

QUALIFICATION FILE– Micro Credentials

Basics of Green Hydrogen Electrolysis Process

☒ Public ☐ Private

☒ Upskilling ☐ Dual/Flexi Qualification ☐ For ToT ☐ For ToA

☐ General ☐ Multi-skill (MS) ☐ Cross Sectoral (CS) ☒ Future Skills ☐ OEM

NCrF/NSQF Level: 6

Submitted By:

Hydrocarbon Sector Skill Council

Chief Executive Officer

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Table of Contents

Section 1: Basic Details	3
Section 2: Training Related.....	5
Section 3: Assessment Related.....	5
Section 4: Evidence of the need for the Qualification.....	5
Section 6: Annexure & Supporting Documents Check List.....	6
Annexure: Evidence of Level	6
Annexure: Tools and Equipment (Lab Set-Up)	8
Annexure: Industry Validations Summary*	9
Annexure: Training & Employment Details	10
Annexure: Detailed Assessment Criteria	12
Annexure: Assessment Strategy	15
Annexure: Acronym and Glossary	16

Section 1: Basic Details

1.	Micro Credential-Qualification Name	Basics of Green Hydrogen Electrolysis Process																
2.	Sector/s	Hydrocarbon																
3.	National Qualification Register (NQR) Code & Version (Will be issued after NSQC approval)	NM-06-HY-03835-2025-V1-HSSC & v-1.0	4. NCrF/NSQF Level: 6															
5.	Brief Description of the Qualification	A Green Hydrogen Production for the electrolysis unit, will be responsible for preparation, operation and maintenance of the electrolysis and other associated units. He/she needs to perform routine maintenance and repairs to keep electrolysis & associated equipment’s in good working order. Besides, he/she will also inspect raw materials and final products, performing quality control evaluations to confirm electrolysis meet established standards. The individual will be accountable for ensuring that the facility maintains a safe and healthy work environment, besides maintaining production logs and other documentation. Production Technicians must be able to detect and troubleshoot issues with machinery and perform routine maintenance. They must also be able to read and interpret technical manuals, blueprints, and schematics.																
6.	Eligibility Criteria for Entry for Student/Trainee/Learner/Employee	a. Entry Qualification & Relevant Experience: <table><tr><th>S. No.</th><th>Academic/Skill Qualification (with Specialization - if applicable)</th><th>Required Experience (with Specialization - if applicable)</th></tr><tr><td>1</td><td>Completed 4th year BE/B tech Engineering in Chemical/Industrial/ Petrochemical / Electrical Mechanical branch</td><td>With 1.5 years of relevant experience</td></tr><tr><td>2</td><td>Completed 3-Year UG Degree in Science (Chemistry/Physics)</td><td>With 3 years of relevant experience</td></tr><tr><td></td><td>Previous relevant Qualification of NSQF level 5.5</td><td>With 1.5 years of relevant experience</td></tr><tr><td></td><td>Previous relevant Qualification of NSQF level 5</td><td>With 3 years of relevant experience</td></tr></table> b. Age: 22		S. No.	Academic/Skill Qualification (with Specialization - if applicable)	Required Experience (with Specialization - if applicable)	1	Completed 4th year BE/B tech Engineering in Chemical/Industrial/ Petrochemical / Electrical Mechanical branch	With 1.5 years of relevant experience	2	Completed 3-Year UG Degree in Science (Chemistry/Physics)	With 3 years of relevant experience		Previous relevant Qualification of NSQF level 5.5	With 1.5 years of relevant experience		Previous relevant Qualification of NSQF level 5	With 3 years of relevant experience
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7.	Credits Assigned to this Qualification, Subject to Assessment (as per National Credit Framework (NCrF))	1	8. Common Cost Norm Category – Category (I)															
9.	Any Licensing requirements for Undertaking Training on This Qualification (wherever applicable)	NA																
10.	Expected Outcomes of the Micro Credential	Terminal learning outcomes are: - Understand Green hydrogen production pathways and purification - Understand Hydrogen compression, storage and transportation - Applications of Hydrogen																

