

BQA NCQF QUALIFICATION TEMPLATE

SECTION A: QUALIFICATION DETAILS													
QUALIFICATION DEVELOPER (S)			Botho University										
TITLE		Certificate V in Solar Energy Technology						NCQF LEVEL		5			
STRANDS (where applicable)		1. N/A 2. 3. 4.											
FIELD		Manufacturing, Engineering and Technology						CREDIT VALUE		152			
SUB FIELD		Engineering and Engineering Trades											
New Qualification		☒		Legacy Qualification		☐		Renewal Qualification		☐			
								Registration Code					
SUB-FRAMEWORK		General Education				☐		TVET		☒		Higher Education	
QUALIFICATION TYPE		Certificate	I	II	III	IV	V	☒	Diploma	Bachelor			
		Bachelor Honours			Post Graduate Certificate			Post Graduate Diploma					
		Masters						Doctorate/ PhD					
Qualifications Authority													
RATIONALE AND PURPOSE OF THE QUALIFICATION													
RATIONALE: Botswana seeks, among other development imperatives, to be an innovative, prosperous, and productive nation with a youth endowed with technical skills and competencies. Furthermore, through its Vision 2036, Botswana envisages a knowledge economy aligned with the global agenda for sustainable development. This qualification forms part of the foundation for realising the vision by providing the nation with competent solar technicians/artisans. This certificate combines several skills, including electrical installation, mechanical fitting, energy, and entrepreneurship. All these are named													

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by the Human Resources Development Council (HRDC) “Priority Skills 2023/2024 Consolidated List of Priority Occupations and Skills” document.

Occupation	Technical Skills	Soft Skills
Renewable Energy Technician	- Assemble, install, and maintain solar panel & PV system. - Configures PV systems and connect panels to the power grid. - Testing and calibrating operating voltages. 3D Modelling and Simulation	- Effective Communication - Planning & Execution - Customer Focus - Team Player
PV Solar Installer (Artisan)	- Basic electrical wiring, install gauges or controls. - Electrical schematic diagrams & solar radiation process - Safety, Health and Environment	- Effective Communication - Team Player - Agility

(Page 10 - **Priority Skills 2023/2024 Consolidated List of Priority Occupations and Skills**)

A detailed market survey has been conducted to establish the need to offer a Certificate V in Solar Energy Technology and determine the viability of the qualification in line with industrial and business trends. (Please refer to Appendix 1: Market Survey).

The global switch to renewable solar technology is positive, and graduates will benefit from the expected rising demand for suitably prepared entrance into the renewable energy space.

PURPOSE: (itemise exit level outcomes)

The purpose of this qualification is to produce graduates with broad technical knowledge, skills, and competence to:

1. Install, operate, and maintain solar photo-voltaic and solar thermal systems, ensuring adherence to industry standards and safety protocols.
2. Apply foundational engineering principles to design efficient and cost-effective solar energy solutions, considering environmental sustainability and resource optimisation.

3. Diagnose and troubleshoot solar PV and thermal system issues to ensure system reliability and performance.
4. Utilise appropriate tools and technologies for the simulation, testing, and optimisation of solar energy systems, enhancing overall system efficiency.
5. Communicate effectively with team members, clients, and stakeholders, using industry-specific terminology to convey technical information clearly and concisely.
6. Adopt a professional and ethical approach in all aspects of solar energy work, demonstrating a commitment to continuous learning, personal development, and adherence to professional standards.

MINIMUM ENTRY REQUIREMENTS (including access and inclusion)

Entry requirements:

- NCQF Level 4 or equivalent.
- Applicants with relevant work experience may be selected based on recognition of prior learning with reference to the institution's RPL policy which is aligned to the BQA national RPL policy.

