THE NATIONAL COUNCIL FOR TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING

OCCUPATIONAL STANDARDS

OCCUPATION: RENEWABLE ENERGY ENGINEER (SOLAR)

LEVEL: NTA LEVEL 7

FEBRUARY 2024

TABLE OF CONTENTS

ABBREVIATIONS

BAPV	Building Attached Photovoltaic
BIPV	Building Integrated Photovoltaic
BMS	Battery Management System
BOS	Balance of System-
CBET	Competency Based Education and Training
CVT	Constant Voltage T-packaging
EMS	Energy Management System
IEA	International Energy Agency
IRENA	International Renewable Energy Agency
NACTVET	National Council for Technical and Vocational Education and Training
NOS	National Occupational Standards
OS	Occupational Standards
PCS	Power Conversion System
PR	Performance Ratio
PVPS	PV Power Station
SC	Storage Capacitor
TET	Technical Education and Training

TVET	Technical and Vocational Education and Training
VSG	Virtual Synchronous Generator

GLOSSARY OF TERMS

Circumstantial Knowledge:	Detailed knowledge, which allows the decision-making in regard to different circumstances and cross cutting issues.
Competence:	The ability to use knowledge, understanding, practical, and thinking skills to perform effectively to the workplace standards required in employment.
Competency:	A description of the ability one possesses when able to perform a given occupational task effectively and efficiently.
Competency-based Education:	An instructional programme that derives its content from validated tasks and bases assessment on the learner's performance.
Curriculum:	A description or composite of statements about "what is to be learned" by the trainee/student in a particular instructional programme; a product that states the "intended learning outcomes".
Educational/Training Programme:	The complete curriculum and instruction (what and how) that is designed to prepare a person for employment in a job or other particular performance situation.
Occupation:	A specific position requiring the performance of specific tasks - essentially the same tasks are performed by all employees having the same title.
Occupational Area:	Extensive grouping of related work, such as PV module installation.
Occupational Standards:	Specific requirements of competences for personnel in a particular occupational area, including knowledge and relevant attitudes. They also act as performance tools of assessment of the prescribed outcomes.
Occupational/Job Analysis:	A process used to identify the tasks that are important to employees in any given occupation.
Performance Criteria:	Indicate expected end results or outcomes in the form of evaluative statements.
Skills:	The ability to perform occupational tasks with a high degree of proficiency within a given occupation. Skill is conceived of as a

	composite of three completely interdependent components: cognitive, affective, and psychomotor.
Standards:	A set of statements, which, if proved true under working conditions, means that an individual is meeting an expected level and type of performance.
Task Analysis:	The process of analyzing each task to determine the steps, circumstantial knowledge, attitudes, performance criteria, tools and materials needed, as well as safety concerns required for the employees performing it.
Task:	A work activity that has a definite beginning and ending, is observable or measurable, consists of two or more definite steps, and leads to products, service, or decisions.
Underpinning Knowledge:	Crucial knowledge that an individual must acquire in order to demonstrate competences that are associated in performing a given task.
Verification Process:	The process of having experts review and confirm the importance of the task (competency) statements identified through occupational analysis. Other questions, such as the degree of task learning difficulty are also frequently asked. This process is also sometimes referred to as validation.
Occupational Competence:	The application of knowledge and skills that consistently meet the standards required by the working conditions.

1.0. INTRODUCTION

Technical Education and Training (TET) is one of the most important education sub-sectors in Tanzania, responsible for developing a skilled workforce to support the country's industrialization economic agenda. Tanzania's *Development Vision 2025* intends to raise the country's economy to a middle-income status, with a high level of human development. This requires a skilled workforce that is aligned with the needs of the public and private sectors of the economy. The National Council for Technical and Vocational Education and Training (NACTVET) has begun the job of drafting Occupational Standards (OS) that will eventually be adopted as National Occupational Standards (NOS) for use in the delivery of TET that meets the needs of the labour market and the country's economic agenda.

Occupational Standards (OS) are performance criteria that are matched with labour market demands. Each of them describes the functions, performance standards, and understanding or knowledge underpinning a given occupation. They combine skills, knowledge, and attitudes to describe best practice. They are useful tools for establishing job roles, personnel recruitment, supervision, and appraisal, as well as TET Standards. They are also helpful for benchmarking and harmonizing job qualifications on a national and international level. Standards, in general, provide a solid framework for high-quality TET that is labour market-relevant, current, and consistent in application across all public and private institutions.

However, it must be noted that Occupational Standards are different from Training /Education Standards. Occupational standards are defined in terms of activities performed by a person in a selected occupation (e.g., an electrical engineer designs electrical circuits, performs troubleshooting in electrical circuits, etc.), and are usually defined by Employers following procedures as agreed upon by all the stakeholders. On the other hand, Training and Education Standards are developed from the activities defined in the occupational standards, and they specify learning objectives to ensure that the necessary skills and knowledge are developed by a person to enable him/her to function at an agreed level in an occupation. Training and Education Standards are used to define curricula in training institutions. It is critical, however, to establish a direct link between the occupational standards and the training standards for both of them to respond collaboratively to the demands of the labour market.

For the purpose of TET delivery, Tanzania has adopted the Competence Based Education and Training (CBET) approach. The CBET approach focuses on providing learners with the skills and knowledge required to meet the occupational standards. Occupational standards are thus the starting point for developing competency-based training (CBET) programmes. Therefore, it is quite pertinent for TET institutions to use the relevant occupational standards as a benchmark for formulating their curricula.

Occupational Standards are developed based on a given occupation's current and future demands. As a result, they serve as a means of bridging the gap between the worlds of employment and technical education and training.

The document explains how the occupational standards were developed, as well as the scope, the occupational profile in the form of DACUM charts, and the Occupational Standards.

2.0. OCCUPATIONAL STANDARDS DEVELOPMENT PROCESS

The process of developing these Occupational Standards involved both local and international expertise. The process began with an examination of major documents that guide Tanzanian skills development including the *10-year National Skills Development Strategy (2016-2026).* NACTVET labour market reports were also used in the literature review to determine the skills demand in the Tanzanian labour market as a whole.

After the literature review, a team of experts in consultation with practitioners developed draft occupational standards. The draft document was used to develop an occupational profile for each occupation (DACUM Chart), which is attached as an **Appendix** to every Occupational Standard.

The occupational standards were validated during the stakeholders' forum held on 22nd and 23rd February 2024 at Morogoro. The information from the stakeholders' forum provides insight from the workplaces, professional bodies, regulatory bodies and sector ministries regarding trends and changes in the profession, including how well graduates are prepared for working in the occupation.

3.0. THE SCOPE AND OVERVIEW OF THE OCCUPATION STANDARDS FOR RENEWABLE ENERGY ENGINEER (SOLAR)

The standards cover a broad range of duties and tasks that can be performed by a Renewable Energy Engineer (Solar). However, the occupational standards are not meant to replace individual job descriptions. Instead, they are to be used for guidance in defining skill levels and knowledge for the

technician in specific settings or positions. The Renewable Energy engineer (Solar) may perform tasks in a number of key areas of the Occupational Standards, but not necessarily in all areas. For example, in large operations, other individuals may be employed or designated to perform specific tasks.

The Renewable Energy engineer (Solar) refers to the personnel engaged in the design, installation, trouble shooting and maintenance of solar photovoltaic energy system. Generally, the Renewable Energy engineer (Solar) performs the following responsibilities:

a) Solar potential assessment

b) Load profile assessment

c) Grid connection

d) Solar on grid and off-connection

e) Carbon financing calculations

f) Economic and financial analysis

g) Solar PV system standards and reputable supplier

h) Designing of solar photovoltaic energy system

i) Installation and debugging of solar photovoltaic energy system with tools

j) Inspection and resolution of faults of solar photovoltaic energy system

k) Diagnosis on components of solar photovoltaic energy system with professional computer softwares

l) Interpretation and analysis of results and data

m) Provision of technical advice and answering of customers' questions

n) Procurement of solar photovoltaic energy system and selection of best materials for utilization

o) Management of PV power stations

p) Operation and maintenance of PV power stations

q) Analysis of economized operation of PV power stations

r) Writing of reports and documents

s) Relevant researches

t) Guidance and training

u) Technical exchange

v) Supervision on subordinates

The Occupational Standards have been clustered into NTA qualification levels, i.e. NTA 7 and 8.

4.0. VALIDITY PERIOD

Due to the rapid development of technology, the validity period of occupational standards is 3-5 years. The review will proceed in the same manner as the one before it, with new occupational standards being developed based on current trends of the labour market.

5.0. OCCUPATIONAL STANDARDS

5.1 OCCUPATIONAL STANDARDS FOR RENEWABLE ENERGY ENGINEER (SOLAR) – NTA LEVEL 7

<table>
<tr><td>OCCUPATION</td><td>RENEWABLE ENERGY ENGINEER (SOLAR)</td><td>OCCUPATION CODE</td><td></td></tr>
<tr><td>DUTY TITLE</td><td>INTERPRET DRAWINGS AND DETERMINE THE COST OF MATERIALS FOR THE ENERGY STORAGE SYSTEMS</td><td>DUTY NO.</td><td>701</td></tr>
<tr><td>TASK TITLE</td><td>INTERPRET THE CONSTRUCTION DRAWINGS OF ENERGY STORAGE SYSTEMS</td><td>TASK NO.</td><td>7011</td></tr>
<tr><td>PERFORMANCE CRITERIA</td><td colspan="3">The person performing this task must be able to interpret the construction drawings of energy storage systems according to the technical drawing interpretation skills and industry standards.</td></tr>
<tr><td>RANGE STATEMENT</td><td colspan="3">The task can be performed in the office or in the construction site under the supervision of senior renewable energy engineers. The tools and equipment to be used include:
1. Computer set;
2. Relevant softwares;
3. Construction drawings of energy storage systems.
4. Safety gear</td></tr>
<tr><td colspan="4">EVIDENCE REQUIREMENT</td></tr>
<tr><td colspan="2">PRACTICAL PERFORMANCE</td><td colspan="2">UNDERPINNING KNOWLEDGE</td></tr>
<tr><td colspan="2">The person performing this task must be able to do the following:
1. Analyze the construction project overview of energy storage power stations;
2. Analyze the economic and technical indexes of energy storage power stations;
3. Analyze the construction standards of energy storage power stations;
4. Analyze the construction area, the main floor, the fire resistance class of the building, the fire resistance limit of the material, etc. of energy storage power stations;
5. Select power generation equipment for energy storage power stations;</td><td colspan="2">Detailed knowledge about:
1.0 Methods
The person performing this task must be able to explain how to:
1.1 Read construction drawings of energy storage systems.
1.2 Determine the required materials, construction area, construction standards, etc.

