SECTION A:	***QUALIFICATION DETAILS***																	
QUALIFICATION DEVELOPER (S)	Construction Industry Trust Fund																	
TITLE	Certificate IV in Solar Water Heating Systems														***NCQF LEVEL***	*4*		
FIELD	Manufacturing, Engineering, and Technology		***SUB-FIELD***	Renewable Energy											***CREDIT VALUE***	*61*		
New Qualification		✓	*Review of Existing Qualification*															
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*												

RATIONALE AND PURPOSE OF THE QUALIFICATION

Rationale

Government has identified high unemployment and poverty amongst youth as a national security risk, hence the need to train this section of the population in productive and income generating skills.

Despite the country continuing to receive investments, these investments are biased towards capital intensive ventures. The above situation has the inherent risk of unemployment continuing being a challenge to the economy. The government, through its vital development policy paper, National Development Plan 11 (NDP 11), has identified areas of potential high employment uptake such as manufacturing, agriculture and services, and has thus made a commitment to give these sectors extensive support with a view to making meaningful contribution the growth of the economy.

Renewable Energy is an emerging sector that many countries are looking into to address their energy deficits. The sector provides opportunities to all members of society, young and old to harness the abundant sunshine to

provide alternative energy sources that are both cost effective and environmentally friendly. There are a lot of career opportunities in this sector and it is an area where education and innovation could be combined to bring out a commercially valuable products capable of positively contributing to the mainstream economy of the country.

Renewable Energy has also been forecasted as one of the top occupations in demand for the future (HRDC, 2019)

This qualification provides qualifying learners with the underlying Solar Water concepts, skills and values in order to become competent and semi-professional practitioners in the industry; be employed or self-employed and pursue further learning in specific areas of Renewable Energy.

PURPOSE:

The purpose of this qualification is to produce graduates with broad knowledge, cognitive and practical skills, and competencies to:

- Adhere to and comply with safety, health, environment, and risk management procedures.
- Apply fundamentals of energy efficiency in a solar thermal system in water heating.
- Demonstrate practical knowledge and skills to perform under minimum supervision in a Solar Water Heating industry.
- Identify solar water system components in different configurations.
- Interpret engineering drawings in Solar Water Heating.
- Install domestic and industrial Solar water heating system components.
- Test, commission, and maintain solar water systems of installed solar water system.
- Apply fundamentals of electrical and mechanical principles in Solar Water Heating

ENTRY REQUIREMENTS (including access and inclusion)

Minimum entry Requirements:

- Certificate III (NCQF Level 3) or equivalent.

- There will be access through Recognition of Prior Learning (RPL) and Credit Accumulation and Transfer (CAT) through institutional Policies in line with the National RPL and CAT Policies.

(Note: Please use Arial 11 font for completing the template)

SECTION B	***QUALIFICATION SPECIFICATION***
GRADUATE PROFILE (LEARNING OUTCOMES)	***ASSESSMENT CRITERIA***
LO 1. Apply principles of electricity in a solar water system.	1.1. Clarify the principles of electrical power, energy, and efficiency during a briefing. 1.2. Interpret electrical circuit diagrams according to industry specifications. 1.3. Use electrical test instruments appliances for safety according to industry specifications. 1.4. Shut down and isolate electrical machines
LO 2. Demonstrate broad knowledge of Solar Water Systems using the principles of Solar Energy.	2.1. Illustrate the principles of renewable energy concepts and technologies. 2.2 Categorise various solar energy technologies and their applications during installation of solar water systems. 2.3 Practice principles of solar energy conversion during installation of solar water systems. 2.4 Apply Methods of solar energy optimization.
LO 3. Apply principles of solar water system to identify components in solar water system.	3.1 Determine solar thermal system types and their applications in the solar water heating systems. 3.2 Operate Solar Water heating systems after installation during inspection. 3.3 Check function and operation of components of a solar water system. 3.4 Determine possible configuration of solar water heating system
LO 4. Develop and mount the structure and components of solar water system according to industry specifications	4.1. Identify the risks associated with solar water heating system installation, operation, and maintenance. 4.2. Complete installation check list according to industry specifications 4.3. Install Solar water system components according to industry specifications. 4.4. Carry out the procedure for battery installation and connection of the charge controller.
LO 5. Test, pre-commission, and maintain a solar water system.	5.1 Perform the flushing process to remove dirt and residual flux from the solar circuit. 5.2 Conduct a pressure test after flushing to detect leaks is the system.

