# THE NATIONAL COUNCIL FOR TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING



## **OCCUPATIONAL STANDARDS**

## **OCCUPATION: RENEWABLE ENERGY ENGINEER (HYDRO)**

LEVEL: NTA LEVEL 7

FEBRUARY 2024

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## **ABBREVIATIONS**

CAD	Computer-Aided Design
CBET	Competency Based Education and Training
NACTVET	National Council for Technical and Vocational Education and Training
NOS	National Occupational Standards
OS	Occupational Standards
ТЕТ	Technical Education and Training
TVET	Technical and Vocational Education and Training

## **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. (Example: baker)
Occupational Area:	This is a broad grouping of related jobs. (Example: food service)
Occupational Competence:	The application of knowledge and skills that consistently meet the standards required by the work context.
Occupational Standards:	Specific requirements of competences people are expected to demonstrate in a particular occupational area, including knowledge and relevant attitudes. They also act as a performance tool 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.

- PerformanceIndicate expected end results or outcomes in the form of evaluativeCriteria: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<br/>knowledge, attitudes, performance standards, tools and materials needed,<br/>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<br/>measurable, and consists of two or more definite steps that leads to a<br/>product, service, or decision.
- UnderpinningCrucial knowledge that an individual must acquire in order toKnowledge: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.

#### **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 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 STANDARD 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 ENGINEERS (HYDRO)

These standards cover a broad range of duties and tasks that can be performed by a Renewable Energy Engineer (Hydro). 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 (Hydro) 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 (Hydro) shall complete the operation management, overhaul and maintenance of the hydropower station under the coordination of the renewable energy technician (hydro). They can also conduct the operation management of hydraulic structures, metal structures, electromechanical equipment, auxiliary equipment and management equipment in the hydropower station, as well as optimal regulation of reservoirs and economic operation of hydropower stations in accordance with regulating principles.

Generally, the Renewable Energy Engineer (Hydro) performs the following responsibilities:

- a) Typical faults and treatment of generator set equipment in hydropower stations
- b) Hydropower station management
- c) Design of small and medium-sized hydropower stations
- d) Operation management of hydraulic structures
- e) Operation management of metal structures
- f) Operation management of electromechanical equipment
- g) Operation management of auxiliary equipment
- h) Operation management of management equipment
- i) Optimization of operation management
- k) Hydropower station management

The Occupational Standards have been clustered into NTA qualification levels, i.e. NTA level 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

# (HYDRO) - NTA LEVEL 7

OCCUPATION	RENEWABLE EN (HYDRO)	ERGY ENGINEER	OCCUPATION CODE	
DUTY TITLE	CONDUCT TH MANAGEMENT STRUCTURES	IE OPERATION OF HYDRAULIC	DUTY NO.	701
TASK TITLE	MONITOR AND SEEPAGE PI HYDRAULIC STRU	ANALYZE THE RESSURE OF UCTURES	TASK NO.	7011
PERFORMANCE CRITERIA	seepage pressure of	ing this task must be a hydraulic structures, in aintenance regulations.		•
RANGE STATEMENT	<ul> <li>The task can be performed in the hydraulic structure under the supervision of water conservancy and hydropower engineer.</li> <li>The tools and equipment to be used include: <ol> <li>Water measuring weirs, piezometer tubes, flowmeters and its parts;</li> <li>Computer and its operating system;</li> <li>Statistical analysis software.</li> </ol> </li> <li>Safety gear.</li> </ul>			
	EVIDENC	E REQUIREMENT		
PRACTICAL PERI	FORMANCE	UNDERPINNING F	KNOWLEDGE	
<ul> <li>The person performing this task must be able to do the following:</li> <li>1. Observe seepage discharge with water measuring weirs or flowmeters;</li> <li>2. Observe uplift pressure (concrete</li> </ul>		Detailed knowledge 1.0 Methods The person perform explain how to 1.1 Observe the seep	ing this task must	be able to
<ul> <li>dams) or wetting lines (earth-rock dams) with piezometer tubes;</li> <li>3. Judge and remove common faults of monitoring equipment;</li> <li>4. Conduct sensitivity tests of observation equipment;</li> </ul>		<ol> <li>1.2 Observe the uplit</li> <li>1.3 Observe the wett</li> <li>1.4 Check and analyz</li> <li>1.5 Check and main and system.</li> </ol>	ing line; ze seepage monitori	0
-	Fill in the seepage rd table in accordance data;	<b>2.0 Principles</b> The person perform:	ing this task must	be able to

<ul> <li>Cherrier in origination analyze and judge the abnormal value;</li> <li>Arrange observation sections and organize the implementation of manual comparison and measurement of seepage discharge;</li> <li>Clean the tools, equipment and workplaces;</li> <li>Standardize the storage of operating tools and equipment.</li> <li>Observe health occupational and environmental safety rules and regulations</li> <li><b>3.0 Theories</b> The person performing this task must be able to explain the following:</li> <li>Principles of analyzing abnormal seepage monitoring data;</li> <li>Causes of common faults of monitoring equipment;</li> <li>Principles of analyzing abnormal seepage monitoring data;</li> <li>Causes of abnormal seepage monitoring data.</li> <li>Causes of abnormal seepage monitoring data;</li> <li>Management skills;</li> <li>Learning skills;</li> <li>Earning skills;</li> <li>Communication skills;</li> <li>Earning skills;</li> <li>Report writing skills;</li> <li>Repare and the operation and maintenance manual.</li> </ul>	6.	Check the original data monitored by	explain the following principles:
the abnormal value;The sensing formation for the automating formation of gamize the implementation of manual comparison and measurement of seepage discharge;2.2 Working principles of piezometer tubes;8. Clean the tools, equipment and workplaces;2.4 Working principles and procedures of manual comparison and measurement of seepage;9. Standardize the storage of operating tools and equipment.2.5 Principles and procedures of inspection and maintenance of the automated system.10. Observe health occupational and cregulations3.0 Theories3.1 Principles of judging the fault of monitoring equipment;3.2 Principles of analyzing abnormal seepage monitoring data;3.3 Causes of common faults of monitoring equipment;3.2 Principles of analyzing abnormal seepage monitoring data;3.4 Causes of abnormal seepage monitoring data.4.0 Essential Skills4.1 Communication skills;4.1 Communication skills;4.2 Learning skills;4.3 Management skills;4.4 Equipment operation skills;4.2 Learning skills;4.5 Teamwork skills;4.6 Report writing skills;4.6 Report writing skills;4.7 Observation skills;4.7 Observation skills;4.7 Observation skills;4.8 Report writing skills;4.7 Observation skills;4.9 RESCRIPTION OF THE END PRODUCT / SERVICEDetailed knowledge about:	0.		
<ul> <li>organize the implementation of manual comparison and measurement of seepage discharge;</li> <li>3. Working principles of the automatic monitoring system;</li> <li>3. Working principles of the automatic monitoring system;</li> <li>4. Principles and procedures of inspection and maintenance of the automated system.</li> <li>3.0 Theories</li> <li>5.1 From the following:</li> <li>3.1 Principles of judging the fault of monitoring equipment;</li> <li>3.2 Principles of analyzing abnormal seepage monitoring data;</li> <li>3.3 Causes of abnormal seepage monitoring data.</li> <li>4.0 Essential Skills</li> <li>The person performing this task must have the following skills;</li> <li>4.1 Communication skills;</li> <li>4.2 Learning skills;</li> <li>4.3 Management skills;</li> <li>4.4 Equipment operation skills;</li> <li>4.5 Teamwork skills;</li> <li>4.6 Report writing skills;</li> <li>4.7 Observation skills;</li> <li>4.8 Equipment operation skills;</li> <li>4.9 Essential Skills</li> </ul>		the abnormal value;	
<ul> <li>2.3 Working principles of the automate monitoring system;</li> <li>2.4 Principles and procedures of manual comparison and measurement of seepage;</li> <li>2.5 Principles and procedures of inspection and maintenance of the automated system.</li> <li>2.6 Observe health occupational and environmental safety rules and regulations</li> <li>3.0 Theories</li> <li>3.0 Theories</li> <li>3.1 Principles of analyzing abnormal seepage monitoring equipment;</li> <li>3.2 Principles of analyzing abnormal seepage monitoring data;</li> <li>3.3 Causes of common faults of monitoring equipment;</li> <li>3.4 Causes of abnormal seepage monitoring data.</li> <li>4.0 Essential Skills</li> <li>The person performing this task must have the following skills;</li> <li>4.1 Communication skills;</li> <li>4.2 Learning skills;</li> <li>4.3 Management skills;</li> <li>4.4 Equipment operation skills;</li> <li>4.5 Teamwork skills;</li> <li>4.6 Report writing skills;</li> <li>4.7 Observation skills;</li> <li>4.7 Observation skills;</li> <li>4.7 Observation skills;</li> <li>4.7 Observation skills;</li> <li>4.8 Report writing skills;</li> <li>4.9 Report writing skills;</li> <li>4.1 Communication skills;</li> <li>4.2 Requirements and the operation and maintenance manual.</li> </ul>	7.	-	2.2 Working principles of piezometer tubes;
<ul> <li>8. Clean the tools, equipment and workplaces;</li> <li>9. Standardize the storage of operating tools and equipment.</li> <li>10. Observe health occupational and environmental safety rules and regulations</li> <li>3.0 Theories</li> <li>3.1 Principles of judging the fault of monitoring equipment;</li> <li>3.2 Principles of analyzing abnormal seepage monitoring data;</li> <li>3.3 Causes of common faults of monitoring equipment;</li> <li>3.4 Causes of abnormal seepage monitoring data.</li> <li>4.0 Essential Skills</li> <li>The person performing this task must have the following: skills;</li> <li>4.1 Communication skills;</li> <li>4.2 Learning skills;</li> <li>4.3 Management skills;</li> <li>4.4 Equipment skills;</li> <li>4.5 Teamwork skills;</li> <li>4.6 Report writing skills;</li> <li>4.7 Observation skills;</li> <li>4.8 Report writing skills;</li> <li>4.9 Report writing skills;</li> <li>4.1 Causen of hydraulic structures is monitored and analyzed in accordance with the technical requirements and the operation and maintenance manual.</li> </ul>		manual comparison and measurement	
<ul> <li>9. Standardize the storage of operating tools and equipment.</li> <li>10. Observe health occupational and environmental safety rules and regulations</li> <li>3.0 Theories The person performing this task must be able to explain the following: <ol> <li>Principles of analyzing abnormal seepage monitoring data;</li> <li>Principles of common faults of monitoring equipment;</li> <li>Causes of common faults of monitoring data;</li> <li>Causes of abnormal seepage monitoring data;</li> <li>CIRCUMSTANTIAL KNOWLEDGE</li> </ol> </li> <li>Description of THE KNOWLEDGE</li> <li>CIRCUMSTANTIAL KNOWLEDGE</li> </ul>	8.	Clean the tools, equipment and	
environmental safety rules and regulations3.0 TheoriesThe person performing this task must be able to explain the following: 3.1 Principles of judging the fault of monitoring equipment; 3.2 Principles of analyzing abnormal seepage monitoring data; 3.3 Causes of common faults of monitoring equipment; 3.4 Causes of abnormal seepage monitoring data.4.0 Essential Skills The person performing this task must have the following skills: 4.1 Communication skills; 4.2 Learning skills; 4.3 Management skills; 4.4 Equipment operation skills; 4.5 Teamwork skills; 4.6 Report writing skills; 4.7 Observation skills; 4.7 Observation skills.DESCRIPTION OF THE END PRODUCT/SERVICEThe seepage pressure of hydraulic structures is monitored and analyzed in accordance with the technical requirements and the operation and maintenance manual.CIRCUMSTANTIAL KNOWLEDGEDetailed knowledge about:	9.	Standardize the storage of operating	
regulationsThe person performing this task must be able to explain the following: 3.1 Principles of judging the fault of monitoring equipment; 3.2 Principles of analyzing abnormal seepage monitoring data; 3.3 Causes of common faults of monitoring equipment; 3.4 Causes of abnormal seepage monitoring data. <b>4.0 Essential Skills</b> The person performing this task must have the following skills: 4.1 Communication skills; 4.2 Learning skills; 4.3 Management skills; 4.4 Equipment operation skills; 4.5 Teamwork skills; 4.6 Report writing skills; 4.7 Observation skills. <b>DESCRIPTION OF THE END</b> <b>PRODUCT / SERVICE</b> The seepage pressure of hydraulic structures is monitored and analyzed in accordance with the technical requirements and the operation and maintenance manual. <b>CIRCUMSTANTIAL KNOWLEDGEDetailed knowledge about:</b>	10.	-	3.0 Theories
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<ul> <li>4.2 Learning skills;</li> <li>4.3 Management skills;</li> <li>4.4 Equipment operation skills;</li> <li>4.5 Teamwork skills;</li> <li>4.6 Report writing skills;</li> <li>4.7 Observation skills.</li> </ul> DESCRIPTION OF THE END PRODUCT / SERVICE THE END PRODUCT / SERVICE THE END The seepage pressure of hydraulic structures is monitored and analyzed in accordance with the technical requirements and the operation and maintenance manual. CIRCUMSTANTIAL KNOWLEDGE Detailed knowledge about:			
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<b>DESCRIPTION OF THE END</b> 4.7 Observation skills. <b>DESCRIPTION OF THE END</b> The seepage pressure of hydraulic structures is monitored and analyzed in accordance with the technical requirements and the operation and maintenance manual. <b>CIRCUMSTANTIAL KNOWLEDGE Detailed knowledge about:</b>			4.5 Teamwork skills;
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PRODUCT / SERVICE       monitored and analyzed in accordance with the technical requirements and the operation and maintenance manual.         CIRCUMSTANTIAL KNOWLEDGE       Detailed knowledge about:			4.7 Observation skills.
			monitored and analyzed in accordance with the technical requirements and the operation and
1. Occupational health and safety;	CII	RCUMSTANTIAL KNOWLEDGE	Detailed knowledge about:
			1. Occupational health and safety;

