

OCCUPATIONAL SKILLS PROGRAMME DOCUMENT

IN LINE WITH QQSF POLICY (2021) OCCUPATIONAL QUALIFICATION TYPE (NOMENCLATURE)

SKILLS PROGRAMME	SKILLS PROGRAMME ID	TITLE (DESCRIPTOR)		NQF LEVEL	CREDITS
Skills Programme	SP-250405	Green Hydrogen Technology		04	29
START DATE	END DATE	LAST DATE FOR ENROLMENT		LAST DATE FOR ACHIEVEMENT	
30 April 2025	30 April 2030	30 April 2031		30 April 2034	
CURRICULUM CODE	900520-000-00-00				
PARTNER DETAILS	ORGANISATION NAME	WEBSITE ADDRESS	TELEPHONE NUMBER	LOGO	
QUALITY PARTNER - DEVELOPMENT	CHIETA	www.chieta.org.za	011 628 7000		

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1. SKILLS PROGRAMME DETAILS

1.1 Sub-Framework: Occupational Qualifications Sub-Framework

1.2 Type (Nomenclature):

1.2.1 Specify if this is a Qualification/Part-Qualification/Skills Programme
Skills Programme

1.2.2 Type: (Nomenclature) e.g. Advanced Occupational Certificate)
Skills Programme

1.3 Title Descriptor: *State the Occupation, Specialisation, context or Skills Programme context*

Green Hydrogen Technology

1.4 NQF Level:

NQF Level 4

1.5 Credits:

29

1.6. Organising Field and Sub-field:

1.6.1 Organising Field:
Field 06: Manufacturing, Engineering and Technology

1.6.2 Sub-field:
Engineering and Related Design

1.7 QCTO Curriculum Code:

900520-000-00-00

1.8 Originator/Quality Partner (QP) – Development/Assessment

1.8.1 Quality Partner (Qualifications Development):
CHIETA

1.8.2 Quality Partner (Assessment):
Not applicable

1.9 Replacement

This skills programme does not replace any other skills programme

2. RATIONALE

2.1 The need for the Skills Programmes

The Hydrogen Society Roadmap for South Africa (HSRM), which serves as a national coordinating framework to facilitate the integration of hydrogen-related technologies, underscores the importance of developing a skilled workforce capable of driving South Africa's hydrogen economy forward. (2021)

Furthermore, a Comprehensive Study on the Hydrogen Economy in South Africa conducted by CHIETA 2023 identified the need to adopt new programmes in training on the identified skill needs, such as green hydrogen technology.

Amid the rapidly evolving global hydrogen value chain, as well as the increasing emphasis on decarbonisation, this skills programme will address the need to develop a workforce with the knowledge and skills required to participate in the emerging green hydrogen industry.

This skills programme will play a critical role in South Africa's efforts to transition towards an "innovation economy" by utilising green hydrogen.

2.2 Similar Qualification(s), Part-Qualifications/Skills Programmes

No qualification, part qualification or skills programme, providing the requisite competencies for Green Hydrogen Technology exist.

2.3 Benefit to the sector, society and the economy:

This skills programme will bridge a sector gap in the hydrogen value chain, empowering industry to reskill or upskill staff and deploy them into newly created jobs as various industrial processes, using green hydrogen as a clean fuel source, are being designed and implemented.

Green Hydrogen, derived from renewable sources such as solar and wind, offers significant benefits to society, including providing a versatile energy carrier for transportation, industry, and heating. This skills programme has the potential to contribute towards achieving global decarbonisation targets

As industry sectors work to reduce carbon emissions, especially in areas where electrification is challenging, such as heavy industry, transport, and high-heat applications, green hydrogen technology becomes essential.

Skills development in green hydrogen plays a significant role in driving economic growth and development. Investing in green hydrogen skills development will provide multiple economic benefits, from job creation and technological innovation to energy security and sustainable growth.

This skills programme will support professional development by reskilling and/or upskilling the workforce, helping to prevent job losses and positioning the country as leaders in the green economy, driving both local and global economic development.

In addition, this skills programme will ensure a skilled workforce to grow hydrogen exports, encouraging inward investment and will foster the growth of startups and new businesses, which will drive innovation and create new economic opportunities in the clean energy sector.

