

NSQF Qualification File

Approved in 13th NSQC Meeting held on 25th Nov 2021

Rationalized in 29th NSQC Meeting dated on 03rd May 2023

CONTACT DETAILS OF THE BODY SUBMITTING THE QUALIFICATION FILE

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| Qualification Code QG-04-PW-00527-2023-V1.1-SCGJ |
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Name and address of submitting body:

Skill Council for Green Jobs,
CIBP Building, Malcha Marg,
Chanakyapuri, New Delhi - 110021

Name and contact details of individual dealing with the submission

Name: Dr. Praveen Saxena
Position in the organisation: Chief Executive Officer
Address if different from above: (Same as above)
Tel number(s): 9871119101
E-mail address: ceo@sscj.in

List of documents submitted in support of the Qualification File

- 1. Model Curriculum (Annexure-I)**
- 2. Ministry Recommendation (Annexure-II)**

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SUMMARY

| | | |
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| 1 | Qualification Title: | Small Hydro Power Plant Technician-(Jal Urja Mitra) |
| 2 | Qualification Code, if any: - | SGJ/Q0604 |
| 3 | NCO code and occupation: - | NCO/2015- 3115.0102 Maintenance Technician – Mechanical |
| 4 | Nature and purpose of the qualification (Please specify whether qualification is short term or long term): | Nature: Skill Certification on SHP Plant maintenance Purpose of the qualification: The course aims to provide sound knowledge and skill to operate, test and maintain different electrical, hydro-mechanical, civil components of Small Hydro Power plant |
| 5 | Body/bodies which will award the qualification: | Skill Council for Green Jobs |
| 6 | Body which will accredit providers to offer courses leading to the qualification: | Skill Council for Green Jobs |
| 7 | Whether accreditation/affiliation norms are already in place or not, if applicable (if yes, attach a copy) | Yes |
| 8 | Occupation(s) to which the qualification gives access: | Technician |
| 9 | Job description of the occupation: | Small Hydro Plant Technician (Jal Urja Mitra) is specialized to operate, test and maintain different electrical, hydro-mechanical, civil components of Small Hydro Power plant to meet the performance and reliability needs by incorporating quality workmanship and complying with all applicable codes, standards and safety requirements |
| 10 | Licensing requirements: | NA |
| 11 | Statutory and Regulatory requirement of the relevant sector (documentary evidence to be provided): | - |
| 12 | Level of the qualification in the NSQF: | Level 4 |

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| <p>13</p> | <p>Anticipated volume of training/learning required to complete the qualification:</p> | <p>450 hours (180 hours mandatory modules + 60 hours employability skills + 90 hours OJT + 120 hours of either 1 elective)</p> |
| <p>14</p> | <p>Indicative list of training tools required to deliver this qualification:</p> | <p>PCs/Laptops, Internet with Wi-Fi (Min 2 Mbps Dedicated) , Documents of standard operating procedures, code of conduct, checklists, schedules, tools and equipment, status report tools like pliers, power drill, screwdrivers, spanner, GPS, Altimeters, intake, power channel, SHP plant, water mills, pico hydro plant, hydro turbine, Channel/pipe/tunnel systems, discharge and sediment measurement system, AC and DC, HVAC, Crane pulley block, firefighting system, AVR, unit control switchboard, scanners and transducers, power cables, batteries, inverters, pumps etc, Models of different types of turbines, switchyards and drive systems, their components (such as runner, casing nozzle/guide vanes, belts and pulleys etc.) Governors, oil pumping unit (OPU) and hydroelectric generator Compressors, compressed air system, cooling water system, unit control switchboard configurations and control circuitry configurations Unit auxiliary transformers, AC supply and distribution boards, LV switchgear, battery chargers, DC distribution boards, inverters, UPS Equipment handling devices such as crane, pulley block etc.</p> |
| <p>15</p> | <p>Entry requirements and/or recommendations and minimum age:</p> | <ul style="list-style-type: none"> • 12th Grade Pass (with Science) without experience • 10th Grade Pass plus 2 year NTC/ 10th Grade Pass plus 1 year NTC plus 1 year NAC • 10th Grade Pass with 2 years of relevant experience • 8th Pass plus 2 year NTC plus 1 year NAC plus CITS • Completed 2nd year of 3 year diploma (after 10th) and pursuing regular diploma • ITI after Class 10th (in Electrical/ |