		- Basics of electrochemistry-oxidation & reduction, redox reactions, electrochemical cell, standard electrode potential, Nernst equation etc - Electrolysis-basic principle, history, how it works, process of electrolysis - Water Electrolysis –history, process, Thermodynamics, - Different types of water electrolyser, PEM, Alkaline, SOEC, AEM, - Concept of over-potential, Faradaic efficiency, electrolytes, water electrolysis cell components, (MEA, Current collectors, separator plates, stacks), - Electrocatalysts for water electrolysis, differences, performance parameters etc. - Check product to ensure right quality and quantities are delivered - Perform data collection and prepare reports in order to meet reporting requirements. - Operate and maintain the equipment's in a safe and approved manner																							
11.	Training Duration by Modes of Training Delivery (Specify Total Duration as per selected training delivery modes and as per requirement of the qualification)	☒ Offline ☐ Online ☐ Blended <table border="1"> <thead> <tr> <th>Training Delivery Modes</th><th>Theory (Hours)</th><th>Practical (Hours)</th><th>OJT Mandatory (Hours)</th><th>OJT Recommended (Hours)</th><th>Total (Hours)</th></tr> </thead> <tbody> <tr> <td>Classroom (offline)</td><td>20</td><td>10</td><td>-</td><td>-</td><td>30</td></tr> <tr> <td>Online</td><td></td><td></td><td></td><td></td><td></td></tr> </tbody> </table> (Refer Blended Learning Annexure for details)						Training Delivery Modes	Theory (Hours)	Practical (Hours)	OJT Mandatory (Hours)	OJT Recommended (Hours)	Total (Hours)	Classroom (offline)	20	10	-	-	30	Online					
Training Delivery Modes	Theory (Hours)	Practical (Hours)	OJT Mandatory (Hours)	OJT Recommended (Hours)	Total (Hours)																				
Classroom (offline)	20	10	-	-	30																				
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12.	Assessment Criteria	<table border="1"> <thead> <tr> <th>Theory (Marks)</th><th>Practical (Marks)</th><th>Project (Marks)</th><th>Viva (Marks)</th><th>Total (Marks)</th><th>Passing %age</th></tr> </thead> <tbody> <tr> <td>190</td><td>95</td><td>0</td><td>0</td><td>285</td><td>70</td></tr> </tbody> </table>						Theory (Marks)	Practical (Marks)	Project (Marks)	Viva (Marks)	Total (Marks)	Passing %age	190	95	0	0	285	70						
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190	95	0	0	285	70																				
13.	Other Indian languages in which the Micro Credential will be implemented	Hindi																							
14.	Is similar Micro Credentials Qualification(s) available on NQR-if yes, justification for this qualification	☐ Yes ☒ No																							
15.	Is the Job Role Amenable to Persons with Disability	☐ Yes ☒ No If “Yes”, specify applicable type of Disability:																							
16.	How Participation of Women will be Encouraged	This job is gender neutral and focus during training should be on enrolment of women in each batch. SSC will encourage the TP and other training bodies to enrol women candidates.																							
17.	Name and Contact Details of Submitting / Awarding Body SPOC (In case of CS or MS, provide details of both Lead AB & Supporting ABs)	Name: Mr. SK Bose Email: ceo@hsscindia.in Contact No.: +91 9871115360 Website: www.hsscindia.in																							
18.	Final Approval Date by NSQC: 18/02/2025	19. Validity Duration: Three Years from the date of Approval			20. Next Review Date: 17/02/2028																				

Section 2: Training Related

1.	Trainer's Qualification and experience in the relevant sector (in years) (as per NCVET guidelines)	Post Graduate Electrical/Mechanical /Chemistry/Electronics with 6 years of relevant experience & 4 Years of training experience
2.	Master Trainer's Qualification and experience in the relevant sector (in years) (as per NCVET guidelines)	Post Graduate Electrical/Mechanical /Chemistry/Electronics with 6 years of relevant experience & 5 Years of training experience
3.	Tools and Equipment Required for Training	☒ Yes ☐ No (If "Yes", details to be provided in Annexure)
4.	In Case of Revised Qualification, Details of Any Upskilling Required for Trainer	NA