2.0 Principle
The person performing this task must be able to explain the following principles:
2.1 Technical standards for drawing construction drawings of energy storage power stations;</td></tr>
</table>

6. Select the capacity of generator set of energy storage power stations; 7. Write interpretation reports of construction drawings of energy storage power stations. 8. Observe health, occupational and environmental safety rules and regulations.	2.2 Construction standards for energy storage power stations. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 System composition of energy storage power stations; 3.2 Knowledge of reading the system composition of energy storage power stations, including but not limited to graphic symbol reading, construction material legend reading, construction structure legend reading, meaning reading of building components' codes, and reading of other codes of professional drawings; 3.3 System composition, working principle, function of each component and knowledge about type selection. **4.0 Essential Skills** 4.1 Report writing skills; 4.2 Communication skills; 4.3 Computer application skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The construction drawings of energy storage systems are interpreted according to the technical drawing interpretation skills and industry standards.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Relevant national and local government regulations and policies; 2. Occupational health and safety.

OCCUPATION	RENEWABLE ENERGY ENGINEER (SOLAR)	**OCCUPATION CODE**	
DUTY TITLE	INTERPRET DRAWINGS AND DETERMINE THE COST OF MATERIALS FOR THE ENERGY STORAGE SYSTEMS	**DUTY NO.**	701
TASK TITLE	INTERPRET CONSTRUCTION DRAWINGS OF SOLAR PHOTOVOLTAIC SYSTEMS	**TASK NO.**	7012
PERFORMANCE CRITERIA	The person performing this task must be able to interpret the construction drawings of Solar-photovoltaic systems according to the technical drawing interpretation skills and industrial standards.		
RANGE STATEMENT	The task can be performed in the office or in the construction site under the supervision of senior renewable energy engineers. The tools and equipment to be used include: 1. Computer set; 2. Relevant softwares; 3. Construction drawings of Solar-photovoltaic energy storage systems. 4. Safety gear		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Analyze the construction project overview of Solar-photovoltaic energy storage for; 2. Analyze the economic and technical indexes of Solar-photovoltaic energy storage for; 3. Analyze the construction standards of Solar-photovoltaic energy storage for; 4. Analyze the construction area, the main floor, the fire resistance class of the building, the fire resistance limit of the material, etc. of Solar-photovoltaic energy storage for; 5. Select power generation equipment for Solar-photovoltaic energy storage for;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Read construction drawings of Solar-photovoltaic energy storage for; 1.2 Determine the required materials, construction area, construction standards, etc. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Technical standards for drawing construction drawings of Solar-photovoltaic energy storage for; 2.2 Construction standards for Solar-photovoltaic energy storage for. **3.0 Theories** The person performing this task must be able to explain

6. Select the capacity of generator set of Solar-photovoltaic energy storage for; 7. Write interpretation reports of construction drawings of Solar-photovoltaic energy storage for. 8. Observe health, occupational and environmental safety rules and regulations.	the following: 3.1 System composition of Solar-photovoltaic energy storage for; 3.2 Knowledge of reading the system composition of Solar-photovoltaic energy storage for, including but not limited to graphic symbol reading, construction material legend reading, construction structure legend reading, meaning reading of building components' codes, and reading of other codes of professional drawings; 3.3 System composition, working principle, function of each component and knowledge about type selection. **4.0 Essential Skills** 4.1 Report writing skills; 4.2 Communication skills; 4.3 Computer application skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The construction drawings of Solar-photovoltaic systems interpreted according to the technical drawings interpretation skills and industry standards.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Relevant local laws, regulations and policies; 2. Occupational health and safety.

OCCUPATION	RENEWABLE ENERGY ENGINEER (SOLAR)	**OCCUPATION CODE**	
DUTY TITLE	INTERPRET DRAWINGS AND DETERMINE THE COST OF MATERIALS FOR THE ENERGY STORAGE SYSTEM	**DUTY NO.**	701
TASK TITLE	DETERMINE THE COST OF MATERIALS USED FOR ENERGY STORAGE SYSTEMS	**TASK NO.**	7013
PERFORMANCE CRITERIA	The person performing this task must be able to estimate the cost of materials used for energy storage systems according to engineering drawings of Solar-photovoltaic energy storage for energy storage systems.		
RANGE STATEMENT	The task can be performed in the office or in the construction site under the supervision of senior renewable energy engineers. The tools and equipment to be used include: 1. Computer set; 2. Relevant software's; 3. Energy Storage System drawings; 4. Material analysis reports on the systems of energy storage systems; 5. Market analysis report of required materials. 6. Safety gear		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Use the construction drawings of energy storage power stations to analyze the material attributes, market conditions, procurement bottlenecks, procurement prices, utilization costs, material losses, etc. of materials required for the project; 2. Determine the boundaries of various expenses; 3. Implement relevant laws and regulations, and handle the expenses according to the scopes of cost expenses; 4. Do the basic tasks of material calculation, including but not limited to establishing and perfecting the	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 According to the construction drawings of energy storage power stations, determine the construction materials, floor area and construction quantities, and the number of commonly-used components; 1.2 Complete the preparation of procurement plan according to the construction drawings of energy storage power stations; 1.3 Complete material calculation reports according to the construction drawings of energy storage power stations. **2.0 Principle** The person performing this task must be able to explain

original vouchers, original records, and reasonable voucher transmission process of material calculation; formulating working hours and the consumption quota of materials; strengthening the quota management; establishing the measurement, acceptance, distribution and inventory system of materials; formulating internal settlement price and internal settlement system, among other tasks; 5. Choose appropriate calculation methods for materials, including variety method, batch method, step-by-step method, classification method, quota method, etc.; 6. Calculate the material demand according to the production task, construction progress and construction drawings of the energy storage power stations, and prepare the procurement plan according to the material names, specifications, models, quantity and quality. 7. Observe health, occupational and environmental safety rules and regulations.	the following principles: 2.1 Market-oriented principle of procurement plan; 2.2 Systematic principle of procurement plan; 2.3 The principle of appropriate quality of procurement plan; 2.4 The principle of appropriate price of procurement plan; 2.5 Principle of legality; 2.6 Principle of relevance; 2.7 Principle of reliability; 2.8 Principle of installment calculation; 2.9 Principle of accrual basis; 2.10 Principle of actual cost pricing; 2.11 Principle of consistency; 2.12 Principle of importance. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Market dynamic condition of related materials; 3.2 Cost-benefit analysis of material calculation. **4.0 Essential Skills** 4.1 Report writing skills; 4.2 Communication skills; 4.3 Computer application skills; 4.4 Market analysis skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The cost of materials used for Solar-photovoltaic energy systems is determined according to engineering drawings of energy storage power stations.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Relevant local laws, regulations and policies; 2. Occupational health and safety; 3. Research on industry market dynamic status; 4. Investment and benefit analysis.

OCCUPATION	RENEWABLE ENERGY ENGINEER (SOLAR)	**OCCUPATION CODE**	
DUTY TITLE	INTERPRET DRAWINGS AND ESTIMATE THE COST OF MATERIALS FOR THE ENERGY STORAGE SYSTEMS	**DUTY NO.**	701
TASK TITLE	DETERMINE THE COST OF MATERIALS USED FOR SOLAR-PHOTOVOLTAIC-STORAGE MICRO GRIDS	**TASK NO.**	7014
PERFORMANCE CRITERIA	The person performing this task must be able to determine the cost of materials used for solar photovoltaic storage micro grids according to engineering drawings of Solar-photovoltaic energy storage systems.		
RANGE STATEMENT	The task can be performed in the office or in the construction site under the supervision of senior renewable energy ENGINEERs. The tools and equipment to be used include: 1. Computer set; 2. Relevant softwares; 3. System drawings of Solar-photovoltaic-storage micro grids; 4. Report on materials required for Solar-photovoltaic-storage micro grids; 5. Market price analysis report of required materials. 6. Safety gear		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Determine the construction materials, floor area and construction quantities, the number of commonly-used components, and complete the preparation of procurement plans according to the construction drawings of Solar-photovoltaic energy storage systems. 2. Determine the boundaries of various expenses; 3. Implement relevant laws and regulations, and handle the expenses according to the scopes of cost expenses;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Use the construction drawings of Solar-photovoltaic energy storage for to analyze the materials, building area, engineering quantity and the number of commonly-used components required for the project; **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Market-oriented principle of procurement plan; 2.2 Systematic principle of procurement plan;

4. Do the basic tasks of material calculation, including but not limited to establishing and perfecting the original vouchers, original records, and reasonable voucher transmission process of material calculation; formulating working hours and the consumption quota of materials; strengthening the quota management; establishing the measurement, acceptance, distribution and inventory system of materials; formulating internal settlement price and internal settlement system, among other tasks; 5. Choose appropriate calculation methods for materials, including variety method, batch method, step-by-step method, classification method, quota method, etc.; 6. Complete material calculation reports according to the construction drawings of Solar-photovoltaic energy storage for. 7. Observe health, occupational and environmental safety rules and regulations.	2.3 The principle of appropriate quality of procurement plan; 2.4 The principle of appropriate price of procurement plan; 2.5 Principle of legality; 2.6 Principle of relevance; 2.7 Principle of reliability; 2.8 Principle of installment calculation; 2.9 Principle of accrual basis; 2.10 Principle of actual cost pricing; 2.11 Principle of consistency; 2.12 Principle of importance. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Market dynamic condition of related materials; 3.2 Cost-benefit analysis of material calculation. **4.0 Essential Skills** 4.1 Report writing skills; 4.2 Communication skills; 4.3 Computer application skills; 4.4 Market analysis skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The cost of materials used for wind-photovoltaic energy storage power stations is determined according to engineering drawings of Solar-photovoltaic energy storage systems.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Relevant national and local government regulations and policies; 2. Occupational health and safety; 3. Research on industry market dynamic status; 4. Investment and benefit analysis.