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SECTION B QUALIFICATION SPECIFICATION	
GRADUATE PROFILE (LEARNING OUTCOMES)	ASSESSMENT CRITERIA
1. Use analytical and critical thinking skills to identify and solve problems related to solar PV and solar thermal technologies	- Identify relevant problems in solar PV and solar thermal technologies, demonstrating a strong understanding of underlying concepts. - Analyse problems using appropriate tools and methodologies. - Address any issues that arise with a problem-solving mindset.
2. Apply foundational scientific principles and engineering methods to design, install, and optimise solar PV and solar thermal systems using appropriate tools and techniques.	- Design, install, and maintain solar systems using relevant scientific principles (e.g., thermodynamics, electricity, and materials science). - Integrate engineering concepts (e.g., circuit design, fluid dynamics) into practical solutions for solar PV and solar thermal systems. - Develop technically sound designs for solar PV and solar thermal systems that meet performance, safety, and efficiency standards. - Install solar PV and thermal systems correctly, ensuring compliance with industry standards and regulations. - Utilize appropriate maintenance techniques and effectively troubleshoot issues in solar systems using foundational scientific and engineering knowledge. - Ensure all designs, installations, and maintenance practices adhere to relevant safety standards, codes, and regulations in the solar industry. - Use simulation software to analyse and predict solar PV and thermal system performance in varying conditions.
3. Develop innovative and effective designs for solar PV and solar thermal systems.	- Demonstrate originality and creativity in the design of solar PV and solar thermal systems, introducing novel approaches or improvements. - Design systems that maximise energy efficiency to optimise performance.

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	Develop designs that are reliable, durable and cost-effective.
4. Evaluate the performance and efficiency of solar PV and solar thermal systems and analyse data to make informed decisions and recommendations.	- Develop clear and methodical experimental plans to evaluate solar systems. - Conduct experiments systematically to test designs in adherence to established protocols and safety standards. - Gather precise and reliable data using appropriate instruments and techniques - Measure the performance and efficiency of solar systems. - Analyse experimental data, interpret results and identify trends or patterns. - Make informed decisions based on the analysis, considering the implications of the data for system performance efficiency, and improvements. - Provide well-founded recommendations based on data analysis. - Communicate findings through detailed reports.
5. Communicate effectively with stakeholders, using technical terminology appropriate to the field of solar energy technology.	- Deliver clear and concise oral presentations to stakeholders with varying levels of expertise. - Produce well-structured and coherent written reports, documents, and correspondence that accurately convey technical information. - Tailor communication style and content to the specific needs and understanding of different stakeholders. - Use visual aids, diagrams, and other documentation to enhance the understanding of technical concepts and data by stakeholders.
6. Evaluate the environmental and societal impact of solar PV and solar thermal technologies to minimize negative effects and promote sustainable solutions.	- Assess environmental impact of solar PV and solar thermal technologies. - Assess the societal implications of solar technologies, including their effects on communities, energy access, and social equity. - Apply sustainability principles in the design, installation, and maintenance of solar systems to minimize environmental impact and ensure long-term viability. - Conduct lifecycle assessments to determine the sustainability of solar technologies from production to disposal.

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	Develop and propose innovative solutions to minimize the environmental and societal impacts of solar technologies.
7. Collaborate with team members from diverse backgrounds to accomplish goals related to the installation, operation, and maintenance of solar PV and solar thermal systems.	- Work with members from diverse backgrounds to achieve common goals in solar system projects. - Adapt to challenges and changes by adjusting roles or approaches in multidisciplinary settings. - Utilise diverse expertise of team members to solve problems in the installation, operation, and maintenance of solar systems. - Manage and resolve conflicts within a team.
8. Adhere to ethical standards and professional codes of conduct in all aspects of work related to solar PV and solar thermal technologies.	- Demonstrate integrity and honesty by maintaining transparency and accuracy in all tasks related to solar technologies. - Assume responsibility for personal actions and decisions in the execution of solar energy projects and tasks. - Follow industry codes of conduct and regulatory guidelines in all aspects of solar PV and solar thermal work.
9. Maintain a safe and productive work environment by following established workplace practices and safety protocols.	- Adhere to safety procedures and regulations in the workplace. - Follow all safety protocols during installation, operation, and maintenance of solar PV and solar thermal systems. - Identify potential hazards and implement measures to minimize risks to self and others. - Utilizes all equipment and tools correctly and safely. - Select and correctly use necessary personal protective equipment, PPE for tasks related to solar energy system installation, operation, and maintenance. - Respond to emergencies by applying appropriate procedures during accidents or incidents related to solar energy systems. - Maintain clean and organised work areas to enhance efficiency and reduce accident risks.