2.	Regulations and detailed rules of the local
	government;
3.	Operation procedures of equipment maintenance;
4.	Hydro geographical environment and climate.

00	CUPATION	RENEWABLE EN (HYDRO)	ERGY ENGINEER	OCCUPATION CODE	
DU	TY TITLE	CONDUCT TH MANAGEMENT STRUCTURES	IE OPERATION OF HYDRAULIC	DUTY NO.	701
TA	SK TITLE		ANALYZE THE PRMATION OF THE F THE HYDRAULIC	TASK NO.	7012
	RFORMANCE ITERIA	external deformation	ing this task must be a on of dam surface of nnical requirements and	of the hydraulic st	tructures in
	<ul> <li>RANGE The task can be performed in the hydraulic structure under the supervision of water conservancy and hydropower engineer. The tools and equipment to be used include:</li> <li>1. Theodolites or total stations and other equipment and their parts;</li> <li>2. Computer and its operating system;</li> <li>3. Statistical analysis software.</li> <li>4. Safety gear.</li> </ul>			er.	
		EVIDENC	CE REQUIREMENT		
PR	ACTICAL PERF	ORMANCE	UNDERPINNING F	KNOWLEDGE	
	1 1	ng this task must be	Detailed knowledge	about:	
able 1.	e to do the followin Conduct the settle the dam surface v	ement observation of	<b>1.0 Methods</b> The person perform explain how to:	ing this task must	be able to
2.		tions to conduct the cement observation	1.1 Conduct dam su with theodolites	or total stations;	
3.		tivity tests of oment;	<ul><li>1.2 Check and analy surface displacer</li><li>1.3 Check the dam s</li></ul>	nent;	
4.	record table	in the observation of dam surface accordance with the	data; 1.4 Analyze the dam data.	-	-
5.	5. Check the original data monitored by the equipment, and analyze and judge the abnormal value;		<ul> <li>2.0 Principles</li> <li>The person perform explain the following</li> <li>2.1 Working princip stations;</li> </ul>	principles:	

<ol> <li>Organize the manual comparison and measurement of dam surface displacement;</li> <li>Clean the tools, equipment and workplaces;</li> <li>Standardize the storage of operating tools and equipment.</li> </ol>	<ul> <li>2.2 Working principles of the automatic monitoring system;</li> <li>2.3 Principles and procedures of manual comparison and measurement of dam surface displacement;</li> <li>2.4 Principles and procedures of inspection and maintenance of the automated system.</li> </ul>
9. Observe health occupational and environmental safety rules and regulations	<ul> <li>3.0 Theories</li> <li>The person performing this task must be able to explain the following:</li> <li>3.1 Principles of judging the common fault of monitoring equipment;</li> <li>3.2 Principles of analyzing the abnormal monitoring data of dam surface displacement;</li> <li>3.3 Causes of common faults of monitoring equipment;</li> <li>3.4 Causes of abnormal monitoring data of dam surface displacement.</li> </ul>
	<ul> <li>4.0 Essential Skills</li> <li>The person performing this task must have the following skills:</li> <li>4.1 Communication skills;</li> <li>4.2 Learning skills;</li> <li>4.3 Management skills;</li> <li>4.4 Equipment operation skills;</li> <li>4.5 Teamwork skills;</li> <li>4.6 Report writing skills.</li> </ul>
DESCRIPTION OF THE END PRODUCT / SERVICE	The external deformation of the dam surface of hydraulic structures is monitored, and analyzed in accordance with the technical requirements and the operation and maintenance manual.
CIRCUMSTANTIAL KNOWLEDGE	<ul> <li>Detailed knowledge about:</li> <li>1. Occupational health and safety;</li> <li>2. Regulations and detailed rules of the local government;</li> <li>3. Operation procedures of equipment maintenance;</li> <li>4. Hydro-geographical environment and climate.</li> </ul>

OC	CUPATION	RENEWABLE I (HYDRO)	ENERGY ENGINEER	OCCUPATION CODE	
DU	TY TITLE	AND MAINTE	THE MANAGEMENT NANCE OF METAL DF THE HYROPOWER		702
TAS	SK TITLE		HE OVERHAUL AND EOF PENSTOCKS OF WER STATIONS	TASK NO.	7021
	RFORMANCE ITERIA	maintenance of th	rming this task must be a he penstock of hydropo ments and maintenance	wer stations in acco	ordance with
	NGE ATEMENT	of water conserva The tools and equ 1. Safety protec	erformed in the hydrauli ncy and hydropower eng ipment to be used includ tion equipment and eme d its accessory structural	gineer. le: rgency tools;	supervision
		EVIDE	NCE REQUIREMENT		
PR	ACTICAL PERF	ORMANCE	UNDERPINNING KN	NOWLEDGE	
	<ul> <li>The person performing this task must be able to do the following:</li> <li>1. Carry out the overhaul and maintenance of the penstock of hydropower stations in accordance with Technical Requirements for Operation and Maintenance of</li> </ul>		Detailed knowledge at 1.0 Methods The person performing how to: 1.1 Overhaul the penst 1.2 Maintain the penst	this task must be ab ock;	le to explain
2.	of penstocks;	detection of cking and leakage	<b>2.0 Principles</b> The person performing the following principle	s:	
3.	in the dam;	overhaul and he buried section	<ul><li>2.1 Operation and main</li><li>2.2 Overhaul and main</li><li>penstocks in the data</li></ul>	ntenance procedures	-
4.	Conduct the maintenance of vibration.	detection and exposed penstock	2.3 Operating proceed penstocks.	lures for handling	g abnormal
5.		occupational and afety rules and	<b>3.0 Theories</b> The person performing	this task must be ab	le to explain

	· · · · · · · · · · · · · · · · · · ·
	the following:
	3.1 Principles of judging the abnormality of penstocks;
	3.2 Causes of common faults of penstocks;
	3.3 Overhaul procedures of penstock vibration and
	measures of vibration reduction.
	4.0 Essential Skills
	The person performing this task must have the following skills:
	4.1 Communication skills;
	4.2 Learning skills;
	4.3 Management skills;
	4.4 Teamwork skills;
	4.5 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The penstocks of the hydropower stations are overhauled and maintained in accordance with technical requirements and the operation and maintenance manual.
CIRCUMSTANTIAL	Detailed knowledge about:
KNOWLEDGE	1. Occupational health and safety;
	2. Regulations and detailed rules of the local government;
	<ol> <li>Operation procedures of equipment maintenance;</li> </ol>
	<ol> <li>Operation procedures of equipment maintenance,</li> <li>Hydro-geographical environment and climate.</li> </ol>
	+. Trydro-geographical environment and enniate.