Section 3: Assessment Related

	Assessor's Qualification and experience in relevant sector (in years) (as per NCVET guidelines)	Post Graduate Electrical/Mechanical /Chemistry/Electronics with 6 years of relevant experience & 4 Years of training experience
	Proctor's Qualification and experience in relevant sector (in years) (as per NCVET guidelines)	Post Graduate Electrical/Mechanical /Chemistry/Electronics with 6 years of relevant experience & 4 Years of training experience
	Lead Assessor's/Proctor's Qualification and experience in relevant sector (in years) (as per NCVET guidelines)	Post Graduate Electrical/Mechanical /Chemistry/Electronics with 6 years of relevant experience & 5 Years of training experience
	Assessment Mode (Specify the assessment mode)	Both – Online and Offline
	Tools and Equipment Required for Assessment	☒ Same as for training ☒ Yes ☐ No (details to be provided in Annexure-if it is different for Assessment)

Section 4: Evidence of the need for the Qualification

Provide Annexure/Supporting documents name.

1.	Latest Skill Gap Study (not older than 2 years) (Yes/No): Yes
2.	Latest Market Research Reports or any other source (not older than 2 years) (Yes/No): Yes
3.	Government /Industry initiatives/ requirement (Yes/No): Yes
4.	Number of Industry validation provided: 10 (Due to limited number of Industries available in Oil & Gas Sector; endorsed by MoPNG through Letter)
5.	Estimated nos. of persons to be trained and employed: Up to 5 lakhs new jobs are expected to be created by 2030 across the Green Hydrogen value chain as per the Green Hydrogen Mission. Multiple qualifications across the key segments of the green hydrogen value chain shall be developed as per the requirement of the industry. It is expected that up to 2000 shall be trained and gradually employed across new projects every year. Green hydrogen generation units in the country as recently announced are mainly under planning stage, targeted skilling activities can be undertaken for priority job roles. Over 4 lakhs jobs are expected to be generated only for meeting the required renewable energy capacity of 125 GW which would be required for powering the Green Hydrogen facilities producing at least 5 MT per annum till 2030. In the medium to long term, innovative business models particularly in transport and power sectors will evolve in the coming decade leading to new opportunities for both jobs and self- employment across various industry clusters. Oil refineries using hydrogen for desulphurization, ammonia production for fertilizers and chemicals industry,

	treatment of basic metals along with steel industry will create the leading market, skilling and employment opportunities for green hydrogen in the short-medium term. Green hydrogen technologies and applications as alternate energy carrier / vector for industrial process heating, transportation and long duration energy storage will also emerge in the long term possibly creating new opportunities for both skilling and employment.
6.	Evidence of Concurrence/Consultation with Line Ministry/State Departments: <i>The Ministry of Petroleum & Natural Gas (MoPNG) which is the Line Ministry for Hydrocarbon Sector has been requested to accord the concurrence</i> If “No”, why:

Section 6: Annexure & Supporting Documents Check List

Specify Annexure Name / Supporting document file name

1.	Annexure: NCrf/NSQF level justification based on NCrf level/NSQF descriptors (<i>Mandatory</i>)	Annexure: NCrf/NSQF level justification based on NCrf level/NSQF descriptors
2.	Annexure: List of tools and equipment relevant for qualification (<i>Mandatory, except in case of online course</i>)	Annexure: List of tools and equipment relevant for qualification
3.	Annexure: Detailed Assessment Criteria (<i>Mandatory</i>)	Annexure: Detailed Assessment Criteria
4.	Annexure: Assessment Strategy (<i>Mandatory</i>)	Annexure: Assessment Strategy
5.	Annexure: Blended Learning (<i>Mandatory, in case selected Mode of delivery is “Blended Learning”</i>)	Annexure: Offline Learning Mode
6.	Annexure: Multiple Entry-Exit Details (<i>Mandatory, in case qualification has multiple Entry-Exit</i>)	Annexure: NA
7.	Annexure: Acronym and Glossary (<i>Optional</i>)	Annexure: Acronym and Glossary
8.	Supporting Document: Model Curriculum (<i>Mandatory – Public view</i>)	Supporting Document: Model Curriculum
9.	Supporting Document: Career Progression (<i>Mandatory - Public view</i>)	Supporting Document: Career Progression – Occupational Map
10.	Supporting Document: Occupational Map (<i>Mandatory</i>)	Supporting Document: Occupational Map
11.	Supporting Document: Assessment SOP (<i>Mandatory</i>)	Supporting Document: Assessment SOP
12.	Any other document you wish to submit:	Any other document you wish to submit: NA