OCCUPATION	RENEWABLE ENERGY ENGINEER (SOLAR)	**OCCUPATION CODE**	
DUTY TITLE	INTERPRET DRAWINGS AND ESTIMATE THE COST OF MATERIALS FOR THE ENERGY STORAGE SYSTEMS	**DUTY NO.**	701
TASK TITLE	PREPARE TECHNICAL SCHEMES FOR THE CONSTRUCTION OF ENERGY STORAGE SYSTEMS	**TASK NO.**	7015
PERFORMANCE CRITERIA	The person performing this task must be able to prepare technical schemes for the construction of energy storage systems according to construction drawings of energy storage Systems.		
RANGE STATEMENT	The task can be performed in the office under the supervision of senior renewable energy Engineers. On-site inspection is required when necessary. The tools and equipment to be used include: 1. Material analysis reports of energy storage systems; 2. Reports on construction area of energy storage systems; 3. Lists of construction quantities of energy storage system; 4. Reports on the quantities of components of energy storage systems; 5. Computer set; 6. Relevant Softwares; 7. Construction drawings; 8. Geological reports of construction sites; 9. Project contracts. 10. Safety gear		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Determine project overview of construction projects according to reports on construction area of energy storage power stations, lists of construction quantities of energy storage System and project contracts, the overview including field conditions, construction periods, main physical quantities and main technical parameters; 2. Determine preparation principles according to the specific content and characteristics of projects, mainly	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Prepare the project overview; 1.2 Prepare principles for the preparation of technical schemes; 1.3 Prepare construction procedures; 1.4 Prepare construction methods; 1.5 Prepare construction schedule plans; 1.6 Prepare resource allocation plans; 1.7 Prepare safety technical measures. 1.8 Prepare quality control measures;

including the current effective specifications and standards; 3. Determine the logical relationship between construction procedures, such as sequence, parallelism and intersection; 4. According to the construction drawings, determine construction methods, including the key points of process operation, selection of machines and tools, inspection methods and requirements, and clarify the technical requirements and quality standards; 5. Reasonably arrange the construction schedule according to the construction period; 6. Prepare the resource allocation plan according to the schedule to meet the requirements of the construction period; 7. Put forward the possible problems in the construction process according to the safety technology standards, and put forward prevention measures; 8. Determine construction quality control measures according to engineering construction quality control regulations; 9. Determine the locations of construction prefabrication areas, material yards and the inspection and test sites. 10. Observe health, occupational and environmental safety rules and regulations.	1.9 Prepare construction layouts. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 The basic principles of concluding a contract, including the principle of equality, voluntary principle, good faith principle, fair principle, the principle of prohibiting abuse of power, and the principle of adherence to public order and good customs; 2.2 The relevant national and industrial standards and specifications in Tanzania; 2.3 Principle of pertinence and feasibility; 2.4 Principle of "safety first, prevention crucial"; 2.5 Principles for construction and comprehensive management of professional teams; 2.6 Principles for civilized construction and environmental protection; 2.7 Principle of cost control. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Quality, safety, schedule and cost objectives of the project. **4.0 Essential Skills** 4.1 Report writing skills; 4.2 Communication skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Technical schemes for the construction of energy storage systems are prepared according to construction drawings.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety; 2. Relevant local laws, regulations and policies.

OCCUPATION	RENEWABLE ENERGY ENGINEER (SOLAR)	**OCCUPATION CODE**	
DUTY TITLE	INTERPRET DRAWINGS AND ESTIMATE THE COST OF MATERIALS FOR THE ENERGY STORAGE SYSTEM	**DUTY NO.**	701
TASK TITLE	WRITING OF TECHNICAL REPORT FOR THE CONSTRUCTION OF SOLAR-PHOTOVOLTAIC-STORAGE SYSTEM FOR MICRO GRIDS	**TASK NO.**	7016
PERFORMANCE CRITERIA	The person performing this task must be able to write technical schemes for the construction of Solar-photovoltaic-energy storage system for micro grids according to material analysis reports, reports on construction area, reports on construction quantities and reports on the quantities of components.		
RANGE STATEMENT	The task can be performed in the office under the supervision of senior renewable energy Engineers. On-site inspection is required when necessary. The tools and equipment to be used include: 1. Material analysis reports on the systems of solar-photovoltaic-energy storage systems for micro grids; 2. Reports on construction area of solar-photovoltaic-energy storage system for micro grids; 3. Lists of construction quantities of solar-photovoltaic-energy storage for micro grids; 4. Reports on the quantities of components of solar-photovoltaic-energy storage for micro grids; 5. Computer set; 6. Relevant softwares 7. Construction drawings; 8. Geological reports of construction sites; 9. Project contracts. 10. Safety gear		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Determine project overview of construction projects according to reports on construction area of Solar-photovoltaic energy storage for, lists of construction quantities of Solar-photovoltaic energy storage for and	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Prepare the project overview; 1.2 Prepare principles for the preparation of technical schemes;

project contracts, the overview including field conditions, construction periods, main physical quantities and main technical parameters; 2. Determine preparation principles according to the specific content and characteristics of projects, mainly including the current effective specifications and standards; 3. Determine the logical relationship between construction procedures, such as sequence, parallelism and intersection; 4. Determine the construction methods, including the key points of process operation, selection of machines and tools, inspection methods and requirements, and clarify the technical requirements and quality standards; 5. Arrange the construction schedule according to the construction period; 6. Prepare the resource allocation plan according to the schedule to meet the requirements of the construction period; 7. Put forward the possible problems in the construction process according to the safety technology standards, and put forward prevention measures; 8. Determine construction quality control measures according to engineering construction quality control regulations; 9. Determine the locations of construction prefabrication areas, material yards and the inspection and test sites. 10. Observe health, occupational and environmental safety rules and regulations.	1.3 Prepare construction procedures; 1.4 Prepare construction methods; 1.5 Prepare construction schedule plans; 1.6 Prepare resource allocation plans; 1.7 Prepare safety technical measures. 1.8 Prepare quality control measures; 1.9 Prepare construction layouts. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 The basic principles of concluding a contract, including the principle of equality, voluntary principle, good faith principle, fair principle , the principle of prohibiting abuse of power, and the principle of adherence to public order and good customs; 2.2 The relevant national and industrial standards and specifications in Tanzania; 2.3 Principle of pertinence and feasibility; 2.4 Principle of "safety first, prevention crucial"; 2.5 Principles for construction and comprehensive management of professional teams; 2.6 Principles for civilized construction and environmental protection; 2.7 Principle of cost control. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Quality, safety, schedule and cost objectives of the project. **4.0 Essential Skills** 4.1 Report writing skills; 4.2 Communication skills; 4.3 Computer application skills.
DESCRIPTION OF THE END	Technical schemes of Solar-photovoltaic energy storage systems are written according to material

PRODUCT / SERVICE	analysis reports, reports on construction area, reports on construction quantities and reports on the quantities of components.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety; 2. Relevant local laws, regulations and policies.

OCCUPATION	RENEWABLE ENERGY ENGINEER (SOLAR)	**OCCUPATION CODE**	
DUTY TITLE	CHECK THE WORKING PERFORMANCES OF MODULES AND ARRAYS	**DUTY NO.**	702
TASK TITLE	SELECT THE SOLAR PV ARRAY TESTERS	**TASK NO.**	7021
PERFORMANCE CRITERIA	The person performing this task must be able to select suitable PV array testers according to technical requirements of PV array systems and standard prescribed testing guidelines.		
RANGE STATEMENT	The task may be executed in areas that do not disturb construction and equipment operation under the supervision of senior renewable energy Engineers. The tools and equipment to be used include: 1. Reference Manuals 2. Solar PV arrays 3. PV testers 4. Safety gear		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select suitable PV array testers according to technical requirements of PV array systems; 2. Choose technical parameters for PV array testers in accordance with the technical requirements of PV array systems, such as voltage, current, sunlight protection, ambient temperature measurement range, measurement accuracy, IP rating and so on. 3. Observe health, occupational and environmental safety rules and regulations.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Choose technical parameters for PV array testers; 1.2 Select PV array testers. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Principles for choosing technical parameters for PV array testers. **3.0 Theories** The person performing this task must be able to explain: 3.1 Technical indexes of PV array testers; 3.2 Working principles of PV array testers; 3.3 Structure of PV array testers.

	4.0 Essential Skills 4.1 Teamwork skills; 4.2 Customer service skills; 4.3 Communication skills; 4.4 Computer application skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The PV array testers are selected in accordance with technical requirements of PV array systems and standard prescribed testing guidelines
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Relevant national and local government regulations and policies; 2. Occupational health and safety.

OCCUPATION	RENEWABLE ENERGY ENGINEER (SOLAR)	**OCCUPATION CODE**	
DUTY TITLE	CHECK THE WORKING PERFORMANCE OF SOLAR MODULES AND ARRAYS	**DUTY NO.**	702
TASK TITLE	DETERMINE THE MODULE PERFORMANCE	**TASK NO.**	7022
PERFORMANCE CRITERIA	The person performing this task must be able to use PV array testers to conduct detection, monitoring, and annual performance of a solar PV System according to technical requirements and standard prescribed module performance testing guidelines.		
RANGE STATEMENT	The task may be executed in areas that do not disturb construction and equipment operation under the supervision of senior renewable energy Engineers. The tools and equipment to be used include: 1. PV array testers; 2. Computer set; 3. Relevant Softwares 4. Personal protective equipment.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Use PV array testers to conduct detection for daily maintenance and other maintenance; 2. Monitor the performance of solar PV systems 3. Collect information of new technologies, new techniques, new equipment and new materials. 4. Observe health, occupational and environmental safety rules and regulations.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Conduct detection of PV arrays, verify the working performance and installation rationality of PV modules; 1.2 Use PV array testers for acceptance, monitoring, yearly detection and daily maintenance detection. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Application principles of PV array testers in installation, manufacturing supervision and acceptance of PV power stations; 2.2 Principles for technical requirements and acceptance standards of construction; 2.3 Principle of "safety first, prevention crucial".