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| | | <p>Mechanical/ Civil/ Instrumentation and related trades) with 1 year of relevant work experience or Government recognised 3 years Diploma (Electrical/ Mechanical/ Civil/ Control & Instrumentation)</p> <ul style="list-style-type: none"> • Previous relevant qualification of NSQF Level 3.0 with minimum education as 8th grade pass with 3 years of experience <p>18 years of age</p> | | |
| 16 | Progression from the qualification: | Vertical Progression: SHP O&M Engineer (Level 5) | | |
| 17 | Arrangements for the Recognition of Prior learning (RPL): | <p>SCGJ recognizes that there may be candidates who have prior learning experience in the Renewable Energy Sector and are desirous of being certified.</p> <ul style="list-style-type: none"> •Propose to carry out RPL for candidates working at Small hydro power unit. •Identify the candidates through training need analysis of the industry •Develop the RPL Training Delivery Plan and bridge course for bridging the skill gap •Training and certification of the candidates | | |
| 18 | International comparability where known (research evidence to be provided): | ISCO-08/3115 | | |
| 19 | Date of planned review of the qualification: | 24 November 2024 | | |
| 20 | Formal structure of the qualification | Mandatory/Optional components | | |
| | Title of component and identification code/NOSs/Learning outcomes | Mandatory /Optional | Estimated size (learning hours) | Level |
| (i) | SGJ /N1205: Introduction | Mandatory | 30:00 | |

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| (ii) | SGJ /N1205– Study components and layout of Small Hydro Power (SHP) Plant | Mandatory | 30:00 | 4 |
| (iii) | SGJ/N0701 – Inspect different components of Small Hydro Power (SHP) Plant | Mandatory | 60:00 | 4 |
| (iv) | SGJ/N0610 – Start and shut Small Hydro Power (SHP) Plant | Mandatory | 30:00 | 4 |
| (v) | SGJ/N0106 – Maintain health, safety and hygiene at workplace | Mandatory | 30:00 | 4 |
| (vi) | DGT/VSQ/N0102: Employability Skills | | 60:00 | 4 |
| (vii) | On the Job Training | | 90:00 | |
| | Total | | 330 | |
| | Elective 1: | | | |
| (viii) | SGJ/N0611 – Study electro-mechanical system of Small hydro plant and its O&M | Any one Elective is Mandatory | 120:00 | 4 |
| | Elective 2: | | | |
| (ix) | SGJ/N0612 – Study Hydro-mechanical and Civil system of Small hydro plant and its O&M | Any one Elective is Mandatory | 120:00 | 4 |
| | Total | | 570:00 | |

SECTION 1

ASSESSMENT

| | |
|------------------|---|
| <p>21</p> | <p>Body/Bodies which will carry out assessment: Skill Council for Green Jobs through its affiliated and accredited Assessment Agency</p> |
| <p>22</p> | <p>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. Final assessment will be carried out by affiliated Assessment Agency of SCGJ, as per RPL Policy and Guidelines</p> |
| <p>23</p> | <p>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.</p> <ol style="list-style-type: none"> 1. Assessment System Overview: <ul style="list-style-type: none"> • Batches assigned to the assessment agencies for conducting the assessment on SDSM/SIP or email • Assessment agencies send the assessment confirmation to VTP/TC looping SSC • Assessment agency deploys the ToA certified Assessor for executing the assessment • SSC monitors the assessment process & records 2. Testing Environment: <ul style="list-style-type: none"> • Confirm that the centre is available at the same address as mentioned on SDMS or SIP • Check the duration of the training. • Check the Assessment Start and End time to be as 10 a.m. and 5 p.m. • Check that the allotted time to the candidates to complete Theory & Practical Assessment is correct. • Check the mode of assessment—Online (TAB/Computer) or Offline (OMR/PP). • Confirm the number of TABs on the ground are correct to execute the Assessment smoothly. • Check the availability of the Lab Equipment for the particular Job Role. 3. Assessment Quality Assurance levels / Framework: <ul style="list-style-type: none"> • Question papers created by the Subject Matter Experts (SME) • Question papers created by the SME verified by the other subject Matter Experts |

- Questions are mapped with NOS and PC
- Question papers are prepared considering that level 1 to 3 are for the unskilled & semi-skilled individuals, and level 4 and above are for the skilled, supervisor & higher management
- Assessor must be ToA certified & trainer must be ToT Certified
- Assessment agency must follow the assessment guidelines to conduct the assessment

4. Types of evidence or evidence-gathering protocol:

- Time-stamped & geotagged reporting of the assessor from assessment location
- Center photographs with signboards and scheme specific branding
- Biometric or manual attendance sheet (stamped by TP) of the trainees during the training period
- Time-stamped & geotagged assessment (Theory + Viva + Practical) photographs & videos

5. Method of verification or validation:

- Surprise visit to the assessment location
- Random audit of the batch
- Random audit of any candidate

6. Method for assessment documentation, archiving, and access

- Hard copies of the documents are stored
- Soft copies of the documents & photographs of the assessment are uploaded / accessed from Cloud Storage
- Soft copies of the documents & photographs of the assessment are stored in the Hard Drives

24. Assessment evidences

CRITERIA FOR ASSESSMENT OF TRAINEES

Job Role Small Hydro Power Plant Technician-(Jal Urja Mitra)

Qualification Pack SGJ/Q0604 v 2.0

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.