Annexure: Evidence of Level

NCrf/NSQF Level Descriptors	Key requirements of the job role/ outcome of the qualification	How the job role/ outcomes relate to the NCrf/NSQF level descriptor	NCrf/ NSQF Level
Professional Theoretical Knowledge/Process	A Green Hydrogen Production specializing in electrolysis includes expertise in electrochemistry, understanding of renewable energy sources, and proficiency in operating electrolysis systems. Knowledge of materials, catalysts, and membrane technologies is crucial. Additionally, a strong grasp of safety protocols, system optimization, and	• Possesses specialized knowledge of procedures employed in both routine and non-routine contexts. • Possesses specialized operational knowledge and understanding of the work • Has knowledge of collecting and interpreting the available	6

	troubleshooting skills are essential for efficient and sustainable green hydrogen production.	information, drawing conclusions & communicating the same.	
Professional and Technical Skills/ Expertise/ Professional Knowledge	A Green Hydrogen Production specializing in electrolysis include proficiency in operating electrolysis equipment, understanding renewable energy systems, and maintaining a safe working environment. Technical skills should encompass electrolyzer troubleshooting, process optimization, and familiarity with control systems. Additionally, expertise in water treatment, electrical systems, and data analysis is essential. Strong problem-solving abilities, attention to detail, and adherence to industry regulations are crucial for successful performance in this role.	• Possesses specialized professional and technical skills; displays clarity of professional knowledge and technical skills in broad range of activities/ tasks. • Can apply the required knowledge for successfully implementing or applying techniques/ processes in a specific field/ job role • The ability to gain, and where relevant apply a range of knowledge, skills and understanding • Possesses the required operational skills for the work/ job. Skill to deliver job/ work with the required precision and in the estimated timelines. • Capabilities of carrying out a choice of processes and procedures within the range of familiar / unfamiliar contexts.	6
Employment Readiness & Entrepreneurship Skills & Mind-set/Professional Skill	Green Hydrogen Production should demonstrate adaptability to evolving technologies, effective communication for collaboration, and a proactive approach to learning. Entrepreneurial skills involve a keen business acumen, strategic thinking for optimizing production processes, and the ability to identify and capitalize on emerging market opportunities. This role demands a strong work ethic, problem-solving mindset, and the capacity to contribute to a sustainable energy future through innovation and continuous improvement.	• Have much broader Employability Skills including understanding of career planning, digital skills, financial and legal literacy. • Good Communication skills, both oral and written. • Advanced literacy and Numeracy skills • Can comfortably use most of the basic digital tools, has clear understanding of Financial and Digital literacy, Aadhaar and Mobile, uses digital payments etc. with proficiency • Good understanding of Constitutional values & Citizenship, inclusion and Diversity. • Very Good understanding of social political and work environment	6
Broad Learning Outcomes/Core Skill	A Green Hydrogen Production specializing in electrolysis includes proficiency in operating and maintaining electrolysis equipment. This entails a comprehensive understanding of renewable energy systems, expertise in troubleshooting electrolyzers, and ensuring optimal process efficiency. Strong technical acumen in areas such as water treatment, electrical systems, and data analysis is essential, along with a commitment to safety protocols and environmental sustainability.	• The candidate must be able to carry out a specialized job/ work/ tasks in a familiar/ unfamiliar, predictable/ unpredictable, routine/ nonroutine, situation of multiple options/ choices • Focus on range of application of standard procedures or operations in production/services. • Able to identify/ anticipate the problems and possible range of solutions in production/services • Complex tasks are performed by himself without much instructions and supervision.	6

		• Apply related occupational safety & general hygiene norms and environmental aspects. • Applies range of well - developed technical skills with clarity of activities involving clear choices within familiar contexts. • Has knowledge and is able to continuously improve processes which the individual uses for concerned job roles • Has information of associated Risks with related job roles.	
Responsibility	The Green Hydrogen Production (Electrolysis) is responsible for overseeing the operation and maintenance of electrolysis equipment to produce green hydrogen efficiently. This includes monitoring and troubleshooting electrolyzers, optimizing process parameters, and ensuring adherence to safety protocols. The technician must contribute to the development and implementation of preventive maintenance strategies, handle water treatment processes, and collaborate with cross-functional teams. Additionally, they play a crucial role in data analysis for process optimization, maintaining accurate records, and staying abreast of technological advancements in electrolysis. Overall, their responsibilities contribute to sustainable and safe green hydrogen production.	The individual is majorly responsible for his own job and self-learning process which justifies the pegging of the QP at level 6 • Can perform all non-standard procedures and non-routine tasks with confidence.	6

