AMDA

HEALTH & SAFETY MANAGEMENT SYSTEM HANDBOOK

Health & Safety Management System for Minigrid Operations in Zambia.

UKaid from the British people

Transforming Energy Access

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Abbreviations and Acronyms

AMDA	Africa Minigrid Developers Association
AC	Alternate Current
BBS	Behaviour Based Safety
BSc	Bachelor of Science
CAPA	Corrective and preventive Action
DC	Direct Current
DoE	Department of Energy
DOHS	Department of Occupational Health and Safety
EAIF	Energy Access Institutions Facility
EIA	Environmental Impact Assessment
EIZ	Engineering Institution of Zambia
ERB	Energy Regulation Board
ERP	Emergency Response Plan
ERT	Emergency Response Team
ESS	Environmental and Social Standards
H&S	Health and Safety
HR	Human Resource
IFC	International Finance Corporation
ILO	International Labour Organization
ISO	International Organization for Standardization
ISO 45001	ISO standard for Occupational Health and Safety Management System
KPI	Key Performance Indicator
LOTO	Lock-Out/Tag-Out
M&E	Monitoring and Evaluation
NEBOSH	National Examination Board in Occupational Safety and Health
OEM	Original Equipment Manufacturer
OHS	Occupational Health and Safety
OHSI	Occupational Health and Safety Institute PACRA - Patents and Companies Registration Agency
PPE	Personal Protective Equipment
PTW	Permit-to-Work
PV	Photovoltaic
REA	Rural Electrification Authority
SCADA	Supervisory Control and Data Acquisition
SOP	Standard Operating Procedure
TEA	Transforming Energy Access
TEVETA	Technical Education, Vocational and Entrepreneurship Training Authority
WCFCB	Workers' Compensation Fund Control Board
ZABS	Zambia Bureau of Standards
ZEMA	Zambia Environmental Management Agency
ZMW	Zambian Kwacha
ZS	Zambian Standard

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01 Executive Summary

Photo Credit: Standard Microgrid

1. Executive Summary

- This Health & Safety (H&S) handbook sets out the corporate-level H&S management framework for minigrid projects in Zambia by the Africa Minigrid Developers Association (AMDA) members.
- It is intended to guide AMDA member companies, project developers, and contractors involved in minigrid development in Zambia.
- The handbook applies at the corporate level and can be adapted for specific projects, providing guidance across the design, construction, operation, and maintenance phases.
- It complements existing members' Occupational Safety and Health Policies and can be adapted to improve the existing Occupational Safety and Health Management System.
- Section 3, on Legal and Regulatory Framework, outlines the key national laws and regulatory requirements governing H&S for energy projects in Zambia. It establishes how members should ensure compliance through proper tracking of permits, licences, and reporting obligations. The Health & Safety Managers maintain the legal register, while Project Managers are responsible for securing all site-specific permits.
- Section 4 presents the AMDA Health & Safety Management System Policy Statement. The policy outlines the foundation for safe operations and community well-being across all AMDA members' projects.
- Section 5, on Organisational Structure and Responsibilities, defines how H&S responsibilities are distributed across corporate and project levels. It includes a responsibility matrix detailing key activities, the accountable personnel, required outputs, and the applicable legislation or standards. These clear role definitions ensure accountability and effective implementation of the H&S system.
- Section 6, on Health & Safety Operational Procedures, provides practical guidance for implementing H&S requirements across all project phases. It sets out Standard Operating Procedures (SOPs) covering Training, Competence and Awareness; Project Implementation Controls; Health & Safety Arrangements; Incident and Accident Reporting and Investigation; Monitoring and Audit Procedures; and Document and Record Control. These procedures standardise safe practices and ensure consistent compliance.
- Section 7, on Risk Management, describes a structured approach to identifying, assessing, and managing risks. A Risk Register is maintained and regularly updated. The risk assessment process involves identifying hazards and potential impacts; assessing likelihood and consequence; determining the risk rating; and prioritising mitigation measures using the mitigation hierarchy. This approach ensures proactive risk reduction and informed decision-making.
- Section 8, on Monitoring, Evaluation and Reporting, sets out how the effectiveness and legal compliance of H&S controls are confirmed. It outlines Key Performance Indicators (KPIs), monitoring tools, data quality assurance processes, and internal and external reporting timelines.
- Section 9, on Emergency Preparedness and Response, details the framework for preparing for and responding to emergencies. It ensures the organisation can act quickly to protect people, property, and the environment. It covers emergency planning, roles, communication protocols, equipment, and response procedures.
- Section 10, on Continuous Improvement, outlines how AMDA and its members commit to continual enhancement of H&S performance. Improvement is driven by systematic monitoring, audits, corrective and preventive actions, and regular management reviews. Lessons learnt are incorporated to strengthen the overall Health & Safety Management System.