	3.0 Theories The person performing this task must be able to explain the following: 3.1 Technical requirements of functional design, structure, performance, installation, experiment and other aspects of the main equipment and auxiliary equipment of PV array testers. **4.0 Essential Skills** 4.1 Teamwork skills; 4.2 Customer service skills; 4.3 Communication skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The module performance is determined according to technical requirements and standard prescribed module performance testing guidelines.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Relevant national and local government regulations and policies; 2. Occupational health and safety.

OCCUPATION	RENEWABLE ENERGY ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	INSTALL THE ENERGY STORAGE SYSTEMS	**DUTY NO.**	703
TASK TITLE	INSTALL ENERGY STORAGE TANKS	**TASK NO.**	7031
PERFORMANCE CRITERIA	The person performing this task must be able to install energy storage tanks in accordance with technical requirements and electrical installation drawings.		
RANGE STATEMENT	The task can be performed in the Energy Storage Systems under the supervision of senior renewable energy Engineers. The tools and equipment to be used include: 1. Safety target responsibility letter; 2. Project Quality Standards; 3. Engineering quality inspection methods; 4. Safety and quality disclosure records; 5. General technical schemes; 6. Technical disclosure record; 7. Relevant tools and instruments. 8. Safety gear		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Install supporting frames of energy storage tanks; 2. Install the base of energy storage tanks; 3. Install main frames of energy storage tanks; 4. Install multiple cover plates of energy storage tanks. 5. Observe health, occupational and environmental safety rules and regulations.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Select tools and equipment; 1.2 Determine the installation position of the tank; 1.3 Install the energy storage tank. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Circuit principles of energy storage tanks; 2.2 Acceptance principles of energy storage tanks. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Composition of components of energy storage tanks; 3.2 Schematic drawings for the electrical installation of energy storage tanks; 3.3 Analysis on fault causes of energy storage tanks. **4.0 Essential Skills**

	4.1 Communication and team cooperation ability; 4.2 Independent thinking ability; 4.3 Report writing skills; 4.4 Computer application skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The energy storage tanks installed in accordance with technical requirements and electrical installation drawings.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Waste disposal methods; 2. Occupational health and safety; 3. Energy conservation and environmental protection.

OCCUPATION	RENEWABLE ENERGY ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	INSTALL THE ENERGY STORAGE SYSTEMS	**DUTY NO.**	703
TASK TITLE	INSTALL CONVERTERS	**TASK NO.**	7032
PERFORMANCE CRITERIA	The person performing this task must be able to install converters in accordance with technical requirements and electrical installation drawings.		
RANGE STATEMENT	The task can be performed in the Energy Storage Systems under the supervision of senior renewable energy Engineers. The tools and equipment to be used include: 1. Safety target responsibility letter; 2. Project Quality Standards; 3. Engineering quality inspection methods; 4. Safety and quality disclosure records; 5. General technical schemes; 6. Technical disclosure record; 7. Relevant tools and instruments. 8. Safety gear		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Install IGBT inverter modules; 2. Install excitation modules; 3. Install heat exchangers; 4. Install grid side reactors; 5. Install grid side filters; 6. Install automatic circuit breakers; 7. Install machine side reactors; 8. Install control equipment. 9. Observe health, occupational and environmental safety rules and regulations.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Choose required tools and equipment; 1.2 Determine location for converters; 1.3 Install converters. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Circuit principles of converters; 2.2 Safety specifications for using converters; 2.3 Principles for the acceptance of converters. **3.0 Theories** The person performing this task must be able to explain

	the following: 3.1 Composition of components of converters; 3.2 Functions of converters; 3.3 Analysis on fault causes of power conversion systems. 3.4 Maintenance of converters. **4.0 Essential Skills** 4.1 Communication and team cooperation ability; 4.2 Independent thinking ability; 4.3 Report writing skills; 4.4 Computer application skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The converters are installed in accordance with technical requirements.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Waste disposal methods; 2. Occupational health and safety; 3. Energy conservation and environmental protection.

OCCUPATION	RENEWABLE ENERGY ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	INSTALL THE ENERGY STORAGE SYSTEMS	**DUTY NO.**	703
TASK TITLE	INSTALL THE POWER DISTRIBUTION BOXES	**TASK NO.**	7033
PERFORMANCE CRITERIA	The person performing this task must be able to install power distribution boxes in accordance with technical requirements and electrical installation drawings.		
RANGE STATEMENT	The task can be performed in the Energy Storage Systems under the supervision of senior renewable energy Engineers. The tools and equipment to be used include: 1. Safety target responsibility letter; 2. Project Quality Standards; 3. Engineering quality inspection methods; 4. Safety and quality disclosure records; 5. General technical schemes; 6. Technical disclosure record; 7. Relevant tools and instruments. 8. Safety gear		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Choose required tools and equipment; 2. Determine the installation position of the box; 3. Install the operation button; 4. Install the touch screen; 5. Install dust covers for left and right side panels; 6. Install the top fan; 7. Install the bottom transformer; 8. Install the low-voltage apparatus; 9. Install the wiring duct; 10. Arrange the components; 11. Connect wires. 12. Observe health, occupational and	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Install the panel for power distribution box; 1.2 Install the body of power distribution box; 1.3 Install the mounting plate of power distribution box. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Circuit principles of power distribution boxes; 2.2 Safety specifications for using power distribution boxes; 2.3 Principles for the acceptance of power distribution boxes.

environmental safety rules and regulations.	**3.0 Theories** The person performing this task must be able to explain the following: 3.1 Composition of components of power distribution boxes; 3.2 Functions of power distribution boxes; 3.3 Analysis on fault causes of power distribution boxes; 3.4 Maintenance of power distribution boxes. **4.0 Essential Skills** 4.1 Communication and team cooperation ability; 4.2 Independent thinking ability; 4.3 Report writing skills; 4.4 Computer application skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The power distribution boxes installed in accordance with the technical requirements and electrical installation drawings.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Waste disposal methods; 2. Occupational health and safety; 3. Energy conservation and environmental protection.

OCCUPATION	RENEWABLE ENERGY ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	CARRY OUT THE INSPECTION, TESTING AND COMMISSIONING FOR ENERGY STORAGE SYSTEMS	**DUTY NO.**	704
TASK TITLE	INSPECT, TEST AND COMMISSION SOLAR PV ENERGY STORAGE SYSTEM	**TASK NO.**	7041
PERFORMANCE CRITERIA	The person performing this task must be able to inspect, test and commission the solar PV energy storage system in accordance with the operational technical quality indicators and operational processes of equipment of energy storage system.		
RANGE STATEMENT	The task can be performed in the Energy Storage Systems under the supervision of senior renewable energy Engineers. The tools and equipment to be used include: 1. Laptops 2. Relevant Softwares 3. Digital multimeters; 4. Clamp ammeters; 5. Universal tool kits for electricians; 6. Technical materials of equipment; 7. Inspection schemes of system security; 8. Optimization schemes of system. 9. Safety gear		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Explain the operation process and requirements of the system; 2. Inspect on the operation stability of energy storage power stations; 3. Inspect on the operation security of energy storage power stations. 4. Observe health, occupational and environmental safety rules and regulations.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Prepare inspection schemes of power station systems; 1.2 Prepare precaution measures to ensure operation security; 1.3 Prepare technical fault manual. **2.0 Principle** The person performing this task must be able to explain the following principles:

	2.1 Principles for technical requirements and acceptance standards of construction; 2.2 Principle of "safety first, prevention crucial". **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Technical standards for operation stability and security of energy storage power stations; 3.2 Technical standards for operation stability and security of Solar-photovoltaic energy storage for; 3.3 Analysis on fault causes of systems. **4.0 Essential Skills** 4.1 Communication and team cooperation ability; 4.2 Independent thinking ability; 4.3 Report writing skills; 4.4 Computer application skills; 4.5 Expression and writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The solar PV storage systems are inspected, tested and commissioned in accordance with the technical requirements, equipment operation status and circumstances, among other factors.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety production terminology; 2. Environmental protection measures at the construction site; 3. Occupational health and safety; 4. Waste disposal methods.

OCCUPATION	RENEWABLE ENERGY ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	CARRY OUT THE INSPECTION, TESTING AND COMMISSIONING FOR ENERGY STORAGE SYSTEM	**DUTY NO.**	704
TASK TITLE	SET THE BUILDING MANAGEMENT SYSTEM CONTROL PARAMETERS	**TASK NO.**	7042
PERFORMANCE CRITERIA	The person performing this task must be able to set the building management system (BMS) control parameters according to technical requirements, equipment operation status and circumstances.		
RANGE STATEMENT	The task can be performed in the Energy Storage Systems under the supervision of senior renewable energy Engineers. The tools and equipment to be used include: 1. Overall technical scheme documents; 2. Complete sets of drawings and data documents; 3. Laptops; 4. Relevant Softwares 5. Universal tool kits for electricians; 6. Sensors; 7. Digital multimeters. 8. The tracking system 9. Safety gear		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Set voltage sampling points; 2. Layout temperature sensors; 3. Set temperature sampling points; 4. Detect current range; 5. Set up the communication interface; 6. Observe health, occupational and environmental safety rules and regulations. 7. Set the battery output port.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Assess power supply for BMS; 1.2 Calculate current; 1.3 Calculate the voltage balance degree; 1.4 Calculate equilibrium current; 1.5 Calculate SOC estimation accuracy; 1.6 Calculate insulation measurement accuracy; 1.7 Calculate BMS power consumption. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Principles for setting basic parameters for BMS systems; 2.2 Working principles of BMS systems; 2.3 Calculation principles for BMS systems. **3.0 Theories** The person performing this task must be able to explain

	the following: 3.1 Structure of BMS systems; 3.2 Controlling strategies of BMS systems. **4.0 Essential Skills** 4.1 Communication and team cooperation ability; 4.2 Independent thinking ability; 4.3 Report writing skills; 4.4 Computer application skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The building management system control parameters set in accordance with the technical requirements, equipment operation status and circumstances.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety production terminology; 2. Environmental protection measures at the construction site; 3. Occupational health and safety; 4. Waste disposal methods.