OC	CUPATION	RENEWABLE (HYDRO)	ENERGY ENGINEER	OCCUPATION CODE	
DU	TY TITLE	CARRY OUT AND MAINT STRUCTURES HYDROPOWE	OF THE	DUTY NO.	702
TAS	SK TITLE	CARRY OUT THE OVERHAUL AND MAINTENANCE OF GATES AND HOISTS AND TRASH RACKS OF THE HYDROPOWER STATIONSTASK NO.7022			7022
	RFORMANCE ITERIA	The person performing this task must be able to carry out the overhaul and maintenance of the gates, hoists and trash racks of hydropower stations in accordance with technical requirements and maintenance regulations to ensure safe and stable operation.			
	NGE ATEMENT	<ul><li>The task can be performed in the hydraulic structure under the supervision of water conservancy and hydropower engineer.</li><li>The tools and equipment to be used include:</li><li>1. Safety protection equipment and emergency tools;</li></ul>			
			ture parts of the gate.		
			ENCE REQUIREMENT		
-	ACTICAL PERF		UNDERPINNING KNO		
	person performin	-	C C	ut:	
<ul> <li>be able to do the following:</li> <li>1. Carry out the overhaul and maintenance of the gate and hoist of hydropower stations in accordance with Technical Requirements for Operation and Maintenance of Small</li> </ul>		<ul><li>1.0 Methods</li><li>The person performing the how to:</li><li>1.1 Overhaul the gate and</li><li>1.2 Maintain the gate and</li></ul>	l hoist;	e to explain	
	Hydropower Stati	ions;	2.0 Principles		
2.	2. Carry out the overhaul and maintenance of the defect of gate surfaces;		The person performing the following principles: 2.1 Operation and mainter		-
3.	Carry out the maintenance of integrity;		<ul><li>2.1 Operation and manne and trash racks;</li><li>2.2 Causes of common f racks.</li></ul>		-
4.	Carry out the maintenance of g structure;		<b>3.0 Theories</b> The person performing the following:	iis task must be abl	e to explain

	1
5. Carry out the overhaul and maintenance of hydraulic hoists;	3.1 Principles of judging the faults of gates, hoists and trash racks;
6. Carry out the overhaul and	3.2 Procedures for overhauling gates and hoists;
maintenance of winches;	3.3 Procedures for maintaining gates and hoists.
7. Carry out the overhaul and	
maintenance of trash racks;	4.0 Essential Skills
8. Carry out power supply equipment inspection and test switching;	The person performing this task must have the following skills:
9. Fill in overhaul and maintenance	4.1 Communication skills;
records;	4.2 Learning skills;
10. Formulate the annual overhaul	4.3 Management skills;
and maintenance plan.	4.4 Teamwork skills;
11. Observe health occupational and	4.5 Report writing skills.
environmental safety rules and regulations	
DESCRIPTION OF THE END	The gates, hoists and trash racks of the hydropower
PRODUCT / SERVICE	stations are overhauled and maintained in accordance with
	technical requirements and the operation and maintenance manual.
CIRCUMSTANTIAL	Detailed knowledge about:
KNOWLEDGE	1. Occupational health and safety;
	2. Regulations and detailed rules of the local government;
	3. Operation procedures of equipment maintenance;
	4. Hydro-geographical environment and climate.

OCCUPATION	RENEWABLE (HYDRO)	ENERGY ENGINEER	OCCUPATION CODE	
DUTY TITLE	QUANTITY	THE ENVIRONMENTAL MONITORING AND F THE HYDROPOWER	DUTY NO.	703
TASK TITLE	QUANTITY	THE ENVIRONMENTAL MONITORING AND F THE HYDROPOWER	TASK NO.	7031
PERFORMANCE CRITERIA	quantity monito	orming this task must be abl ring and analysis of the hy equirements and maintenan	dropower station in	
RANGE STATEMENT	of water conserv The tools and ec 1. Water gaug 2. Computer a	performed in the hydraulic vancy and hydropower engi- quipment to be used include es, rain gauges and relevan and its operating system; nalysis software.	neer. e:	supervision
		ENCE REQUIREMENT		
PRACTICAL PERF	ORMANCE	UNDERPINNING KNO	WLEDGE	
<ol> <li>The person performin be able to do the folloo</li> <li>Use water gauges water level correct</li> <li>Monitor air precipitation and</li> <li>Check the origina by the equipmen judge the abnorm</li> <li>Integrate the more carry out prelimin</li> <li>Judge and remove of monitoring equ</li> <li>Carry out the</li> </ol>	wing: s to observe the ctly; temperature, other items; l data monitored nt; analyze and al value; hitoring data and nary analysis; e common faults hipment;	<ul> <li>Detailed knowledge above</li> <li>1.0 Methods</li> <li>The person performing the how to:</li> <li>1.1 Use water gauges as precipitation observate</li> <li>1.2 Check and analyzed monitoring data.</li> <li>2.0 Principles</li> <li>The person performing the following principles:</li> <li>2.1 Working principles of</li> <li>2.2 Working principles</li> </ul>	his task must be abl and rain gauges to tion; the environment his task must be abl f water gauges and i	c carry out al quantity e to explain rain gauges;

7. Observe health occupational and environmental safety rules and regulations	2.4 Principles and procedures of inspection and maintenance of the automated system.
	3.0 Theories
	The person performing this task must be able to explain the following:
	3.1 Principles of judging the common fault of monitoring equipment;
	3.2 Principles of analyzing the causes of abnormal environmental quantity monitoring data;
	3.3 Causes of common faults of monitoring equipment;
	3.4 Causes of abnormal water level and precipitation monitoring data.
	4.0 Essential Skills
	The person performing this task must have the following skills:
	4.1 Communication skills;
	4.2 Learning skills;
	4.3 Management skills;
	4.4 Teamwork skills;
	4.5 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The environmental quantity monitoring of hydropower stations is carried out and common faults are dealt with, and abnormal data and hydrological status of environment are judged and analyzed in accordance with technical requirements and the operation and maintenance manual.
CIRCUMSTANTIAL	Detailed knowledge about:
KNOWLEDGE	1. Occupational health and safety;
	2. Regulations and detailed rules of the local government;
	3. Operation procedures of equipment maintenance;
	4. Hydro-geographical environment and climate.

OCCUPATION	RENEWABLE (HYDRO)	ENERGY ENGINEER	OCCUPATION CODE	
DUTY TITLE	CARRY OUT MANAGEMEN ELECTROMEC EQUIPMENT	VT OF	DUTY NO.	704
TASK TITLE		UT THE OUTPUT AND ANALYSIS OF LIC TURBINES	TASK NO.	7041
PERFORMANCE CRITERIA	monitoring and	forming this task must be analysis of the hydrauli ements and maintenance re	c turbines in accor	-
RANGE STATEMENT	<ul><li>the supervision</li><li>The tools and ed</li><li>Safety protect</li></ul>	performed in the powerhou of water conservancy and h quipment to be used include ection equipment and emerg urbine parts.	ydropower enginee	
	EVID]	ENCE REQUIREMENT		
PRACTICAL PERF	FORMANCE	UNDERPINNING KNO	WLEDGE	
<ul> <li>generator sets;</li> <li>2. Handle the far generator set sur load when running to various reason</li> <li>3. Handle the fault controller is out of the normal start-to of the generator set.</li> <li>4. Handle the fault shear pins are control of the generator set.</li> </ul>	owing: over speed of ault where the ddenly loses the ng with load due as; where the speed of control during up and shutdown set; where multiple at off during the and shutdown (or	<ul> <li>Detailed knowledge above</li> <li>1.0 Methods</li> <li>The person performing the how to:</li> <li>1.1 Handle common fault</li> <li>2.0 Principles</li> <li>The person performing the following principles:</li> <li>2.1 Principles of handling turbine operation;</li> <li>2.2 Causes of common operation.</li> <li>3.0 Theories</li> </ul>	his task must be abl as in hydraulic turbin his task must be abl ng common faults i h faults in hydrau	e operation. e to explain n hydraulic ılic turbine
<ol> <li>Handle the over- of guide bearing</li> <li>Handle the lubricating oil;</li> </ol>		<ul><li>The person performing the following:</li><li>3.1 Principles of judging hydraulic turbine operation</li></ul>	the causes of comm	-

7 Handle cil deterioration	2.2. Procedures of handling common faults in hydroulis
7. Handle oil deterioration;	3.2 Procedures of handling common faults in hydraulic turbine operation;
8. Handle the cooling water interruption or cooling water pressure reduction;	3.3 Causes of the fault where the generator set suddenly loses the load when running with load due to various
9. Handle the cutting off of shear	reasons;
<ul><li>pins;</li><li>10. Handle the fault where the guide vane fails to move due to foreign</li></ul>	3.4 Causes of the fault where the speed controller is out of control during the normal start-up and shutdown of the generator set;
<ul><li>bodies or mechanical jamming between guide vanes;</li><li>11. Handle the fault where the</li></ul>	3.5 Causes of the fault where multiple shear pins are cut off during the normal start-up and shutdown (or emergency shutdown) of the generator set;
pressure of water flow on the	3.6 Causes of lubricating oil reduction;
guide vane increases when the	3.7 Causes of oil deterioration;
guide vane is opened or closed too fast.	3.8 Causes of cooling water interruption or cooling water pressure reduction;
12. Observe health occupational and environmental safety rules and regulations	3.9 Causes of the fault where the guide vane failing to move due to foreign bodies or mechanical jamming between guide vanes;
	3.10Causes of the fault where the pressure of water flow on the guide vane increases when the guide vane is opened or closed too fast.
	4.0 Essential Skills
	The person performing this task must have the following skills:
	4.1 Communication skills;
	4.2 Learning skills;
	4.3 Management skills;
	4.4 Teamwork skills;
	4.5 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The output monitoring and analysis of hydraulic turbines are carried out in accordance with technical requirements and the operation and maintenance manual.
CIRCUMSTANTIAL	Detailed knowledge about:
KNOWLEDGE	1. Occupational health and safety;
	2. Regulations and detailed rules of the local government;
	3. Operation procedures of equipment maintenance;
	4. Hydro-geographical environment and climate.

00	CUPATION	RENEWABLE (HYDRO)	ENERGY ENGINEER	OCCUPATION CODE	
DU	TY TITLE	CARRY OUT MANAGEMEN ELECTROMEC EQUIPMENT	OF OF	DUTY NO.	704
ТА	SK TITLE	CARRY OUT T ANALYSIS O PARAMETERS		TASK NO.	7042
	RFORMANCE ITERIA	and analysis of	forming this task must be a the generator parameters d maintenance regulations.	•	-
	NGE ATEMENT	<ul><li>the supervision</li><li>The tools and ec</li><li>1. Safety prote</li><li>2. Component</li></ul>	performed in the power hou of water conservancy and h quipment to be used include ection equipment and emerg as and parts of generators. ENCE REQUIREMENT	ydropower engineer	
PR	ACTICAL PERF		UNDERPINNING KNO	WLEDGE	
	e person performin able to do the follo Monitor the electr Monitor the reactive power an Monitor the stat	wing: rical parameters; active power, d frequency;	<b>Detailed knowledge about</b> <b>1.0 Methods</b> The person performing the how to: 1.1 Processing generator 1.2 Analyze the causes of	iis task must be able monitoring paramet	ers;
4. 5. 6.	currents; Monitor the rot currents; Monitor the cooli Monitor the s (interlayer) tempo core temperature;	ng medium; stator winding erature and iron	<ul><li>2.0 Principles</li><li>The person performing the following principles:</li><li>2.1 Principles of monitor</li><li>2.2 Principles of generator</li></ul>	ing generator param	
7. 8.	Monitor the outle stator winding co cooling water pre Monitor the f temperature, and	t temperature of ooling water and ssure; low, hydrogen the inlet and emperature of	<ul> <li>3.0 Theories</li> <li>The person performing the following:</li> <li>3.1 Monitoring analysis of and frequency;</li> <li>3.2 Monitoring analysis of analysi</li></ul>	of active power, rea	ctive power

9. Monitor the mechanical	3.3 Monitoring analysis of rotor voltage and currents;
parameters;	3.4 Monitoring analysis of stator winding (interlayer)
10. Monitor the hydrogen pressure	temperature and iron core temperature;
and sealing oil pressure in the machine;	3.5 Monitoring analysis of the outlet temperature of the
	stator winding cooling water and cooling water
11. Monitor the bearing temperature;	pressure;
12. Monitoring of axial vibration.	3.6 Monitoring analysis of flow, hydrogen temperature, and the inlet and outlet water temperature of
13. Analyze the obtained data	hydrogen coolers;
14. Observe health occupational and	3.7 Monitoring analysis of hydrogen pressure and sealing
environmental safety rules and regulations	oil pressure in the machine;
regulations	3.8 Monitoring analysis of bearing temperature.
	4.0 Essential Skills
	The person performing this task must have the following
	skills:
	4.1 Communication skills;
	4.2 Learning skills;
	4.3 Management skills;
	4.4 Teamwork skills;
	4.5 Report writing skills.
DESCRIPTION OF THE END	The monitoring and analysis of the generator parameters
PRODUCT / SERVICE	are carried out in accordance with technical requirements
	and the operation and maintenance manual.
CIRCUMSTANTIAL	Detailed knowledge about:
KNOWLEDGE	1. Occupational health and safety;
	2. Regulations and detailed rules of the local
	government;
	3. Operation procedures of equipment maintenance;
	4. Hydro-geographical environment and climate.