	5.3 Fill the system with solar liquid. 5.4 Adjust pump and controller pressures according to industry specifications. 5.5 Conduct visual inspection to check the collectors and the solar circuit for changes. 5.6 Check the frost protection of antifreeze fluids with a hydrometer or refractometer. 5.7 Establish the pH value of the heat exchanger fluid to ensure the corrosion protection. 5.8 Check the pressure, temperature, and controller setting, monitor system parameters. 5.9 Fill the heat exchange fluid according to the specification of the standard.
LO 6. Perform Solar Home System Sizing to determine the size of a solar water heating system.	6.1 Determine size of pipes to use for installation of a geyser in a building. 6.2 Calculate the pump size of the system to select the appropriate pump. 6.3 Establish size of Solar Panel suitable for the Home system. 6.5 Determine geyser capacity for the home system.
LO 7. Apply principles of Occupational Health and Safety in the Work Environment	7.1 Identify hazards in the Workplace. 7.2 Asses possible risks in the workplace. 7.3 Practice Good Housekeeping. 7.4 Wear Appropriate Personal Protective Equipment.
8.0 Demonstrate broad knowledge of Entrepreneurial principles in the workplace	8.1 Plan for given work assignments. 8.2 Solve problems creatively in the workplace. 8.3 Mobilise people and resources to execute tasks. 8.4 Create value through innovative ideas.

(Note: Please use Arial 11 font for completing the template)

SECTION C	***QUALIFICATION STRUCTURE***				
COMPONENT	***TITLE***	***Credits Per Relevant NCQF Level***			***Total*** ***(Per** Subject/ Course/ Module/ Units)*
		Level [4]	***Level [5]***	***Level [ ]***	
FUNDAMENTAL COMPONENT *Subjects/ Courses/ Modules/Units*	Safety, health and environmental protection	2			2
	Safety rules and regulations in plumbing operations	2			2
	Engineering drawings in Solar Water Heating	2			2
	Solar thermal system dimensioning		2		2
	Domestic low pressure, high pressure and non-pressurised systems	2			2
	Draw and explain basic electrical circuit diagrams	2			2
	Working at Heights	2			2
	Fundamental entrepreneurial principles	3			3
CORE COMPONENT	Basic electrical and mechanical principles				2

Subjects/Courses/ Modules/Units	Pipe fitting principles in a Solar Water Heating System.	2			2
	Solar thermal system types and applications	5			5
	Materials used in solar water heating	3			3
	Solar water heating systems components		2		2
	Supporting structures for a Solar Water Heating system	2			2
	Installation of a solar water system	12			12
	Solar water system Maintenance	3			3
	Solar water heating systems installation tools and equipment	3			3
	Troubleshooting for Solar Water Heating system	3			3
	Handling, care, and storage of Solar Water Heating System	2			2
	Pressure Ratings in a Solar Water Heating System		2		2

ELECTIVE/ OPTIONAL COMPONENT *Subjects/Courses/ Modules/Units*	Cost a solar water heating system for a client		3		3
	Fundamentals of Welding and Fabrication	3			3
	Scaffolding - Erection and Dismantlement	3			3

(Note: Please use Arial 11 font for completing the template)

SUMMARY OF CREDIT DISTRIBUTION FOR EACH COMPONENT PER NCQF LEVEL	
TOTAL CREDITS PER NCQF LEVEL	
NCQF Level	***Credit Value***
Level 4	***51***
Level 5	***10***
TOTAL CREDITS	***61***

Rules of Combination:

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

The qualification consists of Fundamental, Core and elective Components.

To be awarded the Qualification learners are required to obtain a minimum of 61 credits as detailed below.

Fundamental Components:

The Fundamental components consist of foundational knowledge in Solar Water Heating to the value of 17 credits all of which are compulsory.

Core Components:

The core components consist of modules containing applied knowledge and practical skills to the value of 41 credits which are compulsory.

Elective Components:

Learners are to choose elective unit standard to the value of at least 3 credits to attain a minimum of 61 credits for the qualification.

(Note: Please use Arial 11 font for completing the template)

ASSESSMENT ARRANGEMENTS

Assessment
All assessments leading to the awarding of this qualification will be based on learning outcomes associated with the following assessment criteria:

1. **Formative assessment**

The weighting of formative assessment is 60% of the final assessment mark.

2. **Summative Assessment**

The weighting of summative assessment is 40% of the final mark.