02 Introduction

Photo Credit: Ignite Energy Access

2. Introduction

Purpose

The handbook provides a standardised system for identifying, assessing and managing health & safety risks, and for ensuring high levels of occupational H&S standards across all AMDA projects in Zambia.

Scope

The guidance applies to AMDA member companies implementing or operating minigrid projects in Zambia and complements national regulatory requirements and organisational-specific policies.

References

International Organization for Standardization (ISO) 45001, International Finance Corporation Performance Standards, World Bank Health and Safety Guidelines, and applicable Zambian legislation (Energy Regulation Act (2019), Electricity Act (2019), Occupational Health and Safety (OHS) Act (2010), Electricity - Safety and Technical Standards Regulations (2022)).

Photo Credit: A4&T Power Solutions

03 Legal and Regulatory Framework

Photo Credit: Bboxx

3. Legal and Regulatory Framework

3.1 Overview

This section contains the primary national laws and regulations that govern H&S obligations for energy projects in Zambia. All laws and regulations apply at all project phases (design, construction, operation and maintenance).

Table 3.1: *List of key acts and regulations*

Key Act / Regulation	Primary Requirements (Summary)	Relevant Government Authority (Federal / State Equivalent)
Energy Regulation Act, 2019 (No. 12 of 2019)	Establishes the Energy Regulation Board (ERB) as the key authority for licensing, tariff setting, and oversight of energy undertakings. It provides the legal basis for regulating minigrids, renewable energy systems, and independent power producers. Developers must obtain ERB licenses, ensure safety compliance, and adhere to approved tariffs.	ERB — under the Ministry of Energy
Electricity Act, 2019 (No. 11 of 2019)	Provides the legal framework for the generation, transmission, distribution, and supply of electricity. It promotes competition, private sector participation, and rural electrification through minigrids. It outlines licensing categories, consumer protection, and penalties for non-compliance with safety and operational standards.	Ministry of Energy (policy oversight); ERB (licensing and compliance enforcement); Rural Electrification Authority (REA) (rural and off-grid projects)
OHS Act, 2010 (No. 36 of 2010)	Provides for the safety, health, and welfare of persons at work. It applies to all workplaces, including minigrid sites. Requires employers to identify hazards, conduct risk assessments, provide Personal Protective Equipment (PPE), training, and supervision, and report occupational incidents to the Occupational Health and Safety Institute (OHSI).	Ministry of Labour and Social Security; OHSI; Workers' Compensation Fund Control Board
Electricity (Safety and Technical Standards) Regulations (2022)	Defines technical and safety standards for the construction and operation of electrical systems. Requires compliance with approved design codes, protective systems, and regular maintenance to prevent electrical accidents or fires.	ERB (technical enforcement); Zambia Bureau of Standards (ZABS) (standards compliance); Department of Energy (DoE)– Ministry of Energy (policy coordination)

Table 3.2: *List of penalties for typical offences*

Key Act / Regulation	Typical Offence	Penalties	Enforcement Authority
Energy Regulation Act, 2019 (No. 12 of 2019)	• Operating an energy undertaking without a valid ERB licence or authorisation. • Charging unapproved tariffs or breaching licence conditions. • Obstructing ERB inspectors or failing to provide required information. • Violating safety, quality, or environmental standards prescribed by the ERB.	• Fine not exceeding 500,000 penalty units (~ZMW 150,000) or imprisonment of up to five years, or both. • Suspension or revocation of licence for persistent violations. • Administrative penalties (daily fines) for continued non-compliance.	ERB

Key Act / Regulation	Typical Offence	Penalties	Enforcement Authority
Electricity Act, 2019 (No. 11 of 2019)	• Generation, transmission, or supply of electricity without an ERB licence. • Breach of technical or safety standards or endangering public safety. • Tampering with meters or illegal connections. • Non-compliance with licence or regulatory conditions.	• Fine up to 500,000 penalty units or imprisonment of up to five years. • Disconnection or closure order issued by ERB. • Revocation of licence for repeated offences. • Liability for damages where unsafe operations cause injury or property loss.	ERB
OHS Act, 2010 (No. 36 of 2010)	• Failure to provide safe working conditions, PPE, or health surveillance. • Neglecting to report accidents, injuries, or occupational diseases. • Obstructing OHS inspectors or ignoring improvement/prohibition notices. • Employing untrained or unqualified personnel for hazardous work.	• Fine up to 200,000 penalty units (~ZMW 60,000) or imprisonment of up to three years, or both. • Closure of the workplace until compliance is achieved. • Daily fines for continued non-compliance. • Criminal liability for serious injury or fatality due to negligence.	OHSI
Electricity (Safety and Technical Standards) Regulations (2022)	• Use of non-compliant equipment or materials. • Failure to conduct periodic inspections or maintenance. • Operating installations that pose electrical or fire hazards. • Non-adherence to ERB-approved design codes or ZABS standards.	• Fine not exceeding 200,000 penalty units or imprisonment of up to two years. • Immediate disconnection or shutdown of unsafe installations. • Withdrawal of technical approval or operating licence by ERB.	Regulations 22–26, Electricity (Safety and Technical Standards) Regulations (2022); enforced under Energy Regulation Act (2019)