2.4 Typical learners:

This skills programme is designed for learners who are at post schooling levels as well as individuals already involved in manufacturing operations in the chemical sector including the latest developments such as the hydrogen fuel cell technology, renewable energy, energy management or energy efficiency sectors and are wanting to expand their knowledge and skills in the renewable energy sector.

2.5 Relation to Occupation(s) and/or Profession(s)

2.5.1 Occupation(s) related:

2.5.1.1 Collaboration with relevant stakeholders:

During the development of the skills programme, various stakeholders were collaborated with such as:

- Workplace practitioners
- Higher Education Institutions
- Employers
- Private SDP's
- TVET Colleges
- Various SETA's

2.5.1.2 List typical occupations in which the qualifying learner will operate (if relevant)

Chemical Plant Operators, Electricians, Fitters, Process Technicians, Instrument Artisans, Production Planning within the Green Hydrogen environment

2.5.2 Profession(s) related:

2.5.2.1 Collaboration with relevant stakeholders:

Not applicable

2.5.2.2 List typical professions in which the qualifying learner will operate (if relevant)

Not applicable

3. PURPOSE

3.1 Benefit the learners:

Completing a Green Hydrogen Technology skills programme will provide the learner the opportunity to:

- enhance their skills and career prospects in the renewable energy sector
- gain hands-on experience in developing hydrogen technologies,
- remain relevant with skills required in the emerging Green Hydrogen value chain
- equip themselves with the knowledge and skills required to fill jobs being created in the emerging Green Hydrogen value chain

The qualified learner will have a solid understanding of the potential hazards associated with working with or around hydrogen, hydrogen-related regulations, standards, and codes, and green hydrogen monitoring processes.

As the green hydrogen sector grows, it will create a wide range of jobs in the production, distribution, and uses of hydrogen. The knowledge and skills acquired in this skills programme will enable the learner to seek gainful employment in fields such as research and development, renewable energy firms, engineering, manufacturing, project management, and operations.

3.2 What the qualification or part-qualification intends to achieve:

The purpose of this Green Hydrogen Technology Skills Programme is to prepare the learners to function in the Green Hydrogen Technology value chain.

The Skills Programme will prepare the learner to provide technical expertise in the development, implementation, and management of green hydrogen technologies to ensure compliance with environmental regulations and support long-term sustainability goals.

The qualified learner will be able to:

- Explain technological developments and regulatory changes to technical and production teams to ensure practical integration of hydrogen systems
- Collaborate with technical teams in the design and implementation of green hydrogen solutions
- Compare green hydrogen production processes
- Analyse production and performance reports to improve overall performance

3.3 Typical Graduate attributes

- Health and safety awareness
- Attention to detail
- Communication
- Analytical
- Reliability
- Effective Communication

4. ENTRY REQUIREMENTS

NQF Level 4 qualification with Mathematics and Physical Science

5. RECOGNITION OF PRIOR LEARNING (RPL)

5.1 RPL for Access to Training:

Learners may use the RPL process to gain access to training opportunities for a skills programme if they do not meet the formal, minimum entry requirements for admission. RPL assessment provides an alternative access route into a skills programme.

Such an RPL assessment may be developed, moderated and conducted by the accredited Skills Development Provider which offers that specific skills programme. Such an assessment

must ensure that the learner is able to display the equivalent level of competencies required for access, based on the NQF level descriptors.

For exemption from modules through RPL, learners who have gained the stipulated competencies of the modules of a skills programme through any means of formal, informal or non-formal learning and/or work experience, may be awarded credits towards relevant modules, and gaps identified for training, which is then concluded.

5.2 RPL for Access to the Final Integrated Supervised Assessment (FISA):

Learners who have gained the stipulated competencies of the modules of a programme of learning, skills programme through any means of formal, informal or non-formal learning and/or work experience, may be awarded credits towards relevant modules, and gaps identified for training, which is then concluded.

For a Skills Programme, the accredited Skills Development Provider (SDP) must ensure all modular competency requirements are met prior to the FISA and keep record of such evidence.

Upon successful completion of the FISA, RPL learners will be issued with the QCTO certificate for the qualification, skills programme. Quality Partners are responsible for ensuring the RPL mechanism and process for skills programme is approved by the QCTO.