OCCUPATION	RENEWABLE (HYDRO)	ENERGY ENGINEER	OCCUPATION CODE	
DUTY TITLE	CARRY OUT MANAGEMEN ELECTROMEC EQUIPMENT	OF OF	DUTY NO.	704
TASK TITLE		E OPERATING STATE OR SETS AND CARRY ESHOOTING	TASK NO.	7043
PERFORMANCE CRITERIA	of generator sets	orming this task must be ab and carry out troubleshoot d maintenance regulations.	• •	-
RANGE STATEMENT	<ul><li>the supervision of</li><li>The tools and ec</li><li>Safety prote</li><li>Component</li></ul>	performed in the power hou of water conservancy and h quipment to be used include ection equipment and emerg as and parts of generators. ENCE REQUIREMENT	ydropower enginee:	
		_		
PRACTICAL PERF		UNDERPINNING KNO		
<ul><li>The person performin</li><li>be able to do the follo</li><li>1. Handle generator</li><li>2. Handle the one-particular</li></ul>	wing: overload;	<b>Detailed knowledge about</b> <b>1.0 Methods</b> The person performing the how to:		e to explain
<ol> <li>fault of generator</li> <li>Handle the two- fault of rotor circu</li> <li>Handle the over-h of generators;</li> </ol>	rotors; point grounding uits;	<ul><li>1.1 Analyze the running equipment;</li><li>1.2 Troubleshoot the ope</li></ul>	-	
5. Handle the dis		<b>2.0 Principles</b> The person performing the	is task must be abl	e to explain
<ul><li>generator rotor ci</li><li>6. Handle the grou</li><li>generator stators;</li></ul>		<ul><li>the following principles:</li><li>2.1 Operating princip equipment;</li></ul>	les of electro	omechanical
<ol> <li>Handle the smo generators.</li> <li>Observe health or</li> </ol>		<ul><li>2.2 Principles of operatio equipment.</li></ul>	n analysis of electro	omechanical
environmental sa regulations	-	<b>3.0 Theories</b> The person performing th	is task must be abl	e to evoluin
		the following:	ns task must of dor	e to explain

	3.1 Causes of generator overload;
	3.2 Causes of the one-point grounding fault of generator rotors;
	3.3 Causes of the two-point grounding fault of rotor circuits;
	3.4 Causes of the over-high temperature of generators;
	3.5 Cause of the disconnection of generator rotor circuits;
	3.6 Causes of the grounding fault of generator rotors;
	3.7 Causes of smoke and fire of generators.
	4.0 Essential Skills
	The person performing this task must have the following skills:
	4.1 Communication skills;
	4.2 Learning skills;
	4.3 Management skills;
	4.4 Teamwork skills;
	4.5 Report writing skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The operating state of generator sets is analyzed and the troubleshooting are carried out in accordance with technical requirements and the operation and maintenance manual.
CIRCUMSTANTIAL	Detailed knowledge about:
KNOWLEDGE	1. Occupational health and safety;
	2. Regulations and detailed rules of the local government;
	3. Operation procedures of equipment maintenance;
	4. Hydro-geographical environment and climate.

OCCUPATION	RENEWABLE (HYDRO)	ENERGY ENGINEER	OCCUPATION CODE	
DUTY TITLE		THE MANAGEMENT NANCE OF AUXILIARY	DUTY NO.	705
TASK TITLE	CARRY OUT MAINTENANC CONTROL SYS		TASK NO.	7051
PERFORMANCE CRITERIA	maintenance of	forming this task must be ab f speed control systems nd maintenance regulation	in accordance with	h technical
RANGE STATEMENT	<ul><li>the supervision</li><li>The tools and ed</li><li>Safety protect</li></ul>	performed in the power hou of water conservancy and h quipment to be used include ection equipment and emerg speed controller.	ydropower engineer	
	EVID	ENCE REQUIREMENT		
PRACTICAL PER	FORMANCE	UNDERPINNING KNO	WLEDGE	
<ul> <li>debugging;</li> <li>2. Handle coil agin</li> <li>3. Handle the hydrito meet the requisition of the</li></ul>	owing: fault of new cograms during ng; aulic value failing irements; r contact between ; ult in the fixed controller during alt where foreign	<ul> <li>Detailed knowledge about</li> <li>1.0 Methods</li> <li>The person performing the how to:</li> <li>1.1 Overhaul the speed control systems.</li> </ul>	nis task must be able ontrol system; ontrol system. nis task must be able of speed control syst	e to explain tems;
7. Handle external	c of flexibility in rocess;	<ul><li><b>3.0 Theories</b></li><li>The person performing the following:</li><li>3.1 Causes of coil aging;</li></ul>	nis task must be able	e to explain

10. Handle the multiple oil return angles for the pipeline;	3.2 Causes of hydraulic value failing to meet the requirements;
11. Handle the oil leakage of seals;	3.3 Causes of the poor contact between plug assemblies;
<ol> <li>Handle oil cleanliness reduction;</li> <li>Handle unstable component</li> </ol>	3.4 Causes of the fault where foreign bodies enter parts and pipelines;
operation.	3.5 Causes of external leakage;
14. Observe health occupational and environmental safety rules and	3.6 Causes of the lack of flexibility in the execution process;
regulations	3.7 Causes of multiple oil return angles for the pipeline;
	3.8 Causes of the oil leakage of seals;
	3.9 Causes of oil cleanliness reduction;
	3.10Causes of unstable component operation.
	4.0 Essential Skills
	The person performing this task must have the following skills:
	4.1 Communication skills;
	4.2 Learning skills;
	4.3 Management skills;
	4.4 Teamwork skills;
	4.5 Report writing skills.
DESCRIPTION OF THE END	
PRODUCT / SERVICE	The overhaul and maintenance of speed control systems are carried out in accordance with technical requirements and the operation and maintenance manual.
	are carried out in accordance with technical requirements
PRODUCT / SERVICE	are carried out in accordance with technical requirements and the operation and maintenance manual.
PRODUCT / SERVICE CIRCUMSTANTIAL	are carried out in accordance with technical requirements and the operation and maintenance manual. <b>Detailed knowledge about:</b>
PRODUCT / SERVICE CIRCUMSTANTIAL	<ul> <li>are carried out in accordance with technical requirements and the operation and maintenance manual.</li> <li>Detailed knowledge about: <ol> <li>Occupational health and safety;</li> <li>Regulations and detailed rules of the local</li> </ol> </li> </ul>
PRODUCT / SERVICE CIRCUMSTANTIAL	<ul> <li>are carried out in accordance with technical requirements and the operation and maintenance manual.</li> <li>Detailed knowledge about: <ol> <li>Occupational health and safety;</li> <li>Regulations and detailed rules of the local government;</li> </ol> </li> </ul>

OCCUPATION	RENEWABLE (HYDRO)	ENERGY ENGINEER	OCCUPATION CODE	
DUTY TITLE		THE MANAGEMENT NANCE OF AUXILIARY	DUTY NO.	705
TASK TITLE		THE OVERHAUL AND AINTENANCE OF SYSTEMS	TASK NO.	7052
PERFORMANCE CRITERIA	maintenance o	orming this task must be ab f excitation systems in nd maintenance regulation	accordance with	n technical
RANGE STATEMENT	the supervision The tools and ec	performed in the power hou of water conservancy and h quipment to be used include	ydropower enginee ::	
		ection equipment and emerge excitation system.	gency tools;	
	EVID	ENCE REQUIREMENT		
PRACTICAL PERF	ORMANCE	UNDERPINNING KNO	WLEDGE	
<ul> <li>The person performine be able to do the follows</li> <li>Clean the screen</li> <li>Conduct insulation</li> <li>Conduct signal to the follows</li> <li>Conduct the FCE</li> <li>Conduct the FCE</li> <li>Conduct the dume</li> <li>Conduct the dume</li> <li>Conduct the excitation transform</li> <li>Conduct the excitation the excita</li></ul>	wing: cabinet; on inspection; ests; detection of ormers; my load test; tation test; automatic and	<ul> <li>Detailed knowledge about 1.0 Methods</li> <li>The person performing the how to:</li> <li>1.1 Overhaul the excitation</li> <li>1.2 Maintain the excitation</li> <li>2.0 Principles</li> <li>The person performing the the following principles</li> <li>2.1 Operating principles of the constraint of the excitation systems.</li> </ul>	iis task must be abl on system; on system. iis task must be abl les: of excitation system	e to explain s;
<ol> <li>Conduct te volts/hertz limitin</li> <li>Set the over-exci</li> <li>Conduct the PT of</li> </ol>	tation limit;	<ul><li><b>3.0 Theories</b></li><li>The person performing the following:</li><li>3.1 Methods of cleaning 5</li><li>3.2 Methods of insulation</li></ul>	the screen cabinet;	e to explain