Outcome

Compulsory NOS:

NOS: [SGJ/N1205: Study components and layout of Small Hydro Power \(SHP\)Plant](#)

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|--------------|-----------------|---------------|------------|
| <i>Estimate Small Hydro Plant (SHP) potential</i> | 5 | 12 | - | - |
| PC1. illustrate basic working principles of smallscale hydropower | 1 | 2 | - | - |
| PC2. illustrate general layout of Small hydroPlant | 1 | 2 | - | - |
| PC3. estimate SHP power generation potential | 2 | 5 | - | - |

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|--|----------|-----------|---|---|
| PC4. outline water mills and pico hydro working principles | 1 | 3 | - | - |
| <i>Outline functions of main components of SHP</i> | 9 | 18 | - | - |
| PC5. describe main components of SHP linking to layout plan | 1 | 2 | - | - |
| PC6. illustrate various sub components of civil structure and discuss their functions | 2 | 4 | - | - |
| PC7. outline functions of various mechanical equipment used in the plant | 1 | 2 | - | - |
| PC8. outline functions of electro-mechanical and electrical equipment used in the plant | 1 | 2 | - | - |
| PC9. illustrate components of water mills and pico hydro | 2 | 4 | - | - |
| PC10. compare small hydro plant, pico hydro plant and water mills | 2 | 4 | - | - |
| <i>Outline critical points in water flow</i> | 5 | 11 | - | - |
| PC11. classify different types of streams | 1 | 2 | - | - |
| PC12. outline flow of water in a SHP station | 1 | 2 | - | - |
| PC13. illustrate sub components of intake, power channel and tail race | 1 | 2 | - | - |
| PC14. identify critical points in water flow for operation and maintenance of the Plant | 2 | 5 | - | - |
| <i>Use measuring devices in SHP Plan</i> | 5 | 10 | - | - |
| PC15. describe working principle of water flow measuring devices | 1 | 2 | - | - |

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|---|----|----|---|---|
| PC16. describe working principle of GPS, Altimeters and Total System | 1 | 2 | - | - |
| PC17. demonstrate and use GPS, altimeters and total system for the measurements | 3 | 6 | - | - |
| <i>NOS Total</i> | 24 | 51 | - | - |

NOS: SGJ/N0701: Inspect different components of Small Hydro Power (SHP) Plant

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|--------------|-----------------|---------------|------------|
| <i>Development of inspection schedule of various components of the Plant</i> | 7 | 14 | - | - |
| PC1. identify components of the Plant to be inspected every day, once a week and every month | 1 | 2 | - | - |
| PC2. develop inspection schedule for of various main components of the plant | 1 | 2 | - | - |
| PC3. develop daily inspection route of the plant with daily components to be inspected | 1 | 2 | - | - |
| PC4. develop weekly and monthly inspection route of the plant with components to be inspected | 1 | 2 | - | - |
| PC5. develop annual inspection route of the plant with components to be inspected | 1 | 2 | - | - |
| PC6. complete “reporting “ format for daily, weekly monthly and annual inspections | 1 | 2 | - | - |
| PC7. identify reporting hierarchy in case of noticing malfunctioning of any components during inspection | 1 | 2 | - | - |
| <i>Inspection of Civil structure of the SHP plant</i> | 7 | 14 | - | - |
| PC8. carry out inspection of diversion & intake works and report its status | 1 | 2 | - | - |
| PC9. carry out inspection of channel /pipe/tunnel and report its status | 1 | 2 | - | - |
| PC10. undertake inspection of Desilting Tank and report its status | 1 | 2 | - | - |

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|---|----------|-----------|---|---|
| PC11. carry out inspection of Forebay and surge tanks and report its status | 1 | 2 | - | - |
| PC12. examine Penstock, anchor block and saddles, branching and report its status | 1 | 2 | - | - |
| PC13. carry out inspection of Power house building and report its status | 1 | 2 | - | - |
| PC14. examine Tail Race Channel and report its status | 1 | 2 | - | - |
| <i>Inspection of Hydro-Mechanical equipment of the SHP plant</i> | 2 | 4 | - | - |
| PC15. carry out inspection of Trash rake, gates, hoisting arrangements, valves and report its status | 1 | 2 | - | - |
| PC16. examine Penstock and related specials and report its status | 1 | 2 | - | - |
| <i>Inspection of Electro-Mechanical part of the SHP plant</i> | 9 | 18 | - | - |
| PC17. examine turbine and generators for physical parameters including vibration, etc. and report | 1 | 2 | - | - |
| PC18. examine drive system including belts, pulleys, speed increaser/gear box, etc. and report | 1 | 2 | - | - |
| PC19. examine Governors and OPU functioning and report its status | 1 | 2 | - | - |
| PC20. examine mechanical equipment auxiliaries including drainage system, HVAC, crane pulley block, firefighting system, compression system and cooling water system and report its status | 1 | 2 | - | - |
| PC21. examine functioning of hydroelectric generator including AVR and excitation system | 1 | 2 | - | - |
| PC22. examine functioning of control system including unit control switchboard, various meters, instruments, devices, scanners and transducers | 1 | 2 | - | - |
| PC23. examine functioning of Power transformer and Unit auxiliary transformers | 1 | 2 | - | - |