Assessment arrangements will be done by BQA registered and accredited assessors.

MODERATION ARRANGEMENTS

There shall be provision for internal and external moderation done by BQA registered and accredited Moderators.

RECOGNITION OF PRIOR LEARNING

There will be provision Recognition of Prior Learning (RPL) for award of the qualification through the use of ETP RPL Policy in line with the National RPL Policy.

CREDIT ACCUMULATION AND TRANSFER

There shall be access and award of credits of the qualification using Institutional Credit Accumulation and Transfer (CAT) Policy in line with the National CAT Policy.

PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)

Articulation and Education Pathways

Horizontal Articulation:

Graduates of this qualification may consider pursuing to other programmes on the same levels in the field of Renewable Energy such as

- Certificate IV in Solar Photovoltaic
- Certificate IV in Plumbing and Pipefitting

Vertical Articulation:

Learners may progress to higher level in the same field such as

- Certificate V in Solar Water Heating Systems
- Certificate V in Renewable Energy Systems

Employment Pathways:

Learners who attain this qualification will have competencies and attributes to work as:

- Solar Heating System Installers
- Solar Panel Installers

QUALIFICATION AWARD AND CERTIFICATION

Qualification award:

The candidate must have met the following requirements:

- All exit level outcomes
- Minimum 61 credits requirements

Certification:

Upon completion of the qualification, the candidate will be awarded a
CERTIFICATE IV IN SOLAR WATER HEATING SYSTEMS

REGIONAL AND INTERNATIONAL COMPARABILITY

Benchmarking has been done against qualifications registered in neighbouring countries within the region like South Africa and Internationally to appreciate what is typical of this level and type of qualification out there, in relation to graduate profiling, scope and depth of content, to ascertain regional and international comparability and articulation of the proposed qualification. It has been compared to the following:

- Tjeka Training Matters -South Africa National Certificate: National Certificate: Hot Water System Installation.
- Jomo Kenyatta University of Agriculture and Technology, Kenya: Solar Water Heating Training.
- Young Africa Namibia, Namibia Solar Technology.
- City and Guilds of London, United Kingdom: Installation and Maintenance of Solar Thermal Hot Water Systems.

- Solar Energy International, United States of America Solar Thermal Training – Solar Hot Water Design and Installation. Southern Institute of Technology, New Zealand National Certificate in Solar Water Heating Installation.

i) Tjeka Training Matters in South Africa has the same qualification in (NQF Level 2) worth 122 Credits which produces candidates with competence to be Installers of Solar Water Heating Systems

ii) The Jomo Kenyatta University of Agriculture and Technology in Kenya offers a Solar Water Training qualification specifically developed to meet the licensing requirements for SWH Technicians.

iii) Young Africa Namibia in Namibia offers a Solar Technology Certificate Program, specifically designed for those already working in the skilled trades, particularly the HVAC and Plumbing fields, and learners are expected to install and maintain solar thermal systems on residential and small commercial buildings.

iv) The City and Guilds of London qualification, Level 3 Installation and Maintenance of Solar Thermal Hot Water Systems, include the following subjects/topics: understanding the fundamental principles and requirements of environmental technologies, as well as Solar PV, Solar Thermal, Biomass, Heat Pumps and Rainwater harvesting technologies.

v) The Solar Energy International in the United States of America has Certificate qualification called Solar Thermal Training – Solar Hot Water Design and Installation which is based on standards set by NABCEP (North American Board of Certified Energy Practitioners)

vi) The Level 5 National Certificate in Solar Water Heating Installation offered by the Southern Institute of Technology in New Zealand is for registered plumbers wishing to gain competence in the specialist field of solar installation and design and management of solar installation. The content and structure have been developed to encourage good practice installation and management of solar system installation.

Conclusion:

The proposed qualification generally compares well with the qualification studied since the exit outcomes cover similar scope and depth and are aligned to exit-level descriptors typical of this level and as done within the region and beyond as well as competencies required for certification and recognition as professional installers. However, what sets it apart from the qualifications examined is that there is provision for development of attributes such as effective communication and mathematical literacy, which are critical for basic entrepreneurship.

What is also distinct about this qualification is that it does not have the design aspect which most of the qualifications studied, such as the ones from the United States and Kenya, have the design component making up part of their qualifications.

REVIEW PERIOD
Every five (5) years.

(Note: Please use Arial 11 font for completing the template)