6. RULES OF COMBINATION

6.1 Components:

KNOWLEDGE/THEORY COMPONENT

MODULE CODE	MODULE TITLE	NQF LEVEL	CREDITS	MODE OF DELIVERY
900520-000-00-KM-01	Introduction to Hydrogen energy	4	3	Blended
900520-000-00-KM-02	Green hydrogen technology fundamentals	4	3	Blended
900520-000-00-KM-03	Legislation, Regulations and Compliance	4	2	Blended
900520-000-00-KM-04	Monitor, analyse and reduce risk	4	5	Blended
900520-000-00-KM-05	Teamwork	4	3	Blended

Total Credits = 16 credits

APPLICATION COMPONENT

The Application Component includes the following Practical Skills Modules

PRACTICAL SKILLS MODULE(S)

State compulsory modules:

MODULE CODE	MODULE TITLE	NQF LEVEL	CREDITS	MODE OF DELIVERY
900520-000-00-PM-01	Carry out green hydrogen operational processes and functions	4	5	Face to Face
900520-000-00-PM-02	Gather and analyse green hydrogen data	4	5	Face to Face
900520-000-00-PM-03	Complete administrative duties and functions	4	3	Face to Face

Total credits of the selected modules = 13 credits

6.2 Soft Skills Included:

Indicate if 5% -10% of soft skills is included and give location notes on the modules where this is found:

5% of soft skill(s) are included in:

MODULE CODE	MODULE TITLE	NQF LEVEL	CREDITS
900520-000-00-KM-05	Teamwork	4	3

6.3. Foundational Learning:

Components of foundational learning are included in Curriculum specifications

7. EXIT LEVEL OUTCOMES (ELO) AND ASSOCIATED ASSESSMENT CRITERIA (AAC)

7.1 Exit Level Outcomes (ELO) 1:

Research the impact green hydrogen technologies has on the environment

Associated Assessment Criteria (AAC) for ELO 1:

- Effects and benefits of green hydrogen technology are analysed
- The impact of using renewable energy sources versus fossil fuels to produce hydrogen is compared
- Geographical locations, best-suited energy sources and technologies for producing green hydrogen are analysed
- Research on green hydrogen technology advancements is conducted. Range: solid and liquid production waste disposal, cost reduction and increased energy efficiency, storage and transporting of hydrogen
- A comprehensive risk assessment of a hydrogen system is conducted

7.2 Exit Level Outcomes (ELO) 2:

Coordinate green hydrogen activities between technical and production teams to implement optimal green hydrogen solutions

Associated Assessment Criteria (AAC) for ELO 2:

- The principles of safe and efficient hydrogen infrastructure development are adhered to
- Technical drawings and blueprints for hydrogen infrastructure are analysed
- The teams and their roles in a hydrogen facility are identified
- Knowledge sharing between teams is collaborated
- The Regulatory Framework for Hydrogen Technology is identified

7.3 Exit Level Outcomes (ELO) 3:

Analyse and compare green hydrogen technologies for optimal performance

Associated Assessment Criteria (AAC) for ELO 3:

- Renewable energy system monitoring tools and technologies are used
- Efficiencies of different green hydrogen production technologies are compared
- Relevant green hydrogen technology information, findings and recommendations are communicated

8. INTEGRATED ASSESSMENT

8.1 Formative Assessments conducted internally

Formative assessments are conducted throughout the training. A range of formal, non-formal, and informal ongoing assessment activities are used to focus on teaching and learning outcomes to improve learner attainment.

Formative assessments are conducted continuously by the facilitator to feed into further learning, to identify strengths and weakness, and to ensure the learner's ability to apply the knowledge and skills gained.

Formative Assessments are conducted by the accredited Skills Development Provider (SDP), using a variety of ongoing assessment methods, for example, quizzes, assignments, tests, scenarios, role play, interviews.

Continuous feedback must be provided

8.2 Integrated Summative Assessments conducted Internally

Integrated Assessment involves all the different types of assessment tasks required for a particular skills programme, such as written assessment of theory and practical demonstration of competence. To achieve this, the Internal Assessment Criteria (IAC) for all modules as found in the QCTO curriculum document must be followed.

An accredited SDP should implement a well-designed, formal, relevant, final internal Summative Assessment strategy for all modules to prepare learner for the FISA. These assessments evaluate learning achievements relating to the achievement of each module of the relevant components of the skills programme.

Internal Summative Assessments are developed, moderated and conducted by the SDP at the end of each module or after integration of relevant modules, e.g. applied knowledge tests, workplace tasks, practical demonstrations, simulated tasks/demonstrations, projects and case studies.