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|--|-----------|-----------|---|---|
| PC24. examine functioning of protection system and other switchyard equipment including lighting protection, ground of switchyard equipment, Isolator, circuit breaker, load break switches, bus bars | 1 | 2 | - | - |
| PC25. examine electrical auxiliary system including AC supply, AC and DC distribution board, LV switchgear, batteries, inverters, pumps, power cables and communication channels, etc. | 1 | 2 | - | - |
| <i>Report preparation of Inspection</i> | 1 | 2 | - | - |
| PC26. fill up different reporting formats to report system functioning | 1 | 2 | - | - |
| NOS Total | 26 | 52 | - | - |

NOS: SGJ/N0610: Start and shut Small Hydro Power (SHP) Plant

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|--|--------------|-----------------|---------------|------------|
| <i>Starting Small Hydro Power Plant</i> | 4 | 8 | - | - |
| PC1. illustrate standard operating conditions to start water flow system | 1 | 2 | - | - |
| PC2. list out pre start conditions for SHP plant | 1 | 2 | - | - |
| PC3. illustrate standard operating conditions to start turbine-generator unit (s) and parameters to be watched during running of unit | 1 | 2 | - | - |
| PC4. illustrate standard operating procedure to synchronize Unit with grid | 1 | 2 | - | - |
| <i>Normal Shut down of Small Hydro Power Plant</i> | 1 | 2 | - | - |
| PC5. explain standard operating procedure for normal shut down of unit | 1 | 2 | - | - |
| <i>Special shut down of Small Hydro Power Plant</i> | 2 | 2 | - | - |
| PC6. describe standard operating procedure for special shut down of unit | 1 | 1 | - | - |

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| | | | | |
|---|----------|-----------|---|---|
| PC7. apply procedures of giving and returning shut downs | 1 | 1 | - | - |
| <i>Emergency shut down of Small Hydro Power Plant</i> | 1 | 2 | - | - |
| PC8. illustrate standard operation foremergency shut down | 1 | 2 | - | - |
| NOS Total | 8 | 14 | - | - |

NOS: SGJ/N0106: Maintain health, safety and hygiene at workplace

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|--------------|-----------------|---------------|------------|
| <i>Adopt safe practices at workplace</i> | 9 | 10 | - | - |
| PC1. identify and report any hazards, risks or breaches in site safety to the appropriate authority | 1 | 1 | - | - |
| PC2. follow recommended safe practices in handling physical, chemical, electrical and fire hazards and risk | 1 | 1 | - | - |
| PC3. use appropriate Personal Protective Equipment(PPE) for head, eye, hand, ear, face, body and fall protection specific to work condition | 1 | 1 | - | - |
| PC4. follow safe practices when working at height and in confined space | 1 | 1 | - | - |
| PC5. handle all required tools, tackles, materials and equipment safely | 1 | 2 | - | - |
| PC6. identify expiry dates, wear and tear issues of specified equipment and accordingly inform supervisor and undertake corrective measures | 1 | 1 | - | - |
| PC7. apply ergonomic principles wherever required | 1 | 1 | - | - |
| PC8. use safety signs, labels, charts and notices at workplace | 1 | 1 | - | - |

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|--|-----------|-----------|---|---|
| PC9. identify work safety procedures and instructions for handling heavy components | 1 | 1 | - | - |
| <i>Follow emergencies, rescue and first aid procedures</i> | 4 | 4 | - | - |
| PC10. follow emergency and evacuation procedures in case of accidents, fires and natural calamities | 1 | 1 | - | - |
| PC11. use appropriate fire extinguishers for different types of fire | 1 | 1 | - | - |
| PC12. administer first aid to victim in case of various medical emergencies including bleeding, burns, choking, electric shock, cardiac arrest, etc. | 1 | 1 | - | - |
| PC13. use correct method to move injured person during an emergency | 1 | 1 | - | - |
| Follow good housekeeping practices and infection control guidelines | 4 | 4 | - | - |
| PC14. follow recommended personal hygiene, workplace hygiene and sanitation practices | 1 | 2 | - | - |
| PC15. clean and disinfect all material, tools and supplies before and after use | 1 | 1 | - | - |
| PC16. report immediately to concerned authorities regarding sign and symptoms of illness of self and other colleagues | 1 | 1 | - | - |
| PC17. follow processes specified for disposal of hazardous waste | 1 | - | - | - |
| NOS Total | 17 | 18 | - | - |