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SECTION C	QUALIFICATION STRUCTURE				
COMPONENT	TITLE	Credits Per Relevant NCQF Level			Total Credits
		Level [3]	Level [4]	Level [5]	
FUNDAMENTAL COMPONENT Subjects/ Courses/ Modules/Units	Mathematical Principles for Solar Energy		4		4
	Energy Policy and Regulation		3		3
CORE COMPONENT Subjects/Courses/ Modules/Units	Applied Mathematics for Engineering			10	10
	Advanced Environmental and Sustainability Principles			4	4
	Electrical Fundamentals			12	12
	Solar Energy Fundamentals			7	7
	Engineering Design Principles			8	8
	Solar PV System Design and Installation			20	20
	Solar Thermal System Design and Installation			20	20
	Solar Energy System Design Project			9	9
	Health and Safety Practices in Solar Energy Technologies			8	8
	Effective Communication in			7	7

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	Solar Energy Applications				
	Project-Based Learning			20	20
	Internship/Work Placement			20	20
STRANDS/ SPECIALIZATION	Subjects/ Courses/ Modules/Units	Credits Per Relevant NCQF Level			Total Credits
		Level []	Level []	Level []	
1.					
2.					
Electives					

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SUMMARY OF CREDIT DISTRIBUTION FOR EACH COMPONENT PER NCQF LEVEL

TOTAL CREDITS PER NCQF LEVEL

NCQF Level	Credit Value
4	7
5	145
TOTAL CREDITS	152

Rules of Combination:

(Please Indicate combinations for the different constituent components of the qualification)

- Certificate in Solar Energy Technology qualification will have 152 credits.
- The credit combination for this qualification: 7 credits from fundamental components and 145 credits from core components.

Credit distribution.

Level and Credits	Compulsory	Elective
Level 4 Credits 20	7	N/A
Level 5 Credits 100	145	N/A
Minimum credits total:	152	---

The 152 credits are outside the recommended threshold for a Level 5 qualification because it was bench marked with the ECSA standard, which recommends a minimum of 140 credits and 10% above or below this threshold.

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ASSESSMENT ARRANGEMENTS

This qualification is assessed and moderated as follows:

Summative assessment: will carry a weight of 40% of the final grade.

Formative assessment: will carry 60% of the final grade.

Assessors and Moderators:

- All assessors and moderators should be qualified in renewable energy engineering.
- All assessors must be registered with Botswana Qualifications Authority, BQA.

MODERATION ARRANGEMENTS

Moderation:

- Internal and external moderation arrangements will be provided for quality assurance purposes.
- All moderators must be registered with the BQA.

RECOGNITION OF PRIOR LEARNING

There is provision for the award of credits towards the qualification through Recognition of Prior Learning, RPL in accordance with relevant institutional and national policies on RPL.

CREDIT ACCUMULATION AND TRANSFER

There is a provision for Credit Accumulation and Transfer. Candidates may apply for Credit Accumulation and Transfer, CAT, in accordance with relevant institutional and national policies on CAT.

PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)

Learning Pathway:

Vertical Articulation

- Diploma (NCQF level 6) in Solar Energy Technology, NCQF Level 6.

Horizontal Articulation

- Certificate V in Electrical Installation and Maintenance

Diagonal: Diploma in Electrical Installation and Maintenance, NCQF Level 6.

Employment Pathway

The graduates of this qualification will be competent enough to find employment in both public and private sectors as:

- Solar System Technician
- PV Technical Assistant
- Solar Commercial Installation Electrician
- Solar PV Sales Representative

QUALIFICATION AWARD AND CERTIFICATION

The learner will be awarded a 'Certificate in Solar Energy Technology' after attaining a minimum of 152 credits as specified in the rule of combination and credit distribution.

The learners will be awarded a certificate and transcript after meeting all requirements for the qualification award.