OCCUPATION	RENEWABLE ENERGY ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	CARRY OUT THE INSPECTION, TESTING AND COMMISSIONING FOR ENERGY STORAGE SYSTEM	**DUTY NO.**	704
TASK TITLE	CHARGE AND DISCHARGE STRATEGIES AND PARAMETER SETTINGS FOR ENERGY STORAGE SYSTEM	**TASK NO.**	7043
PERFORMANCE CRITERIA	The person performing this task must be able charge and discharge strategies and parameter settings for energy storage systems, in accordance with the operational technical quality indicators and operational processes of equipment of energy storage systems.		
RANGE STATEMENT	The task can be performed in the Energy Storage Systems under the supervision of senior renewable energy Engineers. The tools and equipment to be used include: 1. Overall technical scheme documents; 2. Complete sets of drawings and data documents; 3. Construction scheme documents; 4. Documents of production security policies and regulations; 5. Quality materials of equipment; 6. Safety gear		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Establish the control model of energy storage power stations; 2. Formulate the charging power calculation strategy; 3. Formulate the intraday schedule charging process; 4. Formulate the day-ahead schedule discharging process; 5. Formulate the intraday schedule discharging process 6. Formulate the real-time charging and discharging processes; 7. Prepare optimization schemes for	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Detect the state data of the energy storage system; 1.2 Conduct day-ahead load forecasting; 1.3 Carry out ultra-short-term load forecasting; 1.4 Detect the actual data of load; 1.5 Conduct day-ahead wind power forecasting6 1.6 Carry out ultra-short-term wind power forecasting; 1.7 Detect the actual data of wind power; 1.8 Formulate day-ahead plans for energy storage; 1.9 Formulate intraday plans for energy storage; 1.10Carry out real-time control of energy storage.

system parameter settings. 8. Observe health, occupational and environmental safety rules and regulations.	**2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 The principle of one charge and one discharge; 2.2 Principles of emergency reserve of energy storage power stations. **3.0 Theories** The person performing this task must be able to explain: 3.1 Work patterns of energy storage power stations; 3.2 Knowledge of control strategy of energy storage power stations; 3.3 Calculation methods of economic evaluation of energy storage power stations. **4.0 Essential Skills** 4.1 Communication and team cooperation ability; 4.2 Expression and writing skills. 4.3 Independent thinking ability; 4.4 Computer application skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The charge and discharge strategies and parameter settings for energy storage system are prepared in accordance with technical requirements, equipment operation status and circumstances, among other factors.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety production terminology; 2. Environmental protection measures at the construction site; 3. Occupational health and safety; 4. Waste disposal methods.

OCCUPATION	RENEWABLE ENERGY ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	CARRY OUT THE INSPECTION, TESTING AND COMMISSIONING FOR ENERGY STORAGE SYSTEM	**DUTY NO.**	704
TASK TITLE	SET THE CONTROL STRATEGIES OF SOLAR-PHOTOVOLTAIC ENERGY STORAGE SYSTEMS	**TASK NO.**	7044
PERFORMANCE CRITERIA	The person performing this task must be able to set the control strategies for Solar-photovoltaic energy storage systems, in accordance with the operational technical quality indicators and operational processes of equipment of energy storage systems.		
RANGE STATEMENT	The task can be performed in the Energy Storage Systems under the supervision of senior renewable energy Engineers. The tools and equipment to be used include: 1. Overall technical scheme documents; 2. Complete sets of drawings and data documents; 3. Quality materials of equipment; 4. Documents of production security policies and regulations. 5. Safety gear		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Establish mathematical models of PV generation systems; 2. Establish mathematical models of wind power generation systems; 3. Establish mathematical models of energy storage systems; 4. Prepare research documents of control strategies of Solar-photovoltaic energy storage for. 5. Observe health, occupational and environmental safety rules and regulations.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Formulate peer-to-peer control strategies; 1.2 Formulate master-slave control strategies; 1.3 Conduct master-slave control and grid-connection and off-grid switching; 1.4 Interpret technical documents. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Principles for setting the control strategies of Solar-photovoltaic energy storage for; 2.2 Operation principles of energy storage power stations.

	3.0 Theories The person performing this task must be able to explain the following: 3.1 Control methods of the operation of micro grids; 3.2 Control techniques of energy storage of micro grids. **4.0 Essential Skills** 4.1 Communication and team cooperation ability; 4.2 Expression and writing skills; 4.3 Independent thinking ability; 4.4 Computer application skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The control strategies of Solar-photovoltaic energy storage are set in accordance with technical requirements, operational technical quality indicators and operational processes of equipment. of energy storage power stations.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety production terminology; 2. Environmental protection measures at the construction site; 3. Occupational health and safety; 4. Waste disposal methods.

OCCUPATION	RENEWABLE ENERGY ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	CARRY OUT THE INSPECTION, TESTING AND COMMISSIONING FOR ENERGY STORAGE SYSTEM	**DUTY NO.**	704
TASK TITLE	ESTABLISH EFFICIENT AND SAFE OPERATION AND MAINTENANCE CULTURE OF ENERGY STORAGE SYSTEM	**TASK NO.**	7045
PERFORMANCE CRITERIA	The person performing this task must be able to establish efficient and safe operation and the maintenance culture of energy storage system in accordance with the operational technical quality indicators and operational processes of equipment of energy storage systems.		
RANGE STATEMENT	The task can be performed in the Energy Storage Systems under the supervision of renewable energy Engineers. The tools and equipment to be used include: 1. Overall technical scheme documents; 2. Complete sets of drawings and data documents; 3. Construction scheme documents; 4. Documents of production security policies and regulations; 5. Quality materials of equipment; 6. Regulations and regulatory documents on quality supervision and management of Energy Storage Systems projects; 7. Documents of production security policies and regulations; 8. Safety gear		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Inspect if the equipment of Energy Storage Systems is damaged; 2. Inspect on the operation status parameters of the equipment of energy storage power stations; 3. Inspect on the operating temperature of the equipment of energy storage power stations; 4. Inspect on the cable room; 5. Inspect on the grounding circuit breaker switch;	Detailed knowledge about: **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Inspect on the appearance; 1.2 Inspect on the indicator lights; 1.3 Inspect on the switches; 1.4 Inspect on the temperature of components; 1.5 Carry out insulation tests of main circuits of circuit breakers; 1.6 Carry out power frequency AC withstand voltage tests;

6. Conduct inspection and maintenance of components in the circuit breaker room; 7. Inspect on the secondary circuit room; 8. Prepare the manual for using energy storage power stations; 9. Prepare relevant documents on precautions in daily use and maintenance of energy storage power stations. 10. Observe health, occupational and environmental safety rules and regulations.	1.7 Conduct insulation tests of auxiliary circuits and control circuits; 1.8 Interpret technical documents of energy storage power stations; 1.9 Prepare the manual for using energy storage power stations. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Usage specifications for energy storage power stations; 2.2 The system composition and working principle of energy storage power stations. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Analysis on fault causes of energy storage power stations; 3.2 Operation and maintenance regulations of energy storage power stations. **4.0 Essential Skills** 4.1 Communication and team cooperation ability; 4.2 Expression and writing skills; 4.3 Independent thinking ability. 4.4 Computer application skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The efficient, and safe operation and the maintenance culture of energy storage system is established in accordance with operational technical quality indicators and operational processes of equipment of energy storage system.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety production terminology; 2. Environmental protection measures at the construction site; 3. Occupational health and safety; 4. Waste disposal methods.

OCCUPATION	RENEWABLE ENERGY ENGINEER	**OCCUPATION CODE**	
DUTY TITLE	CARRY OUT THE INSPECTION, TESTING AND COMMISSIONING FOR ENERGY STORAGE SYSTEM	**DUTY NO.**	704
TASK TITLE	ESTABLISH EFFICIENT AND SAFE OPERATION AND THE MAINTENANCE CULTURE OF SOLAR-PHOTOVOLTAIC ENERGY STORAGE	**TASK NO.**	7046
PERFORMANCE CRITERIA	The person performing this task must be able to establish efficient and safe operation and the maintenance culture of Solar-photovoltaic energy storage in accordance with operational technical quality indicators and operational processes of equipment of Solar-photovoltaic energy storage.		
RANGE STATEMENT	The task can be performed in the Energy Storage Systems under the supervision of senior renewable energy Engineers. The tools and equipment to be used include: 1. Overall technical scheme documents; 2. Complete sets of drawings and data documents; 3. Construction scheme documents; 4. Documents of production security policies and regulations; 5. Quality materials of equipment; 6. Regulations and regulatory documents on quality supervision and management of Energy Storage Systems projects; 7. Documents of production security policies and regulations. 8. Safety gear		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Prepare the operation process of PV generation systems; 2. Prepare the operation process of wind power generation systems; 3. Prepare the operation process of battery energy storage systems; 4. Prepare daily use and maintenance documents of Solar-photovoltaic energy storage for. 5. Observe health, occupational and	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Interpret operation documents of PV generation systems; 1.2 Interpret operation documents of wind power generation systems; 1.3 Interpret operation documents of battery energy storage systems; 1.4 Interpret daily maintenance documents of energy storage power stations;

environmental safety rules and regulations.	1.5 Prepare daily use and maintenance documents of Solar-photovoltaic energy storage for. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Principle of stable operation of Solar-photovoltaic energy storage for; 2.2 The system composition and working principle of Solar-photovoltaic energy storage for; 2.3 Principle of implementing standards. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Optimized configuration of energy storage system capacity of Solar-photovoltaic energy storage for; 3.2 Analysis on fault causes of Solar-photovoltaic energy storage for. **4.0 Essential Skills** 4.1 Communication and team cooperation ability; 4.2 Expression and writing skills; 4.3 Independent thinking ability; 4.4 Computer application skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The efficient and safe operation and the maintenance of culture of Solar-photovoltaic energy storage for are established in accordance with technical requirements, equipment operation status and circumstances, among other factors.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety production terminology; 2. Environmental protection measures at the construction site; 3. Occupational health and safety; 4. Waste disposal methods.