<ul> <li>13. Observe health occupational and environmental safety rules and regulations</li> <li>3.4 Methods of conducting the FCB test;</li> <li>3.5 Methods of detecting excitation transformers;</li> <li>3.6 Methods of conducting the dummy load test;</li> <li>3.7 Methods of conducting the excitation test;</li> <li>3.8 Methods of conducting the automatic and manual adjustment range test;</li> <li>3.9 Methods of conducting the current sharing inspection;</li> <li>3.10Methods of verification of volts/hertz limiting;</li> <li>3.11Methods of setting the over-excitation limit;</li> <li>3.12Methods of conducting the PT disconnection.</li> </ul>
regulations 3.5 Methods of detecting excitation transformers; 3.6 Methods of conducting the dummy load test; 3.7 Methods of conducting the excitation test; 3.8 Methods of conducting the automatic and manual adjustment range test; 3.9 Methods of conducting the current sharing inspection; 3.10Methods of verification of volts/hertz limiting; 3.11Methods of setting the over-excitation limit;
<ul> <li>3.5 Methods of detecting excitation transformers;</li> <li>3.6 Methods of conducting the dummy load test;</li> <li>3.7 Methods of conducting the excitation test;</li> <li>3.8 Methods of conducting the automatic and manual adjustment range test;</li> <li>3.9 Methods of conducting the current sharing inspection;</li> <li>3.10Methods of verification of volts/hertz limiting;</li> <li>3.11Methods of setting the over-excitation limit;</li> </ul>
<ul> <li>3.7 Methods of conducting the excitation test;</li> <li>3.8 Methods of conducting the automatic and manual adjustment range test;</li> <li>3.9 Methods of conducting the current sharing inspection;</li> <li>3.10Methods of verification of volts/hertz limiting;</li> <li>3.11Methods of setting the over-excitation limit;</li> </ul>
<ul> <li>3.8 Methods of conducting the automatic and manual adjustment range test;</li> <li>3.9 Methods of conducting the current sharing inspection;</li> <li>3.10Methods of verification of volts/hertz limiting;</li> <li>3.11Methods of setting the over-excitation limit;</li> </ul>
adjustment range test; 3.9 Methods of conducting the current sharing inspection; 3.10Methods of verification of volts/hertz limiting; 3.11Methods of setting the over-excitation limit;
<ul><li>3.9 Methods of conducting the current sharing inspection;</li><li>3.10Methods of verification of volts/hertz limiting;</li><li>3.11Methods of setting the over-excitation limit;</li></ul>
inspection; 3.10Methods of verification of volts/hertz limiting; 3.11Methods of setting the over-excitation limit;
3.11 Methods of setting the over-excitation limit;
3.12 Methods of conducting the PT disconnection.
4.0 Essential Skills
The person performing this task must have the following skills:
4.1 Communication skills;
4.2 Learning skills;
4.3 Management skills;
4.4 Teamwork skills;
4.5 Report writing skills.
<b>DESCRIPTION OF THE ENDEND</b> The overhaul and maintenance of excitation systems are carried out in accordance with technical requirements and <b>PRODUCT / SERVICE</b> Carried out in accordance with technical requirements and
the operation and maintenance manual.
circumstantial       Detailed knowledge about:
CIRCUMSTANTIAL Detailed knowledge about:
CIRCUMSTANTIAL       Detailed knowledge about:         KNOWLEDGE       1. Occupational health and safety;         2. Regulations and detailed rules of the local

OCCUPATION	RENEWABLE (HYDRO)	ENERGY ENGINEER	OCCUPATION CODE	
DUTY TITLE	CARRY OUT THE MANAGEMENT <b>DUTY</b> AND MAINTENANCE OF AUXILIARY EQUIPMENT		DUTY NO.	705
TASK TITLE		THE OVERHAUL AND CE OF MAIN VALVES	TASK NO.	7053
PERFORMANCE CRITERIA	The person performing this task must be able to carry out the overhaul an maintenance of main valves and cranes in accordance with technica requirements and maintenance regulations to ensure safe and stable operation.		th technical	
RANGE STATEMENT	<ul> <li>The task can be performed in the power house of hydropower stations un the supervision of water conservancy and hydropower engineer.</li> <li>The tools and equipment to be used include:</li> <li>1. Safety protection equipment and emergency tools;</li> <li>2. Parts of main valves and cranes.</li> </ul>			
EVIDENCE REQUIREMENT				
PRACTICAL PERF	PRACTICAL PERFORMANCE UNDERPINNING KNOWLEDGE			
<ol> <li>The person performing this task must be able to do the following:</li> <li>Handle the fault in the main valve;</li> <li>Handle the system fault;</li> <li>Handle the abnormal valve strength;</li> <li>Handle the damage of plates;</li> <li>Handle the fault in the crane;</li> <li>Handle the fault in the fault in the</li> </ol>		<ul> <li>Detailed knowledge above</li> <li>1.0 Methods</li> <li>The person performing the how to:</li> <li>1.1 Overhaul the main van 1.2 Maintain the main van 1.2 Maintain the main van 1.2 Maintain the main van 1.4 Performing the person performing the the following principles:</li> </ul>	iis task must be abl lve and crane; lve and crane.	-
<ul> <li>transmission mech</li> <li>7. Handle the fault device;</li> <li>8. Handle the fault</li> </ul>	in the braking	<ul><li>2.1 Operating principles</li><li>2.2 Principles of the ove valves and cranes.</li></ul>		
<ul> <li>structure;</li> <li>9. Handle the fault system.</li> <li>10. Observe health or environmental saregulations</li> </ul>	ccupational and	<ul><li><b>3.0 Theories</b></li><li>The person performing the following:</li><li>3.1 Causes of system fault</li><li>3.2 Causes of abnormal version</li></ul>	lts;	e to explain

	3.3 Causes of the damage of plates;		
	3.4 Causes of the fault in the transmission mechanism;		
	3.5 Causes of the fault in the braking device;		
	3.6 Causes of the fault in the metal structure;		
	3.7 Causes of the fault in the electrical system.		
	4.0 Essential Skills		
	The person performing this task must have the following skills:		
	4.1 Communication skills;		
	4.2 Learning skills;		
	4.3 Management skills;		
	4.4 Teamwork skills;		
	4.5 Report writing skills.		
DESCRIPTION OF THE END PRODUCT / SERVICE	The overhaul and maintenance of main valves and cranes are carried out in accordance with technical requirements and the operation and maintenance manual.		
CIRCUMSTANTIAL	Detailed knowledge about:		
KNOWLEDGE	1. Occupational health and safety;		
	2. Regulations and detailed rules of the local government;		
	3. Operation procedures of equipment maintenance;		
	4. Hydro-geographical environment and climate.		

OC	CUPATION	RENEWABLE (HYDRO)	ENERGY ENGINEER	OCCUPATION CODE	
DU	TY TITLE	CARRY OUT THE MANAGEMENT <b>DUTY NO.</b> AND MAINTENANCE OF AUXILIARY EQUIPMENT		705	
TA	SK TITLE	CARRY OUT THE OVERHAUL AND TASK NO. MAINTENANCE OF BOOSTER SYSTEMS		TASK NO.	7054
	RFORMANCE ITERIA	The person performing this task must be able to carry out the overhaul and maintenance of the booster systems in accordance with technical requirements and maintenance regulations to ensure safe and stable operation.			
	NGE ATEMENT	<ul> <li>The task can be performed in the power house of hydropower stations under the supervision of water conservancy and hydropower engineer.</li> <li>The tools and equipment to be used include:</li> <li>1. Safety protection equipment and emergency tools;</li> <li>2. Parts of the booster system.</li> </ul>			
	EVIDENCE REQUIREMENT				
PR.	PRACTICAL PERFORMANCE UNDERPINNING KNOWLEDGE				
<ul> <li>The person performing this task must be able to do the following:</li> <li>1. Prevent insulating oil from absorbing moisture or being covered with dust, resulting in the reduction of insulation performance;</li> <li>2. Ensure that the lighting, heat dissipation and dust removal equipment around the transformer are in good condition;</li> <li>3. Ensure the flexible operation and good contact of load switches on the high voltage side of</li> </ul>		<ul> <li>1.0 Methods</li> <li>The person performing this task must be able to explain how to:</li> <li>1.1 Overhaul the booster system;</li> <li>1.2 Maintain the booster system.</li> <li>2.0 Principles</li> <li>The person performing this task must be able to explain the following principles:</li> <li>2.1 Operating principles of booster systems;</li> <li>2.2 Principles of the overhaul and maintenance of booster</li> </ul>			
4. 5.	transformers; Carry out the transformers; Obtain the assis power department performance of no replacement;	stance of local its to check the	<b>3.0 Theories</b> The person performing the following:	iis task must be abl	e to explain

6. Measure the insulation resistance value (to ground and between	3.1 Methods of preventing insulating oil from absorbing moisture or being covered with dust, resulting in the	
phases) of high and low voltage	reduction of insulation performance;	
<ul><li>coils of transformers with meggers;</li><li>7. Ensure a good grounding wire in</li></ul>	3.2 Methods of ensuring that the lighting, heat dissipation and dust removal equipment around the transformer are in good condition;	
<ul><li>the high-voltage generator or combined head.</li><li>8. Observe health occupational and</li></ul>	3.3 Methods of ensuring the flexible operation and good contact of load switches on the high voltage side of transformers;	
environmental safety rules and regulations	3.4 Methods of carrying out the trial operation of transformers;	
	3.5 Methods of oil replacement;	
	3.6 Methods of measuring the insulation resistance value (to ground and between phases) of high and low voltage coils of transformers with meggers;	
	3.7 Methods of ensuring a good grounding wire in the high-voltage generator or combined head.	
	4.0 Essential Skills	
	The person performing this task must have the following skills:	
	4.1 Communication skills;	
	4.2 Learning skills;	
	4.3 Management skills;	
	4.4 Teamwork skills;	
	4.5 Report writing skills.	
DESCRIPTION OF THE END	The overhaul and maintenance of booster systems are	
PRODUCT / SERVICE	carried out in accordance with technical requirements and	
	the operation and maintenance manual.	
CIRCUMSTANTIAL	Detailed knowledge about:	
KNOWLEDGE	1. Occupational health and safety;	
	2. Regulations and detailed rules of the local government;	
	3. Operation procedures of equipment maintenance;	
	4. Hydro-geographical environment and climate.	

OCCUPATION	RENEWABLE (HYDRO)	ENERGY ENGINEER	OCCUPATION CODE	
DUTY TITLE	CARRY OUT THE MANAGEMENT AND MAINTENANCE OF AUXILIARY EQUIPMENTDUTY NO.705			705
TASK TITLE	CARRY OUT THE OVERHAUL AND MAINTENANCE OF POWER DISTRIBUTION SYSTEMSTASK NO.7055			7055
PERFORMANCE CRITERIA	The person performing this task must be able to carry out the overhaul and maintenance of the booster system in accordance with technical requirements and maintenance regulations to ensure safe and stable operation.			
RANGE STATEMENT	<ul> <li>The task can be performed in the power house of hydropower stations under the supervision of water conservancy and hydropower engineer.</li> <li>The tools and equipment to be used include:</li> <li>1. Safety protection equipment and emergency tools;</li> <li>2. Parts of the power distribution system.</li> </ul>			
EVIDENCE REQUIREMENT				
PRACTICAL PERF	PRACTICAL PERFORMANCE UNDERPINNING KNOWLEDGE			
<ul> <li>The person performing this task must be able to do the following:</li> <li>1. Inspect the transformer;</li> <li>2. Inspect the power capacitor;</li> <li>3. Inspect the current transformer;</li> <li>4. Inspect the DC system.</li> <li>5. Observe health occupational and environmental safety rules and regulations</li> </ul>		<ul> <li>Detailed knowledge about</li> <li>1.0 Methods</li> <li>The person performing the how to:</li> <li>1.1 Overhaul the power of</li> <li>1.2 Maintain the power of</li> <li>2.0 Principles</li> <li>The person performing the following principles:</li> <li>2.1 Operating principles</li> <li>2.2 Principles of the over distribution systems.</li> </ul>	his task must be abl listribution system; listribution system. his task must be abl of power distributio	e to explain n systems;
		<ul><li>3.0 Theories</li><li>The person performing the following:</li><li>3.1 Methods of inspecting</li><li>3.2 Methods of inspecting</li></ul>	g the transformer;	-

	3.3 Methods of inspecting the current transformer;	
	3.4 Methods of inspecting the DC system.	
	4.0 Essential Skills	
	The person performing this task must have the following skills:	
	4.1 Communication skills;	
	4.2 Learning skills;	
	4.3 Management skills;	
	4.4 Teamwork skills;	
	4.5 Report writing skills.	
DESCRIPTION OF THE END PRODUCT / SERVICE	<b>D</b> The overhaul and maintenance of power distribution systems are carried out in accordance with technical requirements and the operation and maintenance manual.	
CIRCUMSTANTIAL	Detailed knowledge about:	
KNOWLEDGE	1. Occupational health and safety;	
	2. Regulations and detailed rules of the local government;	
	3. Operation procedures of equipment maintenance;	
	4. Hydro-geographical environment and climate.	