Annexure: Tools and Equipment (Lab Set-Up)

List of Tools and Equipment

Batch Size: 30

S. No.	Tool / Equipment Name	Specification	Quantity for specified Batch size
1	Alkaline Electrolyzers Proton Exchange Membrane (PEM) Electrolyzers Water Pumps Water Quality Monitoring Systems Rectifiers Electrical Panels		NA

	Hydrogen and Oxygen Gas Collection Systems Gas Purification Systems Pressure Regulators Safety Relief Valves Heat Exchangers Cooling Towers Hydrogen Gas Analyzers Oxygen Gas Analyzers Temperature Sensors Pressure Sensors Programmable Logic Controllers (PLCs) Human-Machine Interface (HMI) Panels Emergency Stop Buttons Safety Interlocks Hydrogen Compression Units Hydrogen Storage Tanks Ventilation Fans: Wrenches, Screwdrivers Personal Protective Equipment (PPE) Gas Detection Systems Logbooks Data Logging Systems		
2	Personal Protective Equipment (PPE): Safety helmet, safety glasses, ear protection, respiratory protection (if required), protective gloves, safety boots.		NA

Classroom Aids

The aids required to conduct sessions in the classroom are:

- | | |
|--------------------------------------|-----------------------------|
| 1. White / Black board and Projector | 3. Computer/Laptop |
| 2. Digital Presentation | 4. Public Addressing System |

Annexure: Industry Validations Summary*

Provide the summary information of all the industry validations in table. This is not required for OEM qualifications.

S. No	Organization Name	Representative Name	Designation	Contact Address	Contact Phone No	E-mail ID	LinkedIn Profile (if available)
1	O.I.L	Shri Jayant Barua	CEO		9435348638	jayantbarua@oilindia.in	
2	BPCL	Shri Vishwas Saxena	Dy. General Manager		9669320555	vishwassaxena@bharatpetroleum.in	
3	HPCL	Imtiyaz Arshad	CEO & Secretary		8332864450	iarshad@hpcl.in	
4	IOCL	Apurva Nagmote	DGM (Learning & Skill Development)		8373919522	nagmoteas@indianoil.in	
5	GAIL	Shri M. A. Qureshi	CM (Training)		9179061305	maqureshi@gail.co.in	

6	CPCL	Shri Ayyamuthu A	Assistant Manager (Personnel)		9732492888	ayyamuthu@cpcl.co.in	
7	CHT	Shri Kishore Kumar Bhimwal	Additional Director		9958798282	kishore.bhimwal@cht.gov.in	
8	MRPL	Shri Venkateswarlu Kumbha	Chief Manager (TS)		9035044404	venkat_kumbha@mrpl.co.in	
9	SOM Projects PVT. LTD.	Shri Kuldeep Kumar	Manager			spplusar@gmail.com	
10	EIL	Shri Tathagat Sahoo	SR Manager HR		9702088305	tathagat.sahoo@eil.co.in	

Annexure: Training & Employment Details

Training and Employment Projections: 1350

Year	Total Candidates		Women		People with Disability	
	Estimated Training #	Estimated Employment Opportunities	Estimated Training #	Estimated Employment Opportunities	Estimated Training #	Estimated Employment Opportunities
2024	350	Green Hydrogen is new in India, so training is given to develop future workforce. Training will be given tom college students	150	Green Hydrogen is new in India, so training is given to develop future workforce. Training will be given tom college students	20	Green Hydrogen is new in India, so training is given to develop future workforce. Training will be given tom college students
2025	450	Green Hydrogen is new in India, so training is given to develop future workforce. Training will be given tom college students	200	Green Hydrogen is new in India, so training is given to develop future workforce. Training will be given tom college students	20	Green Hydrogen is new in India, so training is given to develop future workforce. Training will be given tom college students
2026	550	Green Hydrogen is new in India, so training is given to develop future workforce. Training will be given tom college students	250	Green Hydrogen is new in India, so training is given to develop future workforce. Training will be given tom college students	20	Green Hydrogen is new in India, so training is given to develop future workforce. Training will be given tom college students