NOS: *SGJ/N0120: Work effectively with others*

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|----------------------------------|--------------|-----------------|---------------|------------|
| <i>Communicate effectively</i> | 5 | 4 | - | - |

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|---|----------|-----------|---|---|
| PC1. promote a safe and interactive environment | 1 | - | - | - |
| PC2. seek clarifications from appropriate source when required | 1 | 1 | - | - |
| PC3. identify the common grounds with clients, team members, etc. and negotiate in an effective manner to achieve the same | 1 | 1 | - | - |
| PC4. use inclusive language (verbal, non-verbal and written) that is gender, disability and culturally sensitive | 1 | 2 | - | - |
| PC5. display active listening skills while interacting with others at work | 1 | - | - | - |
| <i>Respect diversity</i> | 3 | 5 | - | - |
| PC6. transact with everyone without any personal bias based on gender, disability, caste, religion, colour, sexual orientation and culture | 1 | 2 | - | - |
| PC7. identify and report inappropriate behaviour (e.g. sexual harassment) to appropriate authority | 1 | 1 | - | - |
| PC8. ensure proper personal behavior and conduct, taking gender and disability of the person into consideration | 1 | 2 | - | - |
| <i>Working with others in a collaborative manner</i> | 9 | 10 | - | - |
| PC9. pass on accurate information to the authorized persons who require it and within agreed timescale and confirm its receipt | 2 | 2 | - | - |
| PC10. assist others in performing tasks in a positive manner where required and possible | 2 | 2 | - | - |
| PC11. demonstrate responsible and disciplined behavior at the at project site | 2 | 2 | - | - |
| PC12. escalate grievances and problems to appropriate authority as per procedure to resolve them and avoid conflict | 1 | 2 | - | - |
| PC13. consider and respect the opinions, creativity, values, beliefs and perspectives of others | 2 | 2 | - | - |

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| NOS Total | 17 | 19 | - | - |
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Elective NOS:

NOS: SGJ/N0614: Study electro-mechanical system of Small Hydro Power plant

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|---|--------------|-----------------|---------------|------------|
| <i>Hydro generators, AVR and excitation system</i> | 14 | 6 | - | - |
| PC1. discuss Hydroelectric generator(Induction and Synchronous) | 4 | 1 | - | - |
| PC2. introduce function of AVR and Excitationsystems | 3 | 1 | - | - |
| PC3. dry out & test generators before commissioning | 3 | 1 | - | - |
| PC4. maintain and inspect hydroelectric generators and routine testing at site | 4 | 3 | - | - |
| <i>Control System</i> | 15 | 15 | - | - |
| PC5. discuss control circuitry configurations | 1 | - | - | - |
| PC6. test control system sequence | 4 | 4 | - | - |
| PC7. test various meters, instruments, devices,scanners, transducers, etc. | 4 | 4 | - | - |
| PC8. repair instrument, meters and other electrical devices | 4 | 5 | - | - |
| PC9. discuss Unit control switchboards: configurations and testing | 2 | 2 | - | - |
| <i>Transformers for SHP stations</i> | 10 | 10 | - | - |
| PC10. discuss power transformer: basics and applied concepts | 2 | - | - | - |
| PC11. discuss factory and field tests of power transformers | 2 | 3 | - | - |
| PC12. maintain power transformers | 2 | 4 | - | - |

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|---|-----------|-----------|---|---|
| PC13. discuss Unit auxiliary transformers: basics and applied concepts | 2 | - | - | - |
| PC14. dry out & test transformers at site | 2 | 3 | - | - |
| <i>Protection system and other switchyard equipment</i> | 20 | 20 | - | - |
| <i>PC15.</i> discuss Protection systems for SHP stations | 2 | 2 | - | - |
| <i>PC16.</i> diagnose fault conditions | 2 | 2 | - | - |
| <i>PC17.</i> configure and maintain lightning protection for SHP station | 1 | 2 | - | - |
| <i>PC18.</i> discuss grounding of switchyard equipment | 3 | 4 | - | - |
| <i>PC19.</i> discuss isolators configurations and their applications | 2 | 2 | - | - |
| <i>PC20.</i> discuss load break switches, power fuses and circuit switchers | 3 | 3 | - | - |
| <i>PC21.</i> discuss Circuit Breakers and types | 4 | 3 | - | - |
| <i>PC22.</i> discuss Bus-bars and test bus equipment | 3 | 2 | - | - |
| <i>Electrical auxiliary systems</i> | 15 | 25 | - | - |
| <i>PC23.</i> discuss AC supply and distribution boards | 1 | 1 | - | - |
| <i>PC24.</i> discuss LV switchgear at SHP stations: operation, functions, ratings and testing | 1 | 2 | - | - |
| <i>PC25.</i> elaborate illumination and HVAC loads at SHP stations | 1 | 2 | - | - |
| <i>PC26.</i> discuss installation, maintenance and testing of batteries at SHP stations | 2 | 3 | - | - |
| <i>PC27.</i> discuss battery chargers for SHP stations | 1 | 1 | - | - |
| <i>PC28.</i> discuss DC distribution boards for SHP stations | 1 | 1 | - | - |