OCCUPATION	RENEWABLE (HYDRO)	ENERGY ENGINEER	OCCUPATION CODE	
DUTY TITLE	M CARRY OUT THE ANAGEMENT AND MAINTENANCE OF AUXILIARY EQUIPMENT		DUTY NO.	705
TASK TITLE		CARRY OUT THE OVERHAUL AND TASK NO. 7056 MAINTENANCE OF WATER-OIL-GAS SYSTEMS		
PERFORMANCE CRITERIA	maintenance of	The person performing this task must be able to carry out the overhaul and maintenance of water-oil-gas systems in accordance with technical requirements and maintenance regulations to ensure safe and stable operation.		
<b>RANGE</b> STATEMENTThe task can be performed in the power house of hydropower stations und the supervision of water conservancy and hydropower engineer.The tools and equipment to be used include: 1. Safety protection equipment and emergency tools; 2. Parts of the water-oil-gas system.				
	EVID	ENCE REQUIREMENT		
PRACTICAL PERF	ORMANCE	UNDERPINNING KNO	WLEDGE	
<ul> <li>The person performine be able to do the folloo</li> <li>1. Carry out the maintenance of the maintenance of the temper pressure (or flow equipment;</li> </ul>	wing: overhaul and ne water system; rature and water	Detailed knowledge about 1.0 Methods The person performing the how to: 1.1 Overhaul the water-out 1.2 Maintain the water-out	iis task must be abl il-gas system;	e to explain
<ol> <li>Check the leakage and water hammer resonance in the pipe network system;</li> <li>Check the oil level and color of the cooled equipment;</li> <li>Check the air cooler and water filter;</li> </ol>		<ul> <li>2.0 Principles</li> <li>The person performing this task must be able to explain the following principles:</li> <li>2.1 Operating principles of water-oil-gas systems;</li> </ul>		tems;
<ul><li>maintenance of th</li><li>7. Accept the new of</li></ul>	<ul><li>maintenance of the oil system;</li><li>7. Accept the new oil;</li></ul>		is task must be abl	e to explain
9. Fill or refill the oil;	equipment with	3.1 Methods of checkin pressure (or flow) of	<b>e</b> 1	

10. Discharge dirty oil from the equipment;	3.2 Methods of checking the leakage and water hammer resonance in the pipe network system;			
11. Conduct oil purification;	3.3 Methods of checking the oil level and color of the cooled equipment;			
12. Conduct oil supervision,				
maintenance, sampling and testing;	3.4 Methods of checking the air cooler and water filter;			
13. Conduct the collection and	3.5 Methods of accepting the new oil;			
processing of waste oil;	3.6 Methods of reserving the absolute oil;			
14. Carry out the overhaul and	3.7 Methods of filling or refilling the equipment with oil;			
maintenance of the gas system;	3.8 Methods of discharging dirty oil from the equipment;			
15. Conduct the overhaul and	3.9 Methods of oil purification;			
maintenance of air compressors; 16. Conduct the overhaul and	3.10Methods of oil supervision, maintenance, sampling and testing;			
maintenance of gas supply pipe networks;	3.11 Methods of conducting the collection and processing of waste oil;			
17. Conduct the overhaul and	3.12Methods of the overhaul and maintenance of air			
maintenance of measurement and	compressors;			
control components;	3.13Methods of the overhaul and maintenance of gas			
18. Conduct the overhaul and	supply pipe networks;			
maintenance of gas-consuming equipment.	3.14 Methods of the overhaul and maintenance of measurement and control components;			
19. Observe health occupational and	3.16Methods of the overhaul and maintenance of gas-			
environmental safety rules and regulations	consuming equipment.			
C .	4.0 Essential Skills			
	The person performing this task must have the following skills:			
	4.1 Communication skills;			
	4.2 Learning skills;			
	4.3 Management skills;			
	4.4 Teamwork skills;			
	4.5 Report writing skills.			
DESCRIPTION OF THE END PRODUCT / SERVICE	The overhaul and maintenance of water-oil-gas systems are carried out in accordance with technical requirements and the operation and maintenance manual.			
CIRCUMSTANTIAL	Detailed knowledge about:			
KNOWLEDGE	1. Occupational health and safety;			
	2. Regulations and detailed rules of the local			
	government;			
	3. Operation procedures of equipment maintenance;			

4. Hydro-geographical environment and climate.	
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00	CUPATION	RENEWABLE (HYDRO)	ENERGY ENGINEER	OCCUPATION CODE		
DU	TY TITLE		THE MANAGEMENT NANCE OF AUXILIARY	DUTY NO.	705	
TA	SK TITLE	MAINTENANO	CARRY OUT THE OVERHAUL AND TASK NO. 7057 MAINTENANCE OF THE RELAY PROTECTION SYSTEM			
	RFORMANCE ITERIA	The person performing this task must be able to carry out the overhaul and maintenance of the relay protection system in accordance with technica requirements and maintenance regulations to ensure safe and stable operation.			th technical	
	<b>RANGE</b> STATEMENTThe task can be performed in the power house of hydropower stations und the supervision of water conservancy and hydropower engineer.The tools and equipment to be used include: 1. Safety protection equipment and emergency tools; 2. Parts of the relay protection system.					
		EVID	ENCE REQUIREMENT			
PR	ACTICAL PERF	ORMANCE	UNDERPINNING KNO	WLEDGE		
<ul> <li>The person performing this task must be able to do the following:</li> <li>1. Check the action of transfer switches and buttons;</li> <li>2. Check the logo and name of</li> </ul>		<b>Detailed knowledge above</b> <b>1.0 Methods</b> The person performing the how to: 1.1 Overhaul the relay pr	is task must be abl	e to explain		
3.	<ul><li>components;</li><li>3. Check the meter, relay and wiring terminal screws of the panel cabinet;</li></ul>		<ul><li>1.2 Maintain the relay pro</li><li>2.0 Principles</li></ul>		. 14	
4.	4. Check the luminous plate and red and green indicator lights in the control room;		the following principles:		-	
5. 6.			2.2 Principles of the overhaul and maintenance of rela protection systems.		nce of relay	
7. 8.	7. Check the wiring.		<ul><li><b>3.0 Theories</b></li><li>The person performing the following:</li><li>3.1 Methods of checking and buttons;</li></ul>		-	

	3.2 Methods of checking the logo and name of components;		
	3.3 Methods of checking the meter, relay and wiring terminal screws of the panel cabinet;		
	3.4 Methods of checking the luminous plate and red and green indicator lights in the control room;		
	3.5 Methods of checking the voltage;		
	3.6 Methods of checking the microprocessor-based protector;		
	3.7 Methods of checking the wiring.		
	4.0 Essential Skills		
	The person performing this task must have the following skills:		
	4.1 Communication skills;		
	4.2 Learning skills;		
	4.3 Management skills;		
	4.4 Teamwork skills;		
	4.5 Report writing skills.		
DESCRIPTION OF THE END PRODUCT / SERVICE	The overhaul and maintenance of relay protection systems are carried out in accordance with technical requirements and the operation and maintenance manual.		
CIRCUMSTANTIAL	Detailed knowledge about:		
KNOWLEDGE	1. Occupational health and safety;		
	2. Regulations and detailed rules of the local		
	government;		
	3. Operation procedures of equipment maintenance;		
	4. Hydro-geographical environment and climate.		

OCCUPATION	RENEWABLE (HYDRO)	ENERGY ENGINEER	OCCUPATION CODE	
DUTY TITLE		THE MANAGEMENT NANCE OF AUXILIARY		705
TASK TITLE		THE OVERHAUL AND CE OF THE DC SYSTEM		7058
PERFORMANCE CRITERIA	maintenance of	The person performing this task must be able to carry out the overhaul as maintenance of the DC system in accordance with technical requirement and maintenance regulations to ensure safe and stable operation.		
RANGE       The task can be performed in the powerhouse of hydropower stations un the supervision of water conservancy and hydropower engineer.         STATEMENT       The tools and equipment to be used include: 1. Safety protection equipment and emergency tools; 2. Parts of the DC system.				
PRACTICAL PER		ENCE REQUIREMENT		
<ul> <li>The person performing this task must be able to do the following:</li> <li>1. Check the signal indication;</li> <li>2. Check the alarm system;</li> <li>3. Check the meter indication;</li> <li>4. Check the auxiliary system such as cooling and lighting;</li> </ul>		Detailed knowledge abo 1.0 Methods The person performing the how to: 1.1 Overhaul the DC systems 1.2 Maintain the DC systems	his task must be abl stem;	e to explain
<ol> <li>Check the devices in the panel cabinet;</li> <li>Check the environment and temperature.</li> <li>Observe health occupational and environmental safety rules and regulations</li> </ol>		<ul> <li>The person performing this task must be able to explain the following principles:</li> <li>2.1 Operating principles of DC systems;</li> <li>2.2 Principles of the overhaul and maintenance of DC</li> </ul>		-
		<ul> <li><b>3.0 Theories</b></li> <li>The person performing to the following:</li> <li>3.1 Methods of checking</li> <li>3.2 Methods of checking</li> <li>3.3 Methods of checking</li> </ul>	g the signal indicatio g the alarm system;	n;

	3.4 Methods of checking the auxiliary system such as cooling and lighting;		
	3.5 Methods of checking the devices in the panel cabinet;		
	3.6 Methods of checking the environment and temperature.		
	4.0 Essential Skills		
	The person performing this task must have the following skills:		
	4.1 Communication skills;		
	4.2 Learning skills;		
	4.3 Management skills;		
	4.4 Teamwork skills;		
	4.5 Report writing skills.		
DESCRIPTION OF THE END PRODUCT / SERVICE	The overhaul and maintenance of DC systems are carried out in accordance with technical requirements and the operation and maintenance manual.		
CIRCUMSTANTIAL	Detailed knowledge about:		
KNOWLEDGE	1. Occupational health and safety;		
	2. Regulations and detailed rules of the local government;		
	3. Operation procedures of equipment maintenance;		
	4. Hydro-geographical environment and climate.		

