is not expected to have knowledge about the civil/mechanical maintenance and day to day operation of solar PV power plant</p>	
Professional skill	The job holder is expected to operate/ use screw driver, inspection fixtures, wire cutter, pliers, testers, spanner, etc., plan and organize the regular maintenance activities	The job holder is expected to recall and demonstrate practical skills, which are routine and repetitive in a narrow range of application such as checking the integrity	4

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Title/Name of qualification/component: Solar PV Maintenance Technician – Electrical (Ground Mount)		Level: 4	
NSQF Domain	Key requirements of the job role	How the job role relates to the NSQF level descriptors	NSQF Level
	<p>to be conducted at the solar PV power plant. Further, the job holder must be able to take the day to day decisions and solve problem/s at work. The job holder should also be able to critically analyse the information gathered from different channels like current, voltage readings, observations made by helpers, etc. to identify the possible faults which can occur and take pro-active action</p>	<p>and working conditions of connections, fuses, circuit breakers through visual inspection and checking the working condition of cables, modules, inverters, earthing and lightening protection systems through measurement of the relevant parameters like string current, output voltages, etc. and carrying out routine cleaning and maintenance activities to ensure long life and stability of solar PV power plant. The incumbent further analyses the fault prone areas like connections, joints, earthing, etc., using standard techniques like measuring resistance, etc. takes steps to prevent faults. Further, the incumbent refers to and uses defined rules in SOP manual and tools as per organization's guidelines to conduct various types of maintenance activities</p> <p>Since all the above mentioned professional skill are related to demonstrating practical skills, which are routine and repetitive in a narrow range and using appropriate rule and tool, the role qualifies for Level 4.</p> <p>The Job holder is expected to possess professional skills more than just demonstrating practical skills, which are routine and repetitive in a narrow range but also using appropriate rules & tools to analyse & interpret information. For example, S/he is expected to use quality concepts such as analysing the parameters like current, voltage and resistance to interpret working of electrical components. Also, the incumbent analyses the state of electrical equipment through visual inspection and other methods and takes steps to rectify the same. Hence, the job holder can't be placed at Level 3.</p> <p>Further the job holder doesn't require to use much cognitive skills to accomplish tasks and solve problems at the</p>	

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Title/Name of qualification/component: Solar PV Maintenance Technician – Electrical (Ground Mount)		Level: 4	
NSQF Domain	Key requirements of the job role	How the job role relates to the NSQF level descriptors	NSQF Level
Core skill	<p>The individual is expected to exhibit effective communication skills by communicating clearly with the O&M Engineer and helpers and understanding the instructions given by the supervisors. Further, the individual is expected to perform respective record maintaining work and use basic arithmetic/ algebraic principles like summation, multiplication, etc. to compute resistance, voltages, etc. to identify common faults in the electrical equipment. The individual should also possess basic understanding of natural environment to understand the common faults and issues which can occur at the solar PV power plant</p>	<p>workplace. The activities performed primarily practical skill. Hence s/he can't be placed at level 5.</p> <p>The job holder is expected to exhibit effective oral communication skills (including awareness of vernacular language) so as to understand the instructions of the supervisor as well as clearly instruct helpers while carrying out day to day maintenance activities. The job holder is also expected to possess reading and writing skills so as to read and understand equipment manuals, health and safety instructions, various signage and standard code and concepts well as well as maintain records as per organisation policies. The job holder is also expected to display basic arithmetic/ algebraic awareness to analyse and interpret the evaluation parameters of electrical equipment such as the standard current, voltage level, the accepted resistance levels for different components, etc. The incumbent must understand the social, political of the local environment so as to communicate effectively with solar project helpers who primarily belong to the surrounding regions and natural environment so as to identify common issues and faults which can affect the health of electrical parts in the solar PV power plant.</p> <p>Since all the above mentioned core skills are related to exhibiting effective oral, written communication skills along with basic understanding of the arithmetic principles as well as understanding of the social, political and natural environment such as clarifying the client's understanding and expectation prior to commencement of treatment the role qualifies for Level 4.</p> <p>The Job holder expected to possess core skills more than just demonstrating minimum clarity in oral & written communication such as getting specific instructions from</p>	4

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Title/Name of qualification/component: Solar PV Maintenance Technician – Electrical (Ground Mount)			Level: 4
NSQF Domain	Key requirements of the job role	How the job role relates to the NSQF level descriptors	NSQF Level
		<p>the supervisor and carrying out activity or reporting to supervisor specific observations from the solar PV power plant. Hence, the role can't be placed at Level 3.</p> <p>Further since the job holder doesn't require to use detailed mathematical skill or skill of collecting & organizing information such as collecting information regarding plant operating parameters, getting information from subordinates and peers to identify possible issues and faults, s/he can't be placed at level 5.</p>	
Responsibility	<p>The individual is primarily responsible to gain knowledge about standard protocols and SOPs regarding electrical maintenance in solar PV power plant. S/he is also expected to update self with the solar PV power plant and functioning through equipment manuals, books, etc.</p>	<p>The solar PV maintenance technician is responsible for his/ her own work and learning. S/he is expected to update self with the standard protocols and SOPs using the available equipment manuals, etc. S/he is also expected to have significant on the job learning about the equipment and their maintenance procedures. S/he works under some supervision but primarily carries out his/her day to day activities independently. Thus s/he can be placed at level 4.</p> <p>Since s/he is neither expected to be responsible of other's work and learning , s/he can't be placed at level 5</p> <p>Also as is evident from the above examples that the incumbent is fully responsible for responsible for his/ her own work and learning rather than being responsible in defined limit since s/he gathers the practical skills/ techniques required to perform a task in the on the job, s/he analyses & interprets how to utilize the acquired skills & techniques while executing the maintenance activities and enhances his/her knowledge base about use of several tools, equipments and materials for a given task therefore s/he can't even be placed at Level 3.</p>	4

India-EU Skills Development project: Qualification File

SECTION 3 **EVIDENCE OF NEED**

What evidence is there that the qualification is needed?