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|--|-----------|-----------|---|---|
| <i>PC29. discuss Inverters, UPS and DG sets for SHP stations</i> | 1 | 3 | - | - |
| <i>PC30. List out motors for pumps and electrical cranes</i> | 1 | 2 | - | - |
| <i>PC31. discuss power cables and communication channels</i> | 2 | 2 | - | - |
| <i>PC32. discuss earth faults in electrical systems</i> | 1 | 2 | - | - |
| <i>PC33. discuss overheating</i> | 1 | 2 | - | - |
| <i>PC34. discuss dismantling of equipment</i> | 1 | 2 | - | - |
| <i>PC35. identify and rectify defects</i> | 1 | 2 | - | - |
| <i>NOS Total</i> | 74 | 76 | - | - |

NOS: SGJ/N0613: Study hydro-mechanical and civil system of Small HydroPower Plant

| Assessment Criteria for Outcomes | Theory Marks | Practical Marks | Project Marks | Viva Marks |
|--|---------------------|------------------------|----------------------|-------------------|
| <i>Hydro-Mechanical Equipment</i> | 5 | 6 | - | - |
| PC1. discuss Penstock and related specials (airvent, bends, expansion joints, reducer, matching flanges, bulkhead, piezo metric connections, branching) | 3 | 4 | - | - |
| PC2. illustrate trash rake, gates, hoisting arrangements and valves | 2 | 2 | - | - |
| <i>Hydro-turbine &governing system</i> | 11 | 20 | - | - |
| PC3. categorize types of turbines and their components (runner, casing nozzle/guide vanes, regulating mechanism, shaft, bearings) | 7 | 12 | - | - |
| PC4. introduce drive systems: belts and pulleys, speed increaser/gear box etc. | 2 | 3 | - | - |
| PC5. introduce governors, OPU and their functionality | 2 | 5 | - | - |

NSQF Qualification File

Approved in 13th NSQC Meeting held on 25th Nov 2021

Rationalized in 29th NSQC Meeting dated on 03rd May 2023

| | | | | |
|--|-----------|-----------|---|---|
| <i>Mechanical equipment Auxiliaries</i> | 6 | 8 | - | - |
| PC6. discuss drainage and dewatering pumps | 1 | 2 | - | - |
| PC7. discuss HVAC (heating, ventilation and Air conditioning) | 1 | 1 | - | - |
| PC8. discuss Equipment Handling Devices (crane, pulley block) | 1 | 2 | - | - |
| PC9. discuss compressors and compressed airsystem | 1 | 1 | - | - |
| PC10. discuss cooling water system | 1 | 1 | - | - |
| PC11. discuss fire fighting system | 1 | 1 | - | - |
| <i>Abnormality in the mechanical components</i> | 2 | 4 | - | - |
| PC12. discuss vibrations and noise in mechanical components | 1 | 2 | - | - |
| PC13. discuss overheating host motors | 1 | 2 | - | - |
| <i>Maintenance of mechanical components</i> | 12 | 21 | - | - |
| PC14. discuss dismantling of hydro mechanical equipment | 3 | 6 | - | - |
| PC15. identify and rectify defects | 3 | 5 | - | - |
| PC16. list out tapered locking sleeves and tapered adapter sleeves | 3 | 5 | - | - |
| PC17. explain bearing fit and shaft alignment etc. | 3 | 5 | - | - |
| <i>Civil work components and sizing</i> | 17 | 18 | - | - |
| PC18. discuss diversion and intake works | 2 | 2 | - | - |
| PC19. measure discharge | 1 | 2 | - | - |
| PC20. measure sediments | 1 | 1 | - | - |
| PC21. discuss channel /pipe/tunnel | 3 | 2 | - | - |
| PC22. discuss Desilting Tank | 2 | 2 | - | - |
| PC23. discuss Forebay and surge tanks | 2 | 3 | - | - |
| PC24. discuss Penstock, anchor block and saddles, branching | 3 | 3 | - | - |