OCCUPATION	RENEWABLE (HYDRO)	ENERGY ENGINEER	OCCUPATION CODE	
DUTY TITLE		THE MANAGEMENT NANCE OF AUXILIARY	DUTY NO.	705
TASK TITLE	CARRY OU PROTECTION SYSTEM MAI	AND GROUNDING	TASK NO.	7059
PERFORMANCE CRITERIA	maintenance o accordance with	The person performing this task must be able to carry out the overhaul and maintenance of the lightning protection and grounding system in accordance with technical requirements and maintenance regulations to ensure safe and stable operation.		
RANGE STATEMENT	1 1 7 1			
	EVID	ENCE REQUIREMENT		
PRACTICAL PER	FORMANCE	UNDERPINNING KNO	WLEDGE	
<ul> <li>The person performing this task must be able to do the following:</li> <li>1. Check the system wire corrosion;</li> <li>2. Check the solder point of contact parts;</li> <li>3. Conduct the grounding resistance test;</li> <li>4. Conduct temporary checking after severe thunderstorm;</li> <li>5. Check the grounding electrode in the corrosive soil.</li> <li>6. Observe health occupational and environmental safety rules and regulations</li> </ul>		<ul> <li>Detailed knowledge about</li> <li>1.0 Methods</li> <li>The person performing the how to:</li> <li>1.1 Overhaul the lightnesis system;</li> <li>1.2 Maintain the lightnesis system.</li> <li>2.0 Principles</li> <li>The person performing the following principles:</li> <li>2.1 Operating principles:</li> <li>2.2 Principles of the or lightning protection and pro</li></ul>	his task must be abl ing protection and ing protection and his task must be abl of lightning pro	grounding grounding e to explain tection and
		<b>3.0 Theories</b> The person performing the the following:	iis task must be abl	e to explain

	3.1 Methods of checking the system wire corrosion;		
	3.2 Methods of checking the solder point of contact parts;		
	3.3 Methods of conducting the grounding resistance test;		
	3.4 Methods of temporary checking after severe thunderstorm;		
	3.5 Methods of checking the grounding electrode in the corrosive soil.		
	4.0 Essential Skills		
	The person performing this task must have the following skills:		
	4.1 Communication skills;		
	4.2 Learning skills;		
	4.3 Management skills;		
	4.4 Teamwork skills;		
	4.5 Report writing skills.		
DESCRIPTION OF THE END PRODUCT / SERVICE	The overhaul and maintenance of lightning protection and grounding systems are carried out in accordance with technical requirements and the operation and maintenance manual.		
CIRCUMSTANTIAL	Detailed knowledge about:		
KNOWLEDGE	1. Occupational health and safety;		
	2. Regulations and detailed rules of the local government;		
	3. Operation procedures of equipment maintenance;		
	4. Hydro-geographical environment and climate.		

OCCUPATION	RENEWABLE (HYDRO)	ENERGY ENGINEER	OCCUPATION CODE	
DUTY TITLE	CARRY OUT MANAGEMEN SYSTEMS	T THE OPERATION T OF MANAGEMENT	DUTY NO.	706
TASK TITLE		MANAGEMENT OF MONITORING		
PERFORMANCE CRITERIA				n technical
RANGE STATEMENT	1 1 5 1			
	EVID	ENCE REQUIREMENT		
PRACTICAL PERF	ORMANCE	UNDERPINNING KNO	WLEDGE	
<ul> <li>equipment;</li> <li>2. Conduct the n generators;</li> <li>3. Conduct the n transformers;</li> <li>4. Conduct daily dat monitoring analys</li> </ul>	wing: e operation of electrical naintenance of naintenance of ta recording and sis;	<ul> <li>Detailed knowledge above</li> <li>1.0 Methods</li> <li>The person performing the how to:</li> <li>1.1 Operate the monitoring</li> <li>1.2 Maintain the monitor</li> <li>2.0 Principles</li> <li>The person performing the the following principles:</li> <li>2.1 Operating principles</li> </ul>	nis task must be able ng system; ing system. nis task must be able	e to explain
of abnormal equipment in the data;				
observation data;	nd automatic	<b>3.0 Theories</b> The person performing the following:	nis task must be able	e to explain
7. Record the origination of equipment;	al data and basic of electrical	<ul><li>3.1 Methods of maintaini</li><li>3.2 Methods of maintaini</li></ul>	0	

<ul><li>8. Record the main appendix data.</li><li>9. Observe health occupational and environmental safety rules and regulations</li></ul>	<ul> <li>3.3 Methods of analyzing the information content of abnormal equipment in the data;</li> <li>3.4 Methods of comparative analysis of manual and automatic observation data;</li> <li>3.5 Methods of recording the original data and basic information of electrical equipment;</li> <li>3.6 Methods of recording the main appendix data</li> </ul>		
	<ul><li>3.6 Methods of recording the main appendix data.</li><li>4.0 Essential Skills</li></ul>		
	The person performing this task must have the following skills:		
	4.1 Communication skills;		
	4.2 Learning skills;		
	4.3 Management skills;		
	4.4 Teamwork skills;		
	4.5 Report writing skills.		
DESCRIPTION OF THE END PRODUCT / SERVICE	• The operation management of monitoring systems is carried out in accordance with technical requirements and the operation and maintenance manual.		
CIRCUMSTANTIAL	Detailed knowledge about:		
KNOWLEDGE	1. Occupational health and safety;		
	2. Regulations and detailed rules of the local government;		
	3. Operation procedures of equipment maintenance;		
	4. Hydro-geographical environment and climate.		

OCCUPATION	RENEWABLE EN (HYDRO)	ERGY ENGINEER	OCCUPATION CODE	
DUTY TITLE		THE OPERATION DF MANAGEMENT	DUTY NO.	706
TASK TITLE	CARRY OUT MANAGEMENT COMMUNICATIO	THE OPERATION OF N SYSTEMS	TASK NO.	7062
PERFORMANCE CRITERIA	management of co	ing this task must be mmunication systems operation specification	in accordance wit	h technical
RANGEThe task can be performed in the power house of hydropower stations un the supervision of water conservancy and hydropower engineer.STATEMENTThe tools and equipment to be used include: 1. Safety protection equipment and emergency tools; 2. Parts of the communication system.				
PRACTICAL PERF		CE REQUIREMENT		
		Detailed knowledge		
The person performinable to do the followin 1. Operate	ng: the instation	<b>1.0 Methods</b> The person performing this task must be able to		
communication 2. Operate the pro existing strata; 3. Operate the	otection device of the	<ul><li>explain how to:</li><li>1.1 Operate the comr</li><li>1.2 Manage the comr</li></ul>	•	
<ul> <li>control device;</li> <li>4. Operate the automatic device;</li> <li>5. Operate the tele-control communication interface;</li> <li>6. Collect the protection, measurement and control, and IED device information;</li> </ul>		<ul> <li>2.0 Principles</li> <li>The person performing</li> <li>explain the following</li> <li>2.1 Operating princip</li> <li>2.2 Management princip</li> <li>systems.</li> </ul>	principles: bles of communicati	on systems;
<ul><li>7. Send the corresponding device to execute.</li><li>8. Observe health occupational and</li></ul>		<b>3.0 Theories</b> The person performi	ng this task must	be able to
	safety rules and	<ul><li>explain the following:</li><li>3.1 Methods of opera existing strata;</li></ul>		levice of the

	<ul> <li>3.2 Methods of operating the measurement and control device;</li> <li>3.3 Methods of operating the automatic device;</li> <li>3.4 Methods of collecting the protection, measurement and control, and IED device information;</li> <li>3.5 Methods of sending the corresponding device to execute.</li> </ul>	
	4.0 Essential Skills	
	The person performing this task must have the following skills:	
	4.1 Communication skills;	
	4.2 Learning skills;	
	4.3 Management skills;	
	4.4 Teamwork skills;	
	4.5 Report writing skills.	
DESCRIPTION OF THE END PRODUCT / SERVICE	The operation management of communication systems is carried out in accordance with technical requirements and the operation and maintenance manual.	
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about:	
	1. Occupational health and safety;	
	2. Regulations and detailed rules of the local government;	
	3. Operation procedures of equipment maintenance;	
	4. Hydro-geographical environment and climate.	

OCCUPATION	RENEWABLE E (HYDRO)	NERGY ENGINEER	OCCUPATION CODE	
DUTY TITLE	OPTIMIZE THE STATION MANAGEMENT	HYDROPOWER OPERATION	DUTY NO.	707
TASK TITLE	REGULATE RESERVOIRS HYDROPOWER S	OPTIMALY THE OF THE STATION	TASK NO.	7071
PERFORMANCE CRITERIA	The person performing this task must be able to regulate optimally the reservoirs of hydropower station in accordance with technical requirements and operation specifications.			
RANGE STATEMENT	<ul> <li>The task can be performed in the power house of hydropower stations under the supervision of water conservancy and hydropower engineer.</li> <li>The tools and equipment to be used include: <ol> <li>Computer and its operating system;</li> <li>Statistical analysis software.</li> </ol> </li> <li>Safety gear</li> </ul>			
		CE REQUIREMENT		
PRACTICAL PERF		UNDERPINNING KN		
accordance with regulation princip 2. Draw the reservor	ng: voir regulation in th the optimal	Detailed knowledge al 1.0 Methods The person performing how to: 1.1 Carry out the optim 1.2 Formulate the regu	this task must be ab nal regulation of res	-
<ol> <li>Optimize the power generation dispatching scheme;</li> <li>Prepare the reservoir regulation operation plan;</li> <li>Calculate and evaluate the operation benefit indicator of hydropower stations.</li> <li>Observe health occupational and</li> </ol>		<ul> <li>2.0 Principles</li> <li>The person performing the following principles</li> <li>2.1 Characteristics of principles of regula</li> <li>2.2 Principles of the op</li> <li>3.0 Theories</li> </ul>	s: f reservoir regu ation operation; ptimal regulation of	lation and
environmental s regulations	safety rules and	<ul><li>The person performing</li><li>the following:</li><li>3.1 Water balance anal</li><li>3.2 Mathematical statistical</li></ul>	lysis theories;	le to explain

	3.3 Regulation map drawing methods;	
	3.4 Hydro-energy calculation and analysis methods;	
	3.5 Calculation theories of flood control regulation;	
	3.6 Linear/dynamic programming theories.	
	4.0 Essential Skills	
	The person performing this task must have the	
	following skills:	
	4.1 Communication skills;	
	4.2 Learning skills;	
	4.3 Management skills;	
	4.4 Teamwork skills;	
	4.5 Report writing skills.	
DESCRIPTION OF THE END	The reservoirs of the hydropower stations are optimally	
PRODUCT / SERVICE	regulated in accordance with technical requirements	
	and the operation and maintenance manual.	
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about:	
	1. Occupational health and safety;	
	2. Regulations and detailed rules of the local	
	government;	
	3. Operation procedures of equipment maintenance;	
	4. Hydro-geographical environment and climate.	