Table 3.3: *International conventions ratified by Zambia*

Convention / Treaty	Key Requirements / Focus Areas	Relevant National Implementing Authority
International Labour Organization (ILO) Convention No. 155 — Occupational Safety and Health (1981)	Establishes the foundation for a national OHS policy that includes preventive measures, risk assessment, worker consultation, and continuous improvement of workplace safety and health standards.	Ministry of Labour and Social Security (Department of Occupational Safety and Health); OHSI
ILO Convention No. 187 — Promotional Framework for Occupational Safety and Health (2006)	Promotes the creation of a national system for OHS governance, focusing on a culture of prevention, continuous monitoring, and stakeholder participation.	Ministry of Labour and Social Security; OHSI

3.2 Legal and Regulatory Compliance Management

The Legal and Regulatory Compliance Management will ensure all permits, licences, and reporting obligations are tracked and fulfilled. The Health & Safety Managers will maintain the legal register while the Project Managers ensure site-level permits are in place. Refer to Annex "i. Legal and Regulatory Compliance Tracker".

Table 3.4: *List of key licences, permits, and certificates*

#	Licence / Permit / Certificate	Issuing Authority / Agency	Purpose / Notes
1	Company Registration / Incorporation Certificate	Patents and Companies Registration Agency (PACRA)	Legally establishes the project entity or Special Purpose Vehicle as a recognised business under Zambian law.
2	Business Levy / Trading Licence	Local Authority / Municipal or District Council	Authorises the business to operate within a specific jurisdiction. Required annually for all operating entities.
3	Import Permit / Customs Clearance	Zambia Revenue Authority and Ministry of Commerce, Trade and Industry	Required for the importation of solar equipment, batteries, and electrical components sourced from outside Zambia. Ensures compliance with customs duties and standards.
4	Renewable Energy System Installer / Contractor Licence	ERB	All companies or individuals installing, maintaining, or commissioning solar photovoltaic (PV) systems must be licensed by the ERB. Adherence to technical and safety standards.
5	Construction Permit / Building Approval	Local Authority (Municipal or District Council)	Required for construction of minigrid infrastructure (control rooms, powerhouses, poles, etc.). Ensures compliance with zoning, safety, and public works regulations.
6	Generation Licence	ERB	Authorises generation of electricity from renewable sources (e.g., solar PV). Required prior to commencement of operations. Capacity threshold and licence category depend on system size.
7	Distribution Licence	ERB	Allows the operator to distribute electricity to consumers through a local network. Often combined with a generation licence for integrated minigrids.
8	Supply / Retail Licence	ERB	Authorises the sale and supply of electricity to end-users. Tariffs must be approved by ERB.
9	Workplace Registration Certificate	Department of Occupational Health and Safety (DOHS) (under Ministry of Labour and Social Security)	Certifies that the workplace meets minimum safety and health standards. Required before commencing operations.
10	Annual Occupational Health and Safety Audit / Fire Safety Report	DOHS	Mandatory self-audit or certified audit to ensure compliance with the OHS Act (2010) and fire safety requirements.

04 Policy Commitments

Photo Credit: ARC Power

4. Policy Commitments

AMDA
Health & Safety Management System Policy Statement

"Sustainable Energy. Responsible Practices. Empowered Communities."

AMDA members are committed to ensuring the highest standards of occupational health & safety in the construction, installation, operation, and maintenance of minigrids across Zambia. We are also committed to ensuring that health & safety management practices are inclusive, taking into account the needs of communities, and that local communities are protected through awareness and safety signage at all project sites.

We are dedicated to complying with all applicable health & safety laws and regulations, including the **Energy Regulation Act (2019), Electricity Act (2019), the Occupational Health and Safety Act (2010), and the Electricity (Safety and Technical Standards) Regulations (2022)**.

Our vision is zero harm—ensuring no injuries, no damage to equipment, and no harm to the community in all minigrid operations. Through our Health & Safety Management System, we:

- Identify, assess, and control risks associated with minigrid construction and operational activities.
- Provide safe and healthy working conditions for all employees, contractors, and visitors at project sites.
- Ensure proper use, maintenance, and inspection of PPE, tools, machinery, and electrical systems.
- Commit to worker consultation and participation, e.g., toolbox meetings, safety committee, or other agreed channels.
- Promote safety awareness through regular induction, training, and supervision.
- Maintain emergency preparedness and response plans, including first aid and fire safety protocols and practices.
- Report, investigate, and document all incidents, accidents, and near misses to prevent recurrence.
- Foster a safety culture that encourages proactive reporting of hazards and unsafe conditions.