NSQF Qualification File

Approved in 13th NSQC Meeting held on 25th Nov 2021

Rationalized in 29th NSQC Meeting dated on 03rd May 2023

| | | | | |
|--|-----------|-----------|---|---|
| <i>PC25. discuss power house building</i> | 2 | 2 | - | - |
| <i>PC26. discuss Tail Race Channel</i> | 1 | 1 | - | - |
| <i>Maintenance of civil works</i> | 9 | 11 | - | - |
| <i>PC27. discuss application of construction material in maintenance</i> | 2 | 2 | - | - |
| <i>PC28. discuss different SHP plant construction method</i> | 2 | 2 | - | - |
| <i>PC29. discuss quality control</i> | 1 | 2 | - | - |
| <i>PC30. discuss rate and cost estimate</i> | 2 | 3 | - | - |
| <i>PC31. measure and check quantities</i> | 2 | 2 | - | - |
| <i>NOS Total</i> | 62 | 88 | - | - |

Compulsory NOS

| National Occupational Standards | Theory Marks | Practical Marks | Project Marks | Viva Marks | Total Marks | Weightage |
|--|---------------------|------------------------|----------------------|-------------------|--------------------|------------------|
| SGJ/N1205.Study components and layout of Small Hydro Power (SHP) Plant | 24 | 51 | - | - | 75 | 17 |
| SGJ/N0701.Inspect different components of Small HydroPower (SHP) Plant | 26 | 52 | - | - | 78 | 17 |
| SGJ/N0610.Start and shutSmall Hydro Power (SHP) Plant | 8 | 16 | - | - | 24 | 5 |
| SGJ/N0106.Maintain health, safety and hygiene at workplace | 18 | 36 | - | - | 54 | 12 |
| SGJ/N0120.Work effectively with others | 17 | 19 | 0 | 0 | 36 | 16 |
| Total | 93 | 174 | 0 | 0 | 267 | 67 |

NSQF QUALIFICATION FILE

Elective: 1 Electro-mechanical system

| National Occupational Standards | Theory Marks | Practical Marks | Project Marks | Viva Marks | Total Marks | Weightage |
|--|---------------------|------------------------|----------------------|-------------------|--------------------|------------------|
| SGJ/N0614.Study electro-mechanical system of Small Hydro Power plant | 74 | 76 | - | - | 150 | 33 |
| Total | 74 | 76 | - | - | 150 | 33 |

Elective: 2 Hydro-mechanical and Civil system

| National Occupational Standards | Theory Marks | Practical Marks | Project Marks | Viva Marks | Total Marks | Weightage |
|--|---------------------|------------------------|----------------------|-------------------|--------------------|------------------|
| SGJ/N0613.Study hydro-mechanical and civil system of Small Hydro Power Plant | 62 | 88 | - | - | 150 | 33 |
| Total | 62 | 88 | - | - | 150 | 33 |

NSQF QUALIFICATION FILE

SECTION 2

25. EVIDENCE OF LEVEL

OPTION A

| Title/Name of qualification/component: Small Hydro Power Plant Technician (Jal Urja Mitra) | | | 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 operate, test and maintain different electrical, hydro-mechanical, civil components of small Hydro Power Plant to meet the performance and reliability needs, incorporating quality workmanship and complying with all applicable codes, standards and safety requirements | The individual performs activities such as operating, periodically testing the electrical, hydro-mechanical and civil components of the power plant through inspection of different components of the power plant such as Desilting tank, pipe/tunnel, valves, etc. Hence, role qualifies as a Level 4 role. | 4 |
| Professional knowledge | The individual is expected to be exhibit the knowledge of basic Working principle of a small Hydro Plant, main components of SHP, different types of streams, | The job holder is expected to exhibit an understanding factual knowledge of the field of power plant operation and maintenance . For example, she/he is expected to know the various types of faults that can occur in various components of SHP plant, various types of tools, measuring | 4 |

NSQF QUALIFICATION FILE

| Title/Name of qualification/component: Small Hydro Power Plant Technician (Jal Urja Mitra) | | | Level: 4 |
|--|--|---|------------|
| NSQF Domain | Key requirements of the job role | How the job role relates to the NSQF level descriptors | NSQF Level |
| | basic electricity rules, electricity generation, electrical symbols and single line diagrams, discharge measurement system, sediment measurement system, channel /pipe/tunnel systems, dealing with tripping of units in abnormal conditions, basic knowledge of hydro turbine, Governor, OPU, hydro generator, AVR & excitation system, basic knowledge about types of transformers and switchyards | equipment involved in maintenance and troubleshooting of components of SHP plant, various methods of fault prevention like regular inspection of various components of the SHP plant. Further, she/he should know about the risks and hazards/ safe working practices/ materials and equipment needed/ tasks and activities to the required standard. She/he should also have the ability to speak read and write in the local vernacular language and English. | |
| 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 inspection and maintenance activities to be conducted at the SHP 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 | 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 and working conditions of various components through inspection. Carrying out routine cleaning and maintenance activities to ensure long life and stability of SHP plant. The incumbent further analyses the fault prone areas by using standard techniques to prevent faults. Further, the incumbent refers to and uses defined rules in SOP manual and tools as per organization's guidelines to conduct | 4 |