8.3 De-centralised Final Integrated Supervised Assessment (FISA) for Skills Programmes

The FISA is de-centralised, and the assessment standards set by the QCTO must be implemented by the accredited SDP in the development, moderation, and implementation of all FISA for skills programmes.

The accredited SDP manages and conducts the FISA and submits learner results for QCTO approval for certification, according to QCTO required compliance standards.

For entrance into the FISA, the learner must have completed the skills programme successfully and be found competent in all modules, recorded internally by the SDP.

Continuous Assessment

The SDP must ensure that all learners are enrolled with the QCTO at the start of training (within 5 days) in the format required by the QCTO.

Continuous assessments are set by the SDP in accordance with the outcomes provided.

This may consist of a variety of methods, e.g. practical or written assessments, assignments, projects, demonstrations, presentations or any other form of assessment to assist the learner in the learning process.

During training, it is mandatory for formal summative assessments to take place at the end of each module/topic. These results must be formally recorded and be available for monitoring and/or evaluation by the QCTO.

Final Integrated Supervised Assessment (FISA)

All learners gain entrance to the Final Integrated Supervised Assessment by successfully completing all formal summative assessments conducted by the SDP.

Format of FISA:

A **practical and written assessment** integrating the relevant Exit Level Outcomes, with short answer theory assessments and simulated practical assessments.

All FISAs must be supervised, and virtual FISA's must be recorded, and camera monitored throughout the assessment.

All Exit Level Outcomes and associated assessment criteria must be covered in the FISA. In the FISA, the learner must demonstrate applied knowledge and skills to prove that the competencies of the Green Hydrogen Technology skills programme have been achieved.

Standards for Final Integrated Supervised Assessment (FISA):

The FISA INSTRUMENT (Written case study, scenario) must be developed and moderated by the SDP and conducted in a supervised environment. It is assessed by means of an **INSTRUMENT** and a **MEMORUNDUM** developed by the SDP for this purpose.

In the **Written Component**, learners must be given real-life scenarios in which they must demonstrate that they have applied knowledge for all the Exit Level Outcomes:

1. Research the impact green hydrogen technologies has on the environment

- Analyse the environmental effects and benefits of implementing green hydrogen technologies.
- Compare the environmental impacts of hydrogen production using renewable energy versus fossil fuels.
- Evaluate ideal geographical locations and renewable energy sources for green hydrogen production.
- Investigate advancements in green hydrogen technology related to waste disposal, cost efficiency, storage, and energy usage.
- Conduct and interpret a comprehensive risk assessment for hydrogen systems, considering environmental, safety, and operational factors.

2. Coordinate green hydrogen activities between technical and production teams to implement optimal green hydrogen solutions

- Outline the principles of safe and efficient infrastructure development in green hydrogen facilities.
- Interpret technical drawings and blueprints for green hydrogen systems.
- Apply knowledge on the structure of hydrogen production teams and describe each role in the facility.
- Apply knowledge of methods for effective collaboration and knowledge sharing among technical and production teams.
- Evaluate the regulatory framework and legal standards applicable to hydrogen technology in South Africa and globally.

3. Analyse and compare green hydrogen technologies for optimal performance

- Outline tools used to monitor renewable energy systems supporting hydrogen production.
- Compare the efficiency and performance of different green hydrogen production technologies.
- Summarise and document technical information, data, findings, and recommendations from green hydrogen evaluations clearly and accurately.

To respond to challenges/issues/problems in the scenarios above:

- a. The assessment should be a maximum of 100 marks.
- b. The assessment should be a maximum of 2 hours.
- b. The pass mark is 60% for the FISA.

- c. No FISA instrument is allowed to be used verbatim for re-assessment or for a different cohort of learners.

Learners who do not meet the pass mark will be allowed up to two re-assessment opportunities.

The memorandum used to assess these competencies must also include a section for the assessor/facilitator used in this session to make a note of competencies shown, (or not shown), as well as the questions that were asked, and a summary of the learner's answers, and state whether these are of the acceptable standard or not.

The memorandum or compliance checklist compiled should contain specific compulsory sections in order for the learner to pass the final assessment. Compulsory sections are when the safety of the candidate or others would be affected if incorrectly completed, [e.g. what to do in an emergency].

A computer-based assessment may be administered so that the above evidence can be created using document processing applications such as word, excel etc.