SUMMARY OF REGIONAL AND INTERNATIONAL COMPARABILITY

Benchmarking was conducted with the following qualifications:

- Applying Renewable Energy: Solar Technologies, offered by Energy Academy (RENAC) in Germany.
- Solar Thermal Technology, Monroe Community College's (MCC), United States of America
- City and Guilds- Installing and Testing Domestic Photovoltaic Systems. United Kingdom.

Similarities

- **The Renewable Energy Academy (RENAC)** in Germany offers an online qualification that covers a broad range of renewable energy topics, including PV and solar thermal, which align with components in the proposed qualification. Both qualifications feature similar assessment strategies, with a 60% emphasis on formative assessment and 40% on summative assessment and are offered at NCQF level 5. Additionally, they share comparable learning and employment pathways.

- **Monroe Community College (MCC)** offers a Solar Technology Certificate qualification that includes solar photovoltaic, solar thermal, installation, and maintenance components like those in the proposed qualification.
- **City and Guilds – Installing and Testing Domestic Photovoltaic Systems** provides photovoltaic training that aligns closely with the proposed qualification. Both qualifications are available at NCQF level 5.

Differences

- Renewable Energy Academy (RENAC) in Germany offers a six-month online qualification totalling 70 70hrs, which differs from the proposed qualification that combines theory and practice and includes 152 credits. The RENAC qualification has a distinct title and includes solar energy resource topics not part of the proposed qualification's exit-level outcomes.
- Monroe Community College (MCC) Solar Technology Certificate qualification has a different title from the proposed qualification and includes sales-related content not found in the proposed curriculum. The MCC qualification is also designed specifically for the U.S. market and has unique learning and employment pathways. The proposed qualification has 152 as opposed to 54 credit hours, an equivalence of 162 credits for the Solar Technology Certificate.
- City and Guilds – Installing and Testing Domestic Photovoltaic Systems focuses solely on domestic photovoltaic systems, covering modules different from the proposed qualification. It has a distinct title and carries 344 credits, compared to 152 credits in the proposed qualification. Its narrower scope leads to different learning and employment pathways.

Important qualification Attributes

- This qualification aligns closely with Monroe Community College's (MCC) Solar Technology Certificate qualification, which includes topics on Solar Photovoltaic, Solar Thermal, Installation, and Maintenance.
- Unique to this qualification are modules such as *Health and Safety Practices in Solar Energy Technologies*, *Effective Communication in Solar Energy Applications*, and *Internship/Work Placement*, which are not included in comparable qualifications.

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The proposed qualification aligns well with the competencies covered in international standards, with two key distinctions:

1. Most international qualifications treat Solar PV and Solar Thermal as separate credentials, while this qualification integrates both.
2. Many international qualifications require a full electrician qualification as a prerequisite for Solar PV training. In contrast, this qualification incorporates essential electrician skills directly into the curriculum.

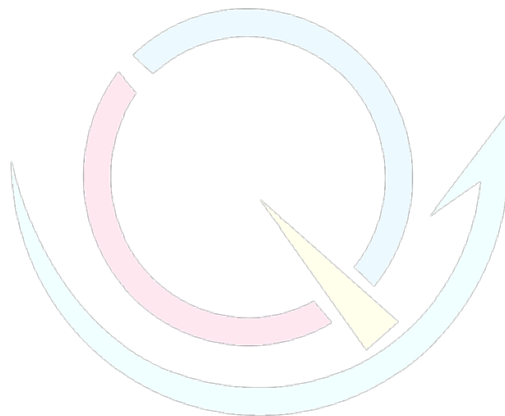
Additionally, the qualification emphasises the design of Solar PV and Solar Thermal systems, enhancing employment prospects and offering stronger articulation opportunities.

REVIEW PERIOD

The qualification will be renewed every five years.

For Official Use Only:

CODE (ID)			
REGISTRATION STATUS	BQA DECISION NO.	REGISTRATION START DATE	REGISTRATION END DATE
LAST DATE FOR ENROLMENT		LAST DATE FOR ACHIEVEMENT	



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