NSQF QUALIFICATION FILE

| Title/Name of qualification/component: Small Hydro Power Plant Technician (Jal Urja Mitra) | | | Level: 4 |
|--|--|---|------------|
| NSQF Domain | Key requirements of the job role | How the job role relates to the NSQF level descriptors | NSQF Level |
| | can occur and take pro-active action | <p>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> | |
| 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 SHP plant</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</p> | 4 |

NSQF QUALIFICATION FILE

| Title/Name of qualification/component: Small Hydro Power Plant Technician (Jal Urja Mitra) | | Level: 4 | |
|--|---|--|------------|
| NSQF Domain | Key requirements of the job role | How the job role relates to the NSQF level descriptors | NSQF Level |
| | | <p>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 SHP 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> | |
| Responsibility | The individual is primarily responsible to gain knowledge about standard protocols and SOPs regarding the operation, testing and maintenance of a SHP plant. She/he is also expected to update self with the SHP plant and functioning through equipment manuals, books, etc. | The Small Hydro Power Plant technician is responsible for his/ her own work and learning. She/he is expected to update self with the standard protocols and SOPs using the available equipment manuals, etc. She/he is also expected to have significant on the job learning about the equipment and their maintenance procedures. She/he works | 4 |

NSQF QUALIFICATION FILE

| Title/Name of qualification/component: Small Hydro Power Plant Technician (Jal Urja Mitra) | | Level: 4 | |
|--|----------------------------------|---|------------|
| NSQF Domain | Key requirements of the job role | How the job role relates to the NSQF level descriptors | NSQF Level |
| | | under some supervision but primarily carries out her/his day to day activities independently. Thus she/he can be placed at level 4. | |

NSQF QUALIFICATION FILE

SECTION 3

EVIDENCE OF NEED

| | | |
|------------------|--|--|
| 26 | What evidence is there that the qualification is needed? What is the estimated uptake of this qualification and what is the basis of this estimate? | |
| | Basis | In case of other Awarding Bodies (Institutes under Central Ministries and states departments) |
| | Need of the qualification | <p>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. Estimates have been made in manpower requirement in the Renewable energy sector till 2025 and 2030. The research provides the data that the discussed qualification is one of the critical roles in the sector.</p> <p>Evidence of the qualification is supported by validations with representation from across sub sectors</p> |
| | Industry Relevance | |
| | Usage of the qualification | <p>On the lines of Saurya Urja Mitra skill development Programme launched by MNRE in 2015 and assigning the task of coordination of the trainings to NISE for creating skilled manpower for employment in solar energy projects, it is proposed that a Jal Urja Mitra Skill Development Programme for Small hydro Power Projects is coordinated by Department of Hydro and Renewable Energy (HRED-Formerly AHEC), IIT Roorkee with a target to develop 5,000 Jal Urja Mitras by the 2025-26 for the country. The programme shall follow the Ministry of Skill Development & Entrepreneurship norms with additional support of strengthening the training institution which shall primarily be Government sector in remote areas.</p> |
| Estimated uptake | | |

NSQF QUALIFICATION FILE

| | |
|----|---|
| 27 | <p>Recommendation from the concerned Line Ministry of the Government/Regulatory Body. To be supported by documentary evidences.</p> <p>Ministry of New and Renewable Energy recommended this Qualification.(Annexure-II)</p> |
| 28 | <p>What steps were taken to ensure that the qualification(s) does (do) not duplicate already existing or planned qualifications in the NSQF? Give justification for presenting a duplicate qualification</p> <p>Discussed the growth trajectory within each occupation after studying organisational charts of various industry players across small, medium and large scale organizations. Explored various lateral career opportunities for the discussed qualification. Ensured 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.</p> <p>National Qualifications Register was searched to assess if there was any similar qualification and no overlap was found with the existing qualifications.</p> |
| 29 | <p>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? Specify the review process here</p> <p>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.</p> |

SECTION 4

EVIDENCE OF PROGRESSION

| | |
|----|---|
| 30 | <p>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?</p> <p><i>Show the career map here to reflect the clear progression</i></p> |
|----|---|

NSQF QUALIFICATION FILE