Learners who complete this skills programme will accumulate credits towards the relevant full or part qualification. The Credit Accumulation and Transfer (CAT) Policy may apply to these learners.

Standards for Practical Final Integrated Supervised Assessment (FISA):

In the **Practical Component**, the learner should be provided with a brief/job card/task to demonstrate what the learner should show, know or produce in a product, relevant to the Exit Level Outcomes and the purpose of the Skills Programme.

This is the section where the learner must show applied competency (what the learner must be able to do, and to what expected standard). The learner must prove that he/she can work competently in a simulated, controlled Green Hydrogen Technology environment.

1. Determine the impact green hydrogen technologies has on the environment

- Conduct a desktop or field-based environmental impact assessment for a green hydrogen project.
- Compare hydrogen production scenarios using renewable and fossil energy sources and present findings.
- Identify appropriate locations for green hydrogen production based on real-world data and site characteristics.
- Gather information on recent advancements in hydrogen production, focusing on waste management, energy efficiency, and cost and present the findings.
- Complete a written report including a risk assessment for a hydrogen system using the given case-study

2. Coordinate green hydrogen activities between technical and production teams to implement optimal green hydrogen solutions

- Interpret and explain provided technical blueprints on the hydrogen facility infrastructure

- Identify roles within a hydrogen production team in the case study and describe task coordination methods
- Participate in or simulate a collaborative knowledge-sharing activity between two teams
- Identify and explain key points from the regulatory framework relevant to a simulated hydrogen technology project
- Apply safety and efficiency principles in planning a basic hydrogen system layout

3. Analyse and compare green hydrogen technologies for optimal performance

- Operate or simulate the use of monitoring tools to assess the performance of a renewable energy system.
- Collect and compare performance data from at least two hydrogen production technologies.
- Present findings report outlining efficiency comparisons and suggesting optimal technologies for a defined context.
- Provide constructive feedback or recommendations to a simulated stakeholder group based on data analysis.

Please take note of the following:

- a. Candidates must have clear guidelines and instructions on completing the assessment tasks/job, including the assessment criteria and expected outcomes.
- b. The duration of the assessment is 4 hours.
- c. Candidates must be declared C/NYC.
- d. No FISA instrument is allowed to be used verbatim for re-assessment or for a different cohort of learners.

NOTE: Should a learner be found to be competent in all of the above areas, they should be declared “Competent”. If not yet competent in any of the above areas, they should be declared “NYC”, re-trained and then be re-assessed with different applicable tasks/scenarios.

The marking rubric/compliance checklist used to assess these competencies must include a section for the assessor/facilitator used in this session to make a note of competencies shown, (or not shown), as well as the questions that were asked, and a summary of the learner's answers, and state whether these are of the acceptable standard or not.

The marking rubric/compliance checklist compiled should contain specific areas marked with an asterisk (*) as compulsory sections in order for the learner to be declared C (Competent). Compulsory sections are when the safety of the candidate or others would be affected if incorrectly completed.

Learners who complete this skills programme will accumulate credits towards the relevant full or part qualification. The Credit Accumulation and Transfer (CAT) Policy may apply to these learners.

Submission of final results

Final results must be submitted to the QCTO in the required format, within 21 days of the date of the FISA, together with the following:

- Completed QA Verification Report on the FISA (QCTO template: relevant sections).

- A copy of the final Assessment Instrument used, as well as the marking guideline / rubric.
- Learner results spreadsheet

10. ARTICULATION

10.2 Articulation for Skills programmes

10.2.1 Work Opportunities:

Qualifying learners would be employable in the Green Hydrogen environment as Chemical Plant Operators, Electricians, Fitters, Process Technicians, Instrument Artisans, Production Planning

10.2.2 Learning Opportunities:

Qualified learners may further their studies by enrolling in other related skills programmes subject to meeting minimum entry requirements of such skills programmes such as

- Green Hydrogen Production, NQF Level 04, 29 Credits
- Green Hydrogen Storage and Transfer, NQF Level 05, 39 Credits

11. NOTES

11.1 Additional Legal or Physical Entry Requirements

None

11.2 Criteria for Accreditation

Curriculum Code:

900520-000-00-00

11.3 Encompassed Trades (where applicable)

None

12. ASSOCIATED QUALIFICATION(S)/PART-QUALIFICATION(S):

None