During extensive industry interactions carried out while creating occupational maps and prioritization of job roles for Qualification Pack development, the mentioned qualification was indicated as a key requirement by the industry. In addition, the Skill Gap Report for the sector has indicated that a significant proportion of the workforce is involved in this work function. The study also indicates that this domain will be in great demand, due to focus of Government of India to support the sector through policy and implementation. Research was conducted in the Renewable energy sector manpower requirement estimates till 2025. The research provides the data that the discussed qualification is one of the critical roles in the sector. The details of statistics and research analysis are provided separately as a research analysis report

Evidence of the qualification is supported by validations with representation from across sub sectors .The complete list of validating companies has been enclosed as an annexure to the Q file.

What is the estimated uptake of this qualification and what is the basis of this estimate?

The increase in manpower requirements (as per projections) from 2017 to 2025 is approx. 10 times for this role. It is estimated that close to 98,000 trained manpower are required for this role by 2025. All the numbers are provided in research analysis study

What steps were taken to ensure that the qualification(s) does/do not duplicate already existing or planned qualifications in the NSQF?

Currently, Skill Council for Green Jobs is the only Sector Skill Council set up which has the mandate of Certification and Assessment of candidates undergoing Skill Development courses in Solar Photovoltaic domain. NSDC list of Approved QPs was checked prior to commissioning the work. There is no overlap of these Qualification Packs with existing Qualification Packs. The NCO/2015 Classification and MES Course List was also cross examined for existing trades, wherein no overlap / existing trade was found.

What arrangements are in place to monitor and review the qualification(s)? What data will be used and at what point will the qualification(s) be revised or updated?

In the Qualification Pack, review date is scheduled for after 3 years in consultation with Subject Matter Experts. The monitoring of evaluation of assessments and Employer feedback will be sought post-placement, for review of the effectiveness of the Qualification.

Please attach any documents giving further information about any of the topics above.

Give the titles and other relevant details of the document(s) here. Include page references showing where to find the relevant information.

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SECTION 4 **EVIDENCE OF PROGRESSION**

What steps have been taken in the design of this or other qualifications to ensure that there is a clear path to other qualifications in this sector?

1. Discussing the growth trajectory within each occupation after studying organisational charts of various industry players across small, medium and large scale organizations.
2. Exploring various lateral career opportunities for the discussed qualification
3. Ensuring that there is a clear role up in terms of performance criteria qualification experience and skill requirement from lower NSQF Level to higher levels in the hierarchy.

Please refer to attached career path as per annexure 1 which clearly defines the career path.

Please attach any documents giving further information about any of the topics above.

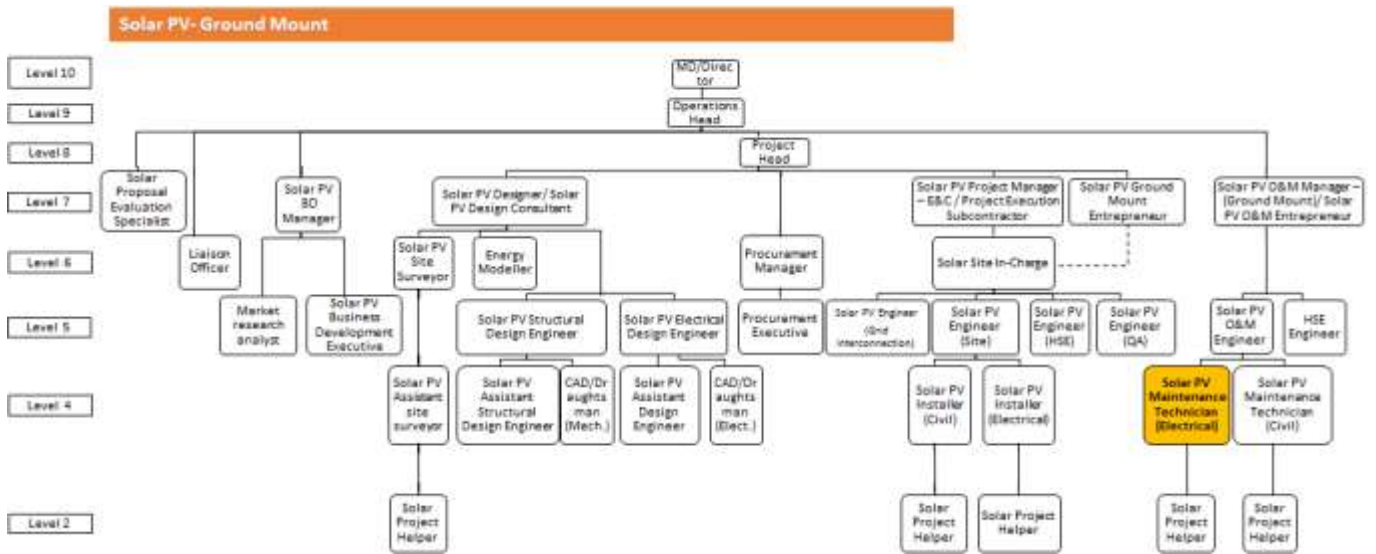
Give the titles and other relevant details of the document(s) here. Include page references showing where to find the relevant information.

1. Career Map of Solar PV Maintenance Technician – Electrical (Ground Mount) -
Annexure 1
2. QP SGJ/Q0115 - Annexure 2

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Annexure 1: Career Map



Annexure 2: QP SGJ/ Q0115