OCCUPATION	RENEWABLE ENERGY ENGINEER (SOLAR)	**OCCUPATION CODE**	
DUTY TITLE	CARRY OUT THE MAINTENANCE OF ENERGY STORAGE STATION	**DUTY NO.**	705
TASK TITLE	DETERMINE AND FIX COMMON FAULTS IN SOLAR PV STRUCTURES	**TASK NO.**	7051
PERFORMANCE CRITERIA	The person performing this task must be able to determine and fix common faults in solar PV structures in accordance with the standard faults diagnostic and fixing techniques.		
RANGE STATEMENT	The task may be executed in areas that do not disturb construction and equipment operation under the supervision of senior renewable energy Engineers. The tools and equipment to be used include: 1. Various types of wrenches, level gauges, theodolites, benchmarks and other measuring instruments; 2. Cutting machines, electric drills, electric welding machines and marking pens; 3. Personal protective equipment, such as safety shoes, goggles and gloves. 4. Safety gear		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Inspect if the foundation of supports is firm and if the bolts have no loosening phenomenon; 2. Inspect whether the welding points are firm and whether the supports are deformed; 3. Verify whether the supports meet the corresponding strength grades; 4. Verify whether the stability and hardness of the support foundations meet the requirements and the seismic standards; 5. Ensure that the functions of PV module support packaging control systems and gale protection devices meet the requirements; 6. Check the information of computer monitoring system of power stations, and	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Check the faults of the tracker support foundations; 1.2 Analyze the strength grade indicators of tracker supports; 1.3 Analyze the stability and hardness indicators of tracker support foundations; 1.4 Analyze the seismic indicators of tracker supports; 1.5 Test the electrical faults of tracker supports; 1.6 Look up for data and collect information. **2.0 Principle** The person performing this task must be able to explain the following principles:

conduct on-site inspections and tests. 7. Fix the faults found in tracker supports. 8. Observe health, occupational and environmental safety rules and regulations.	2.1 The working principles of tracker supports; 2.2 Technical requirements of tracker support; 2.3 Principle of "safety first, prevention crucial"; 2.4 Principle of superiority of prevention and planned overhauls; 2.5 General principles of fault treatment. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Composition of tracker supports; 3.2 Process flow of tracker support installation; 3.3 Installation methods of tracker supports; 3.4 Precautions of tracker support installation. **4.0 Essential Skills** 4.1 Teamwork skills; 4.2 Customer service skills; 4.3 Communication skills; 4.4 Computer application skills; 4.5 Report writing skills
DESCRIPTION OF THE END PRODUCT / SERVICE	Common faults in solar PV structures are determined and fixed in accordance with the standard faults diagnostic and fixing techniques.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Relevant national and local government regulations and policies; 2. Civilized construction and environmental protection; 3. Occupational health and safety; 4. Waste disposal methods.

OCCUPATION	RENEWABLE ENERGY ENGINEER (SOLAR)	**OCCUPATION CODE**	
DUTY TITLE	CARRY OUT THE MAINTENANCE OF ENERGY STORAGE STATION	**DUTY NO.**	705
TASK TITLE	DETERMINE AND FIX THE FAULTS OF GROUND SOLAR PV SYSTEM	**TASK NO.**	7052
PERFORMANCE CRITERIA	The person performing this task must be able to determine and fix faults of ground solar PV system in accordance with the standard fault diagnostic and fixing technique.		
RANGE STATEMENT	The task can be performed in the office under the supervision of renewable energy Engineers. The tools and equipment to be used include: 1. Supervisory control computers; 2. Reserve computers; 3. Personal protective equipment, such as safety shoes, goggles and gloves; 4. Switchboards and routers; 5. Security systems.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Monitor the operation of ground PV power station equipment in real time; 2. Collect and control the power parameters of each link of the system; 3. Detect and identify the faults. 4. Observe health, occupational and environmental safety rules and regulations.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Detect the running status of equipment; 1.2 Collect power station data; 1.3 According to the fault phenomena of data sets of the monitoring systems of ground PV power stations, identify the faults. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Working principles of monitoring systems for ground PV power stations; 2.2 Principle of stable operation of monitoring systems of ground PV power stations; 2.3 Principle of "safety first, prevention crucial"; 2.4 Principle of information collection; 2.5 General principles of fault treatment.

	3.0 Theories The person performing this task must be able to explain the following: 3.1 Composition of monitoring systems for ground PV power stations; 3.2 Theories for detecting and identifying the faults. **4.0 Essential Skills** 4.1 Teamwork skills; 4.2 Customer service skills; 4.3 Communication skills; 4.4 Skills to use computer-aided design software.
DESCRIPTION OF THE END PRODUCT / SERVICE	The faults of ground solar PV systems are determined and fixed in accordance with technical the faults monitoring systems of ground PV system and the standard fault diagnostic and fixing technique.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Relevant national and local government regulations and policies; 2. Occupational health and safety; 3. Civilized construction and environmental protection;

OCCUPATION	RENEWABLE ENERGY ENGINEER (SOLAR)	**OCCUPATION CODE**	
DUTY TITLE	CARRY OUT THE MAINTENANCE OF ENERGY STORAGE SYSTEM	**DUTY NO.**	705
TASK TITLE	DETERMINE AND FIX THE USER-RELATED FAULTS OF THE SOLAR PV ENERGY-STORAGE SYSTEMS	**TASK NO.**	7053
PERFORMANCE CRITERIA	The person performing this task must be able to determine and fix the user-related faults of the PV energy-storage systems in accordance with the user operation manuals and the standard faults diagnostic and fixing technique.		
RANGE STATEMENT	The task may be executed in areas that do not disturb construction and equipment operation under the supervision of senior renewable energy Engineers. The tools and equipment to be used include: 1. Oscilloscopes; 2. Multimeters; 3. Various types of wrenches; 4. Various types of screwdrivers; 5. electronic measuring instruments; 6. Personal protective equipment, such as safety shoes, goggles and gloves.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Realize fault detection within the preset range of the whole PV energy-storage system; 2. Collect fault data; 3. Analyze fault causes according to the data; 4. Fix the faults and ensure normal operation of equipment. 5. Observe health, occupational and environmental safety rules and regulations.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Identify the faults according to the common fault phenomena of PV modules and energy storage devices in users' PV energy-storage systems; 1.2 Collect and process the data of users' PV energy-storage systems; 1.3 Look up for data and collect information. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Working principles of users' PV energy-storage systems; 2.2 Principle of stable operation of PV energy-storage systems;

	2.3 Principle of information collection; 2.4 General principles of fault treatment. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Structure of users' PV energy-storage systems; 3.2 Theories for identifying the faults of users' PV energy-storage systems. **4.0 Essential Skills** 4.1 Teamwork skills; 4.2 Report writing skills; 4.3 Communication skills; 4.4 Computer application skills;
DESCRIPTION OF THE END PRODUCT / SERVICE	The user related faults of the PV energy-storage system are determined and fixed in accordance with the user operation manuals and standard faults diagnostic and fixing technique.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Relevant national and local government regulations and policies; 2. Civilized construction and environmental protection; 3. Occupational health and safety.

OCCUPATION	RENEWABLE ENERGY ENGINEER (SOLAR)	**OCCUPATION CODE**	
DUTY TITLE	CARRY OUT THE MAINTENANCE OF ENERGY STORAGE SYSTEMS	**DUTY NO.**	705
TASK TITLE	IDENTIFY AND FIX THE CENTRALIZED CONTROL FAULTS OF THE ENERGY STORAGE SYSTEMS	**TASK NO.**	7054
PERFORMANCE CRITERIA	The person performing this task must be able to identify and fix the centralized control faults of the Energy Storage Systems in accordance the centralized monitoring system and the standard faults diagnostic and fixing technique.		
RANGE STATEMENT	The task may be executed in areas that do not disturb construction and equipment operation under the supervision of senior renewable energy Engineers. The tools and equipment to be used include: 1. Various types of screwdrivers and wrenches; 2. Multimeters, insulation resistance testers, etc.; 3. Personal protective equipment, such as safety shoes, goggles, gloves, safety helmets, insulating bars, foot buckles, climbing boards, insulated herringbone ladders; 4. Safety tools and equipment cabinet; 5. Manual hydraulic pliers, open line scissors; 6. Removable cable trays.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select centralized control for solar street lights, wind-solar complementary street lights and photovoltaic-city-power complementary street lights with good performance; 2. Select the appropriate installation environment; 3. 3. Detect whether the circuit of street light controller, wind-solar complementary street lights and photovoltaic city power complementary street lights have short circuit and poor contact; 4. Measure battery voltage;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Choose street lights with better performance according to the technical indexes of street lights; 1.2 Choose the appropriate installation environment according to the user's requirements; 1.3 Identify all faults according to the phenomena of common faults of centralized control solar street lights, wind-solar complementary street lights and photovoltaic-city-power complementary street lights; 1.4 Look up for data and collect information.