OCCUPATION	RENEWABLE (HYDRO)	ENERGY ENGINEER	OCCUPATION CODE	
DUTY TITLE		THE POWER STATION	DUTY NO.	707
TASK TITLE	ENSURE ECO HYDROPOWE	NOMIC OPERATION IN R STATIONS	TASK NO.	7072
PERFORMANCE CRITERIA		forming this task must be ropower stations in accorda		
RANGE STATEMENT	<ul> <li>The task can be performed in the power house of hydropower stations under the supervision of water conservancy and hydropower engineer.</li> <li>The tools and equipment to be used include:</li> <li>1. Computer and its operating system;</li> <li>2. Statistical analysis software.</li> <li>3. Safety gear</li> </ul>			
EVIDENCE REQUIREMENT				
PRACTICAL PERF	ORMANCE	UNDERPINNING KNO	WLEDGE	
<ul> <li>The person performing this task must be able to do the following:</li> <li>1. Draw the dynamic property curve of the generator set;</li> <li>2. Carry out the dynamic property test of the generator set;</li> <li>3. Allocate the optimal load of the generator set;</li> <li>4. Formulate the work plan of the generator set.</li> <li>5. Observe health occupational and environmental safety rules and regulations</li> </ul>		<ul> <li>Detailed knowledge about</li> <li>1.0 Methods</li> <li>The person performing the how to:</li> <li>1.1 Carry out the economic stations.</li> <li>2.0 Principles</li> <li>The person performing the following principles:</li> <li>2.1 Principle of economic stations;</li> <li>2.2 Theories of dynamic gates;</li> <li>2.4 Preparation procedure sets.</li> </ul>	his task must be abl omic operation in his task must be abl nic operation in properties of genera l load allocation of	hydropower e to explain hydropower ator sets; of generator
		<b>3.0 Theories</b> The person performing the following:	iis task must be abl	e to explain

	3.1 Judging methods of dynamic properties of generator	
	sets in hydropower stations;	
	3.2 Methods of optimal load allocation of generator sets.	
	4.0 Essential Skills	
	The person performing this task must have the following skills:	
	4.1 Communication skills;	
	4.2 Learning skills;	
	4.3 Management skills;	
	4.4 Teamwork skills;	
	4.5 Report writing skills.	
DESCRIPTION OF THE END PRODUCT / SERVICE	The economic operation in hydropower stations is ensured in accordance with technical requirements and the operation and maintenance manual.	
CIRCUMSTANTIAL	Detailed knowledge about:	
KNOWLEDGE	1. Occupational health and safety;	
	2. Regulations and detailed rules of the local government;	
	3. Operation procedures of equipment maintenance;	
	4. Hydro-geographical environment and climate.	

## APPENDIX: DACUM CHART FOR RENEWABLE ENERGY ENGINEER (HYDRO) -

## NTA LEVEL 7

DUTIES	TASKS	ENABLERS
1.0 Conduct the operation management of	1.1 Monitor and analyze seepage pressure of hydraulic structures.	<ul> <li>General skills and knowledge</li> <li>Communication skills</li> <li>Learning skills</li> </ul>
hydraulic structures	1.2 Monitor and analyze the external deformation of the dam surface of the hydraulic structures.	<ul> <li>Management skills</li> <li>Software operation skills</li> <li>Teamwork skills</li> <li>Report writing skills</li> <li>Skills of reading and making drawings.</li> <li>Office software operation skills</li> </ul>
		Tools and equipment
		<ul> <li>Computer and its operating system</li> </ul>
		Safety protection equipment and emergency tools
		<ul><li>Piezometer tubes</li><li>osmometers</li></ul>
		• Strain meters; joint meters
		Materials
		Office software
		<ul><li>Printers and calculators</li><li>Drawings and documents</li></ul>
		Corresponding specifications
		Operation and maintenance manual
		Requirements for employees
		• Diligence in learning
		Hard working
		• Scientific spirit and rigor
		• Teamwork spirit
		Honesty and trustworthiness

DUTIES	TASKS	ENABLERS
		• Time management
		• Better safety consciousness
		• High professional ethics
2.0 Carry out the management and maintenance of metal structures of the hydropower stations	<ul> <li>2.1 Carry out the of overhaul and maintenance of the penstocks of the hydropower stations.</li> <li>2.2 Carry out the overhaul and maintenance of gates, hoists and trash racks of the hydropower stations.</li> </ul>	<ul> <li>General skills and knowledge</li> <li>Communication skills</li> <li>Learning skills</li> <li>Management skills</li> <li>Software operation skills</li> <li>Teamwork skills</li> <li>Report writing skills</li> <li>Skills of reading and making drawings</li> <li>Office software operation skills</li> </ul> Tools and equipment <ul> <li>Computer and its operating</li> </ul>
		<ul> <li>Computer and its operating system</li> <li>Safety protection equipment and emergency tools</li> <li>Strain meters; flowmeters</li> </ul>
		Metal structure parts
		Materials
		Office software
		Printers and calculators
		• Drawings and documents
		Corresponding specifications
		Operation and maintenance manual
		Requirements for employees
		Diligence in learning
		Hard working
		• Scientific spirit and rigor
		• Teamwork spirit
		Honesty and trustworthiness
		• Time management

DUTIES	TASKS	ENABLERS
		Better safety consciousness
		• High professional ethics
3.0 Carry out the	3.1 Carry out the environmental	General skills and knowledge
environmental	quantity monitoring of	Communication skills
quantity	hydropower stations.	• Learning skills
monitoring of hydropower		• Management skills
stations		• Software operation skills
		• Teamwork skills
		Report writing skills
		• Skills of reading and making drawings
		• Office software operation skills
		Tools and equipment
		• Computer and its operating system
		Statistical analysis software
		• Safety protection equipment and emergency tools
		• Water gauges
		• Rain gauges
		Materials
		Office software
		• Printers and calculators
		• Drawings and documents
		Corresponding specifications
		Operation and maintenance manual
		Requirements for employees
		• Diligence in learning
		• Hard working
		• Scientific spirit and rigor
		• Teamwork spirit
		• Honesty and trustworthiness
		• Time management

DUTIES	TASKS	ENABLERS
		Better safety consciousness
		• High professional ethics
4.0 Carry out the	4.1 Carry out the output	General skills and knowledge
operation	monitoring of hydraulic	Communication skills
management of electromechanical	turbines and cause analysis.	• Learning skills
equipment	4.2 Carry out the monitoring of	Management skills
	generator parameters and cause analysis.	Software operation skills
		• Teamwork skills
	4.3 Analyze the operating state	Report writing skills
	of generator sets and carry out troubleshooting.	<ul> <li>Skills of reading and making drawings</li> </ul>
		• Office software operation skills
		Tools and equipment
		Computer and its operating system
		• Safety protection equipment and emergency tools
		• Components and parts of generators
		• Hydraulic turbine parts
		Materials
		Office software
		• Printers and calculators
		• Drawings and documents
		Corresponding specifications
		• Operation and maintenance manual
		Requirements for employees
		• Diligence in learning
		Hard working
		• Scientific spirit and rigor
		• Teamwork spirit
		• Honesty and trustworthiness
		• Time management

DUTIES	TASKS	ENABLERS
		Better safety consciousness
		High professional ethics
5.0 Carry out the management and maintenance of	5.1 Carry out the overhaul and maintenance of speed control systems.	General skills and knowledge• Communication skills• Learning skills
auxiliary equipment	5.2 Carry out the overhaul and maintenance of the excitation systems.	<ul> <li>Management skills</li> <li>Software operation skills</li> <li>Teamwork skills</li> </ul>
	5.3 Carry out the overhaul and maintenance of the main valves and cranes.	<ul> <li>Report writing skills</li> <li>Skills of reading and making drawings</li> </ul>
	5.4 Carry out the overhaul and maintenance of the booster systems.	• Office software operation skills
	5.5 Carry out the overhaul and maintenance of the power distribution systems.	<ul> <li>Tools and equipment</li> <li>Computer and its operating system</li> </ul>
	5.6 Carry out the overhaul and maintenance of water-oil-gas systems.	<ul> <li>Safety protection equipment and emergency tools</li> <li>Components and parts of generators</li> </ul>
	5.7 Carry out the overhaul and maintenance of the relay protection system.	• Hydraulic turbine parts
	5.8 Carry out the overhaul and maintenance of the DC system.	<ul> <li>Materials</li> <li>Office software</li> <li>Printers and calculators</li> </ul>
	5.9 Carry out the Lightning protection and grounding system maintenance.	<ul> <li>Drawings and documents</li> <li>Corresponding specifications</li> <li>Operation and maintenance manual</li> </ul>
		Requirements for employees
		• Diligence in learning
		Hard working
		• Scientific spirit and rigor
		Honesty and collaboration
		• Teamwork spirit
		• Better safety consciousness

DUTIES	TASKS	ENABLERS
6.0 Carry out the operation management of management systems	<ul> <li>6.1 Carry out the operation management of monitoring systems.</li> <li>6.2 Carry out the operation management of communication systems.</li> </ul>	<ul> <li>General skills and knowledge</li> <li>Communication skills</li> <li>Learning skills</li> <li>Management skills</li> <li>Software operation skills</li> <li>Teamwork skills</li> <li>Report writing skills</li> <li>Skills of reading and making drawings</li> </ul>
		<ul> <li>Office software operation skills</li> <li>Tools and equipment</li> <li>Computer and its operating system</li> <li>Safety protection equipment and emergency tools</li> </ul>
		<ul> <li>Materials</li> <li>Office software</li> <li>Printers and calculators</li> <li>Drawings and documents</li> <li>Corresponding specifications</li> <li>Operation and maintenance manual</li> </ul>
		<ul> <li>Requirements for employees</li> <li>Diligence in learning</li> <li>Hard working</li> <li>Scientific spirit and rigor</li> <li>Teamwork spirit</li> <li>Honesty and trustworthiness</li> <li>Time management</li> <li>Better safety consciousness</li> </ul>
7.0 Optimize the hydro power	7.1 Regulate optimally the reservoirs of the hydropower stations.	<ul> <li>High professional ethics</li> <li>General skills and knowledge</li> <li>Communication skills</li> </ul>

DUTIES	TASKS	ENABLERS
station operation	7.2 Ensure economical	Learning skills
management	operation in hydropower	Management skills
	stations.	• Software operation skills
		Teamwork skills
		Report writing skills
		<ul> <li>Skills of reading and making drawings</li> </ul>
		• Office software operation skills
		Tools and equipment
		• Computer and its operating system
		• Safety protection equipment and emergency tools
		Materials
		Office software
		• Printers and calculators
		• Drawings and documents
		Corresponding specifications
		• Operation and maintenance manual
		Requirements for employees
		• Diligence in learning
		• Hard working
		• Scientific spirit and rigor
		Teamwork spirit
		• Honesty and trustworthiness
		• Time management
		• Better safety consciousness
		• High professional ethics