Data to be provided year-wise for next 3 years

Annexure: Blended Learning**Blended Learning Estimated Ratio & Recommended Tools:**

Refer NCVET “Guidelines for Blended Learning for Vocational Education, Training & Skilling” available on:

<https://ncvet.gov.in/sites/default/files/Guidelines%20for%20Blended%20Learning%20for%20Vocational%20Education,%20Training%20&%20Skilling.pdf>

S. No.	Select the Components of the Qualification	List Recommended Tools – for all Selected Components	Offline : Online Ratio
1	☐ Theory/ Lectures - Imparting theoretical and conceptual knowledge		Offline
2	☐ Imparting Soft Skills, Life Skills, and Employability Skills /Mentorship to Learners		Offline
3	☐ Showing Practical Demonstrations to the learners		Offline
4	☐ Imparting Practical Hands-on Skills/ Lab Work/ workshop/ shop floor training		Offline
5	☐ Tutorials/ Assignments/ Drill/ Practice		Offline
6	☐ Proctored Monitoring/ Assessment/ Evaluation/ Examinations		Offline
7	☐ On the Job Training (OJT)/ Project Work Internship/ Apprenticeship Training		Offline

Annexure: Detailed Assessment Criteria

Detailed assessment criteria for each NOS/Module are as follows:

NOS/Module Name	Assessment Criteria for Performance Criteria/Learning Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Overview of hydrogen as an energy carrier and Green Hydrogen Value Chain	<i>Understanding Hydrogen molecule as an energy carrier</i>			-	-
	PC1. Understand hydrogen molecule	2	1	-	-
	PC2. Understand Basic physical and chemical properties of hydrogen	2	1	-	-
	PC3. Understand energy content of hydrogen	2	1	-	-
	PC4. Understand advantages & disadvantages of hydrogen	2	1	-	-
	PC5. Understand demand supply scenario	2	1	-	-
	PC6. Understand emissions from hydrogen and colours of hydrogen	2	1	-	-
	<i>Green hydrogen production pathways and purification</i>			-	-
	PC7. Understand hydrogen production using conventional routes	2	1	-	-
	PC8. Understand green hydrogen production using renewable energy sources like solar & wind	2	1	-	-
	PC9. Understand different types of electrolyzers	2	1	-	-
	PC10. Understand green hydrogen production from biomass gasification	2	1	-	-
	PC11. Understand purification requirements of hydrogen	2	1	-	-
	<i>Hydrogen compression, storage and transportation</i>			-	-
	PC12. Understand need for hydrogen compression	2	1	-	-
	PC13. Understand physical storage of hydrogen in cylinders and vessels	2	1	-	-
	PC14. Understand chemical storage of hydrogen	2	1	-	-
	PC15. Understand how hydrogen is transported in different ways	2	1	-	-
	<i>Applications of Hydrogen</i>			-	-
	PC16. Understand hydrogen applications and quality requirements	2	1	-	-
	PC17. Understand application of hydrogen as a blend with CNG	2	1	-	-
	PC18. Understand application of hydrogen in Fuel Cell	2	1	-	-
	PC19. Understand application of hydrogen in direct IC engine	2	1	-	-
	PC20. Understand application of hydrogen in different industries	2	1	-	-
	Total Marks	40	20	-	-
Basic fundamental of electrolysis	<i>Basics of electrochemistry</i>			-	-
	PC1. Understand what is electrochemistry, electron flow, cathode and anode	2	1	-	-