5. Detect whether there is voltage and current output when the solar panel works normally; 6. Inspect the light source. 7. Observe health, occupational and environmental safety rules and regulations.	**2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Principle of "safety first, prevention crucial"; 2.2 General principles of fault treatment; 2.3 Working principles of centralized control solar street lights; 2.4 Working principles of wind-solar complementary street lights; 2.5 Working principles of photovoltaic-city-power complementary street lights. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Fault detection and maintenance of centralized control solar street lights; 3.2 Fault detection and maintenance of wind-solar complementary street lights; 3.3 Fault detection and maintenance of photovoltaic-city-power complementary street lights. **4.0 Essential Skills** 4.1 Teamwork skills; 4.2 Customer service skills; 4.3 Communication skills; 4.4 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The centralized control faults of the energy storage systems are identified and fixed in accordance with the user operation manuals and standard faults diagnostic and fixing technique.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Relevant national and local government regulations and policies; 2. Occupational health and safety; 3. Civilized construction and environmental protection;

OCCUPATION	RENEWABLE ENERGY ENGINEER (SOLAR)	**OCCUPATION CODE**	
DUTY TITLE	CARRY OUT THE MAINTENANCE OF ENERGY STORAGE SYSTEMS	**DUTY NO.**	705
TASK TITLE	IDENTIFY AND FIX COMMON FAULTS OF CENTRALIZED SOLAR PV CONVERTERS	**TASK NO.**	7055
PERFORMANCE CRITERIA	The person performing this task must be able to identify common faults of centralized PV inverters and fix them in accordance with the technical requirements and specifications in the manufacturer's manual		
RANGE STATEMENT	The task may be executed in areas that do not disturb construction and equipment operation under the supervision of senior renewable energy Engineers. The tools and equipment to be used include: 1. Various types of screwdrivers; 2. Multimeters, insulation resistance testers, etc.; 3. Personal protective equipment, such as safety shoes, goggles, gloves, safety helmets and insulating bars; 4. Safety tools and equipment cabinet; 5. Manual hydraulic pliers, open line scissors; 6. Removable cable trays.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Detect insulation impedance by startup of the inverter; 2. Detect the problematic cluster on the input side of the inverter; 3. Detect whether the inverter component itself leaks electricity to the ground grid through the frame; 4. Measure busbar voltage; 5. Choose the appropriate installation environment and cost-effective equipment; 6. Carry out DC overvoltage protection measures; 7. Survey the heavy/light load work of the power grid, and survey the	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Read the instructions of each equipment correctly; 1.2 Investigate and deal with the low insulation impedance of centralized PV inverters; 1.3 Identify and deal with the low bus bar voltage; 1.4 Identify and deal with current leakage; 1.5 Carry out DC overvoltage protection measures; 1.6 Identify and deal with unresponsive inverters after start-up; 1.7 Deal with overvoltage and under voltage of power grids. **2.0 Principle**

health status of the voltage of grid-connection points in advance; 8. Monitor lap joints to ensure stable communication. 9. Observe health, occupational and environmental safety rules and regulations.	The person performing this task must be able to explain the following principles: 2.1 Technical requirements of centralized PV inverters; 2.2 Working principles of centralized PV inverters; 2.3 Principle of "safety first, prevention crucial"; 2.4 General principles of fault treatment. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Instructions of centralized PV inverters; 3.2 Structure of centralized PV inverters; 3.3 Fault detection and maintenance techniques on centralized PV inverters. **4.0 Essential Skills** 4.1 Teamwork skills; 4.2 Customer service skills; 4.3 Communication skills; 4.4 Report writing skills
DESCRIPTION OF THE END PRODUCT / SERVICE	The common faults of centralized PV inverters are identified and fixed in accordance with technical requirements and common fault phenomena of centralized PV inverters
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Relevant national and local government regulations and policies; 2. Occupational health and safety; 3. Civilized construction and environmental protection.

OCCUPATION	RENEWABLE ENERGY ENGINEER (SOLAR)	**OCCUPATION CODE**	
DUTY TITLE	CARRY OUT THE MAINTENANCE OF ENERGY STORAGE SYSTEMS	**DUTY NO.**	705
TASK TITLE	IDENTIFY AND FIX COMMON FAULTS OF THE SOLAR PV MONITORING SYSTEM	**TASK NO.**	7056
PERFORMANCE CRITERIA	The person performing this task must be able to identify common faults of monitoring of Solar PV System and fix them in accordance with technical requirements and specifications in the manufacturer's manual and the standard faults diagnostic and fixing techniques		
RANGE STATEMENT	The task may be executed in areas that do not disturb construction and equipment operation under the supervision of senior renewable energy Engineers. The tools and equipment to be used include: 1. Supervisory control computers; 2. Project computers; 3. Relevant softwares 4. Personal protective equipment, such as safety shoes, goggles and gloves; 5. Switchboards and routers; 6. Cable trays.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Conduct real-time monitoring of PV power station equipment operation status; 2. Collect faults data; 3. Identify the faults of the PV power station monitoring system causes according to the fault data Fix the identified faults and ensure normal operation of equipment. 4. Observe health, occupational and environmental safety rules and regulations.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Analyze the normal operation status of equipment; 1.2 Collect and process power station data; 1.3 Conduct fault identification according to fault data. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Principle of stable operation of monitoring systems of PV power stations; 2.2 Working principles of monitoring systems for PV power stations; 2.3 Principle of "safety first, prevention crucial";

	2.4 General principles of fault treatment. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 The composition of monitoring systems of PV power stations; 3.2 Detection and maintenance techniques of common faults of monitoring systems of PV power stations. **4.0 Essential Skills** 4.1 Teamwork skills; 4.2 Customer service skills; 4.3 Communication skills; 4.4 Skills to use computer-aided design software; 4.5 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The common faults of the Solar PV monitoring system are identified and fixed in accordance with the technical requirements of the monitoring systems of the Solar PV and standard faults diagnostic and fixing technique.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Relevant national and local government regulations and policies; 2. Occupational health and safety; 3. Civilized construction and environmental protection.

OCCUPATION	RENEWABLE ENERGY ENGINEER (SOLAR)	**OCCUPATION CODE**	
DUTY TITLE	CARRY OUT THE MAINTENANCE OF ENERGY STORAGE SYSTEMS	**DUTY NO.**	705
TASK TITLE	ANALYSE, IDENTIFY AND FIX FAULTS OF SOLAR-PHOTOVOLTAIC ENERGY STORAGE SYSTEM	**TASK NO.**	7057
PERFORMANCE CRITERIA	The person performing this task must be able to analyze, identify and fix the faults of solar-photovoltaic energy storage in accordance with technical requirements and specifications in the manufacturer's manual, and the standard faults diagnostic and fixing techniques.		
RANGE STATEMENT	The task can be performed in the office under the supervision of senior renewable energy Engineers. The tools and equipment to be used include: 1. Various types of screwdrivers and wrenches; 2. Multimeters, insulation resistance testers, etc.; 3. Personal protective equipment, such as safety shoes, goggles, gloves, safety helmets, insulating bars, foot buckles, climbing boards, insulated herringbone ladders; 4. Safety tools and equipment cabinet; 5. Manual hydraulic pliers, open line scissors; 6. Removable cable trays.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Detect and control the running state of the system in real time; 2. Conduct automatic distribution of the working state and output of power generation equipment in the system to ensure the stable operation of the system; 3. Identify common faults of PV panels and wind turbines such as panels not charging after connection; turbines not rotating. 4. Identify common faults of energy storage devices; 5. Inspect the operation competence	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Identify faults of PV panels, wind turbine generators and energy storage devices in Solar-photovoltaic energy storage for utilizing identification methods; 1.2 Test the operation competence under grid-connection and islanded modes. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Principle of stable operation of Solar-photovoltaic energy storage for;

under grid-connection and islanded modes; 6. Prepare fixing plans. 7. Observe health, occupational and environmental safety rules and regulations.	2.2 Working principles of PV panels; 2.3 Working principles of wind turbine generators; 2.4 Working principles of energy storage devices; 2.5 Principle of "safety first, prevention crucial". **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Structural composition of Solar-photovoltaic energy storage for; 3.2 Detection and maintenance techniques of common faults of Solar-photovoltaic energy storage for **4.0 Essential Skills** 4.1 Teamwork skills; 4.2 Report writing skills; 4.3 Communication skills; 4.4 Computer application skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The faults of the wind-photovoltaic-storage micro grid is analyzed, identified and fixed in accordance with technical requirements and the fault diagnostic technique.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Relevant national and local government regulations and policies; 2. Occupational health and safety; 3. Civilized construction and environmental protection; 4. Market analysis; 5. Specifications in the manufacturer's manual.

OCCUPATION	RENEWABLE ENERGY ENGINEER (SOLAR)	**OCCUPATION CODE**	
DUTY TITLE	PROVIDE TRAINING ON THE OPERATION AND MANAGEMENT OF THE ENERGY STORAGE SYSTEMS	**DUTY NO.**	706
TASK TITLE	PREPARE THE TECHNICAL SUMMARIES FOR THE PROJECTS CONSTRUCTION	**TASK NO.**	7061
PERFORMANCE CRITERIA	The person performing this task must be able to prepare technical summaries of the construction project according to standard construction procedures and original plan of the project construction.		
RANGE STATEMENT	The task can be performed in the office under the supervision of senior renewable energy Engineers. The tools and equipment to be used include: 1. Computer set; 2. Relevant Softwares 3. Construction process data. 4. Safety gear		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Analyze the general situation and main purpose of the construction project; 2. Analyze the main contents of specific practices in the construction process; 3. Analyze the achievements and shortcomings of the construction; 4. Analyze the experience and lessons in the construction process; 5. Analyze the problems and opinions in the construction process; 6. Write the main construction methods: including the construction methods and technical measures taken for key and difficult construction projects; 7. Write contents about project quality, security and civilized construction; 8. Write the existing shortcomings and the improvement measures.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Refer to project management and acceptance data, construction quality acceptance records, etc.; 1.2 Summarize the main contents of specific practices in the construction process according to construction technical data and data on construction materials; 1.3 Analyze the experience and lessons in the construction process, and summarize the problems and opinions in the construction process, all in accordance with construction survey records, construction records, construction test records, construction quality acceptance records, etc. 1.4 Write contents about project quality, security and civilized construction according to project management and acceptance data, construction

9. Observe health, occupational and environmental safety rules and regulations.	quality acceptance records, etc. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Principle of confidentiality; 2.2 Principles for writing technical summaries of construction projects; 2.3 Principle of implementing standards. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Basic requirements for writing technical summary report. **4.0 Essential Skills** 4.1 Report writing skills; 4.2 Communication skills; 4.3 Computer application skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The technical summaries of the construction project are prepared according to the standard construction procedures and the original plan of the construction project.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Occupational health and safety; 2. Relevant national and local government regulations and policies; 3. Civilized construction and environmental protection.

OCCUPATION	RENEWABLE ENERGY ENGINEER (SOLAR)	**OCCUPATION CODE**	
DUTY TITLE	PROVIDE TRAINING ON THE OPERATION AND MANAGEMENT OF THE ENERGY STORAGE POWER SYSTEM	**DUTY NO.**	706
TASK TITLE	CONDUCT TRAINING ON INSTALLATION AND OPERATION OF SOLAR PV DEVICES (STREET LIGHTS AND SPOTLIGHTS)	**TASK NO.**	7062
PERFORMANCE CRITERIA	The person performing this task must be able to conduct training on installation and operation of solar PV energy devices (street lights and spotlights), according to the manufacturer's user manuals and standard troubleshooting of the devices.		
RANGE STATEMENT	The task can be performed in the office or in the training sites under the supervision of senior renewable energy Engineers. On-site operation guidance is required when necessary. The tools and equipment to be used include: 1. Simple solar simulators; 2. Computer set; 3. Relevant Softwares; 4. Training Materials. 5. Safety gear		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Explain the principles of simple solar energy devices (street lights and spotlights); 2. Explain the installation steps of simple solar energy devices (street lights and spotlights); 3. Use the simulation system to simulate and practice the installation steps of simple solar energy devices (street lights and spotlights); 4. Explain the common problems encountered in the installation of solar energy devices (street lights	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Carry out installation operation of simple solar energy devices (street lights and spotlights); 1.2 Simulate the installation steps of simple solar devices (street lights and spotlights). **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Technical requirements for installation of simple solar energy devices (street lights and spotlights); 2.2 Working principles of simple solar energy device

and spotlights) and give solutions; 5. Prepare training PPTs for installation and operation of simple solar energy devices (street lights and spotlights). 6. Observe health, occupational and environmental safety rules and regulations.	(street lights and spotlights). **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Teaching theories based on systematization of working process; 3.2 Teaching theories featuring integration of theory and practice. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Computer application skills; 4.3 Expression competence; 4.4 Field control competence.
DESCRIPTION OF THE END PRODUCT / SERVICE	The training on installation and operation of simple solar devices (street lights and spotlights) is conducted according to the manufacturer's user manuals and standard troubleshooting of the devices.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Relevant national and local government regulations and policies; 2. The manufacturer's technical manual; 3. Knowledge of pedagogy and psychology.

OCCUPATION	RENEWABLE ENERGY ENGINEER (SOLAR)	**OCCUPATION CODE**	
DUTY TITLE	PROVIDE TRAINING ON THE OPERATION AND MANAGEMENT OF THE ENERGY STORAGE POWER SYSTEM	**DUTY NO.**	706
TASK TITLE	CONDUCT TRAINING ON INSTALLATION AND OPERATION OF GRID CONNECTION AND OFF-GRID SOLAR PV GENERATION SYSTEMS	**TASK NO.**	7063
PERFORMANCE CRITERIA	The person performing this task must be capable to conduct training on the installation and operation of grid and off-grid solar PV generation systems according to technical requirements of PV installation and standard grid and off-grid connection guidelines.		
RANGE STATEMENT	The task can be performed in the office or in the training sites under the supervision of senior renewable energy Engineers. On-site operation guidance is required when necessary. The tools and equipment to be used include: 1. Simulation systems of grid and off-grid PV generation systems; 2. Computer set; 3. Relevant Softwares 4. Training Materials. 5. Safety gear		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Explain the basic principles of grid-connection and off-grid solar PV generation systems; 2. Explain the installation and operation steps of grid-connection and grid-connection and off-grid solar PV generation systems; 3. Use the simulation systems to simulate the installation operation steps of grid-connection and off-grid solar PV generation systems; 4. Explain the common problems encountered in the installation process of grid-connection and	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Explain the installation and operation process of grid-connection and off-grid solar PV generation systems; 1.2 Use the simulation systems of grid-connection and off-grid solar PV generation systems to demonstrate the installation steps; 1.3 Resolve common problems encountered during installation. **2.0 Principle** The person performing this task must be able to explain the following principles:

off-grid solar PV generation systems, and offer solutions; 5. Prepare training PPTs for installation and operation grid-connection and off-grid solar PV generation systems. 6. Observe health, occupational and environmental safety rules and regulations.	2.1 Working principles of grid-connection and off-grid PV generation systems. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Teaching theories based on systematization of working process; 3.2 Teaching theories featuring integration of theory and practice. **4.0 Essential Skills** 4.1 Communication skills; 4.2 Computer application skills; 4.3 Expression competence; 4.4 Teaching competence.
DESCRIPTION OF THE END PRODUCT / SERVICE	The training on installation and operation of grid-connection and off-grid solar PV generation systems is conducted according to technical requirements of solar PV installation and standard grid-connection and off-grid connection guidelines.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Relevant national and local government regulations and policies; 2. Specifications in the manufacturer's manual; 3. Knowledge of pedagogy and psychology; 4. Civilized construction and environmental protection; 5. Occupational health and safety.

APPENDIX: DACUM CHARTS FOR RENEWABLE ENERGY ENGINEER (SOLAR) - NTA LEVEL 7

DUTIES	TASKS	ENABLERS
1.0 Interpret drawings and determine the cost of materials for the energy storage systems	1.1 Interpret the construction drawings of energy storage systems	**General skills and knowledge** · Cooperating with others using communication skills and reporting to the superiors · Skills to use computer-aided design software · Basic management ability · Knowledge of laws and regulations · Basic knowledge of construction, power electronics and power grid · Cost accounting skills · Knowledge of reading architectural drawings · Market analysis skills · Report writing skills **Tools and equipment** · Computer set · Calculator · Ranging tools **Materials** · Computer aided design software **Requirements for employees** · Teamwork, integrity, resource management and commitment
	1.2 Interpret construction drawings of solar photovoltaic systems	
	1.3 Determine the cost of materials used for energy storage systems	
	1.4 Determine the cost of materials used for solar-photovoltaic-storage micro grids	
	1.5 Prepare technical schemes for the construction of energy storage systems	
	1.6 Writing of technical report for the construction of solar-photovoltaic-storage system for micro grids	
2.0 Check the working performances of modules and arrays	2.1 Select the PV array testers.	**General skills and knowledge** · Communication skills · Test instrument use skills · Basic management ability · Knowledge of laws and regulations **Tools and equipment**
	2.2 Determine the module performance	

		· PV array testers · Computer **Materials** · Computer aided design software **Requirements for employees** · Teamwork, integrity, resource management and commitment
3.0 install the Energy Storage Systems	3.1 Install the energy storage tanks. 3.2 Install converters. 3.3 Install the power distribution boxes.	**General skills and knowledge** · Communication skills · Interpretation skills of electrical schematic diagrams and installation drawings · Wiring skills and underpinning knowledge of power distribution boxes **Tools and equipment** · Personal protective equipment, such as safety shoes, goggles, gloves and safety helmets · Special tools for electrical installation **Materials** · Relays, contactors, fuses, low-voltage apparatuses, etc **Requirements for employees** · Quality and safety requirements for equipment installation · Technical quality requirements for equipment overhaul
4.0 Carry out the inspection, testing and commissioning for energy storage systems	4.1 Inspect, test and commission solar PV energy storage system 4.2 Set the building management system control parameters	**General skills and knowledge** · Communication skills · Underpinning knowledge and maintenance requirements of energy storage System

	4.3 Charge and discharge strategies and parameter settings for energy storage system 4.4 Set the control strategies of solar-photovoltaic energy storage systems 4.5 Establish efficient and safe operation and maintenance culture of energy storage system 4.6 Establish efficient and safe operation and the maintenance culture of solar-photovoltaic energy storage	· Underpinning knowledge and maintenance requirements of Solar-photovoltaic energy storage for · Skills to use computer-aided design software · Basic management ability · Knowledge of laws and regulations **Tools and equipment** · Personal protective equipment, such as safety shoes, goggles, gloves and safety helmets · Safety tools and equipment cabinet · Removable cable trays · Computer **Materials** · Computer aided design software **Requirements for employees** · Teamwork, integrity, resource management and commitment
5.0 Carry out maintenance of Energy Storage Systems	5.1 Determine and fix common faults in solar PV structures. 5.2 Determine and fix of faults of ground Solar PV system. 5.3 Determine and fix the user-related faults of the solar PV energy-storage systems 5.4 Identify and fix the centralized control faults of the energy storage system. 5.5 Identify and fix common faults of centralized solar	**General skills and knowledge** · Communication skills · Ability to read project manuals · Interpretation skills of technical data · Customer service knowledge and skills · Skills to use computer-aided design software **Tools and equipment** · Various types of screwdrivers and wrenches · Multimeters, insulation resistance testers, etc.

	PV converters. 5.6 Identify and fix common faults of solar PV System monitoring systems. 5.7 Analyze, identify and fix the faults of Solar-photovoltaic energy storage system.	· Personal protective equipment, such as safety shoes, goggles, gloves, safety helmets, insulating bars, foot buckles, climbing boards, insulated herringbone ladders · Safety tools and equipment cabinet · Manual hydraulic pliers, open line scissors · Removable cable trays · Construction recorder · Laptops **Materials** · Computer aided design software **Requirements for employees** · Teamwork, integrity, time management and commitment
6.0 Provide training on the operation and management of the energy storage systems	6.1 Prepare technical summaries for the projects construction. 6.2 Conduct training on installation and operation training of solar PV devices (street lights and spotlights). 6.3 Conduct training on installation and operation training of grid-connection and off-grid PV generation systems.	**General skills and knowledge** · Communication skills · Basic management ability · Report writing skills · Computer application skills · Working principles of simple solar energy devices · Working principles of grid-connection and grid-connection and off-grid PV generation systems · Working principles of grid-connection and off-grid wind-solar complementary power generation systems · Customer service knowledge and skills · Interpretation of technical data · Cost accounting skills **Tools and equipment**

		· Simple solar energy devices · Operation platform for simulation of grid-connection and grid-connection and off-grid PV generation systems · Operation platform for simulation of grid-connection and off-grid wind-solar complementary power generation systems · Laptops **Materials** · Training PPTs **Requirements for employees** · Teamwork, integrity, time management and commitment