	PC2. Understand what is oxidation in a chemical reaction	2	1	-	-
	PC3. Understand what is reduction in a chemical reaction	2	1	-	-
	PC4. Understand what is a redox reactions	2	1	-	-
	PC5. Understand how to identify oxidation & reduction of different elements in a reaction	2	1	-	-
	PC6. Understand how an electrochemical Cell works	2	1	-	-
	PC7. Understand how a galvanic cell works	2	1	-	-
	PC8. Understand standard electrode potential and its significance	2	1	-	-
	PC9. Understand Nernst equation	2	1	-	-
	PC10. Understand basic principle of electrolysis and its history	2	1	-	-
	PC11. Understand working of electrolysis process in different industries	2	1	-	-
	PC12. Understand water electrolysis phenomenon	2	1	-	-
	PC13. Understand basic thermodynamics involved in water electrolysis	2	1	-	-
	PC14. Understand working of PEM electrolyser and its components	2	1	-	-
	PC15. Understand working of Alkaline electrolyser and its components	2	1	-	-
	PC16. Understand working of Solid Oxide electrolyser (SOEC) and its components	2	1	-	-
	PC17. Understand working of Anion Exchange membrane (AEM) electrolyser and its components	2	1	-	-
	PC18. Understand role of catalysts in electrolyzers	2	1	-	-
	PC19. Understand comparison of different electrolyser technologies	2	1	-	-
	PC20. Understand performance parameters of different types of electrolyzers	2	1	-	-
	Total Marks	40	20	-	-
Commercial Electrolyser unit in a Green hydrogen production facility	PC1. Understand concept of cell stacks in commercial electrolyzers	2	1	-	-
	PC2. Understand the stack design-zero gap design	2	1	-	-
	PC3. Understand electrode material	2	1	-	-
	PC4. Understand Different electrode assemblies in a commercial electrolyser	2	1	-	-
	PC5. Understand membrane / diaphragm material	2	1	-	-
	PC6. Understand Atmospheric vs pressurised electrolyzers	2	1	-	-
	PC7. Understand Efficiency and gas purity	2	1	-	-
	PC8. Understand Balance of energy and materials	2	1	-	-
	PC9. Understand role of Balance of Plant (BoP) units	2	1	-	-
	PC10. Understand role of power supply and water purification system	2	1	-	-
	PC11. Understand role of hydrogen purification system	2	1	-	-
	PC12. Understand role of electrolyte circulating system	2	1	-	-
	PC13. Understand role of heat exchanges	2	1	-	-
	PC14. Understand role of safety systems and online gas leakage detection analysers	2	1	-	-

	PC15. Understand diagrams and functioning of various units of PEM and Alkaline electrolyzers	2	1	-	-
	PC16. Understand how an industrial PEM electrolyser looks	2	1	-	-
	PC17. Understand how an industrial Alkaline electrolyser looks	2	1	-	-
	PC18. Understand how an industrial Alkaline electrolyser looks	2	1	-	-
	PC19. Understand production flow diagram in a PEM electrolyser unit	2	1	-	-
	PC20. Understand functional specifications of a PEM electrolyser	2	1	-	-
	PC21. Understand system design features of a PEM electrolyser	2	1	-	-
	PC22. Basics-Operating conditions of PEM electrolyser and implications	2	1	-	-
	PC23. Understand production flow diagram in an Alkaline electrolyser unit	2	1	-	-
	PC24. Understand functional specifications of an Alkaline electrolyser	2	1	-	-
	PC25. Understand system design features of an Alkaline electrolyser	2	1	-	-
	PC26. Basics-Operating conditions of Alkaline electrolyser and implications	2	1	-	-
	PC27. Understand production flow diagram in a SOEC unit	2	1	-	-
	PC28. Understand functional specifications of a SOEC	2	1	-	-
	PC29. Understand system design features of a SOEC	2	1	-	-
	PC30. Understand Basics-Operating conditions of SOEC and implications	2	1	-	-
	PC31. Understand relationship between electrolyser capacity in MW and hydrogen generation capacity in Kg.	2	1	-	-
	PC32. Understand about Commercial manufactures of different categories of electrolyzers	2	1	-	-
	Total Marks	64	32	-	-
Roles and Responsibilities of Production technician in an Electrolyser unit	PC1. Understand data collection and prepare reports in order to meet reporting requirements.	2	1	-	-
	PC2. Understanding routine maintenance required in water treatment unit	2	1	-	-
	PC3. Understand importance of ensuring continuous operation	2	1	-	-
	PC4. Understand how to maintain water & raw consumption records, waste records and fills out the daily logbook	2	1	-	-
	PC5. Understanding loading, unloading, and maintaining material to a water treatment plant.	2	1	-	-
	PC6. Understand how to operate material handling equipment to move parts in and out of the work station.	2	1	-	-
	PC7. Understand how to manage multiple work orders on multiple output stations (if applicable).	2	1	-	-
	PC8. Understand ensuring daily paperwork is submitted accurately and on time.	2	1	-	-
	PC9. Understand maintaining consumption, waste records and fills out the daily logbook.	2	1	-	-
	PC10. Understanding loading, unloading, and maintaining material to assigned machine units.	2	1	-	-
	PC11. Understand how to prepare and stage material as needed.	2	1	-	-
	PC12. Understand to report data and interface with other employees and departments.	2	1	-	-

Onsite Training	PC13. Understand carry out work in a safe manner, notifying management of safety issues and risks	2	1	-	-
	Total Marks	26	13	-	-
	PC1. Understand actual working of a green hydrogen facility	2	1	-	-
	PC2. Understand working aspects of different units	2	1	-	-
	PC3. Understand detailed working of the complete electrolyser system including balance of plant units	2	1	-	-
	PC4. Understand integration of renewable electricity with the electrolyser system	2	1	-	-
	PC5. Understanding compression and storage systems	2	1	-	-
	PC6. Understand dispensing of hydrogen in vehicles	2	1	-	-
	PC7. Understand the control room setup and automation	2	1	-	-
	PC8. Understand working of online analyzers and sensors	2	1	-	-
	PC9. Understand safety features employed in the facility	2	1	-	-
	PC10. Prepare a short report of the visit and learnings	2	1	-	-
Total Marks		20	10	-	-
Grand Total		190	95	0	0

Annexure: Assessment Strategy

This section includes the processes involved in identifying, gathering, and interpreting information to evaluate the Candidate on the required competencies of the program.

1. Assessment System Overview:

- Batches assigned to the assessment agencies for conducting the assessment on SIDH or email
- Assessment agencies send the assessment confirmation to VTP/TC looping SSC
- Assessment agency deploys the ToA certified Assessor for executing the assessment
- HSSC monitors the assessment process & records

2. Testing Environment:

- Confirm that the centre is available at the same address as mentioned on SDMS or SIDH
- 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:

- Question bank is created by the Subject Matter Experts (SME) of Hydrocarbon Sector are verified by the Industry Experts, each performance criteria have its marks for theory based on the level of question i.e., easy, medium and difficult.
- Questions are mapped to the specified assessment criteria
- Assessor must be ToA certified & trainer must be ToT Certified

4. Types of evidence or evidence-gathering protocol:

- Time-stamped & geotagged reporting of the assessor from assessment location
- Centre 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 crosschecking with candidate over audio/video call or physical visit
- Random audit of the batch

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

7. **On the Job:**

1. The evidence record of OHT will be done through organized Monitoring Reports
2. During the OJT, every trainee is required to fill the OJT monitoring report which is required to be signed by his/her supervisor and the HR of that company.
3. During assessment, each module will be assessed separately.
4. The candidate must score 60% in each module to successfully complete the OJT.
5. Tools of Assessment that will be used for assessing whether the candidate is having desired skills and etiquette of dealing with customers, understanding needs & requirements, assessing the customer and perform Soft Skills effectively:
 - Videos of Trainees during OJT
6. Assessment of each Module will ensure that the candidate is able to:
 - Effective engagement with the customers
 - Understand the working of various tools and equipment

Annexure: Acronym and Glossary

Acronym

Acronym	Description
AA	Assessment Agency
AB	Awarding Body
ISCO	International Standard Classification of Occupations
NCO	National Classification of Occupations

NCrF	National Credit Framework
NOS	National Occupational Standard(s)
NQR	National Qualification Register
NSQF	National Skills Qualifications Framework
OJT	On the Job Training

Glossary

Term	Description
National Occupational Standards (NOS)	NOS define the measurable performance outcomes required from an individual engaged in a particular task. They list down what an individual performing that task should know and also do.
Qualification	A formal outcome of an assessment and validation process which is obtained when a competent body determines that an individual has achieved learning outcomes to given standards
Qualification File	A Qualification File is a template designed to capture necessary information of a Qualification from the perspective of NSQF compliance. The Qualification File will be normally submitted by the awarding body for the qualification.
Sector	A grouping of professional activities on the basis of their main economic function, product, service or technology.
Long Term Training	Long-term skilling means any vocational training program undertaken for a year and above. https://ncvet.gov.in/sites/default/files/NCVET.pdf