AMDA members, management, and employees share responsibility for maintaining a safe and healthy work environment and are committed to continuous improvement in safety performance.

This policy shall be reviewed regularly to ensure it remains relevant, effective, and aligned with current legislation and best practices in minigrid construction and operation.

05 Organisational Structure and Responsibilities

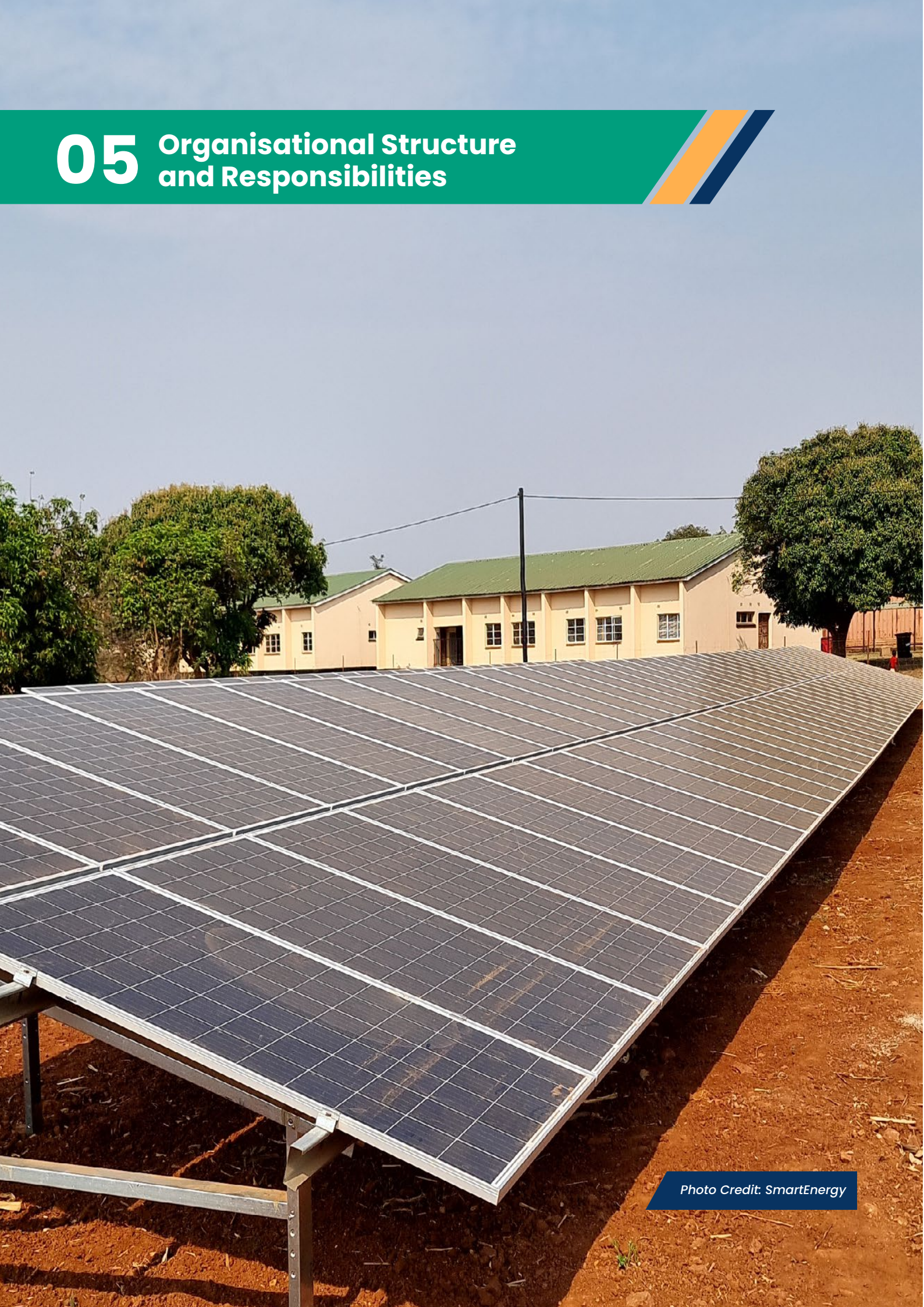

Photo Credit: SmartEnergy

5. Organisational Structure and Responsibilities

This health & safety handbook is implemented through clear roles and responsibilities across corporate and project levels. The table below gives guidance on key activity / stage, the corresponding responsible person, expected output and applicable legislation or standard.

Table 5.1: *Detailed key steps in developing organisational structure and responsibilities*

Key Step / Activity	Description	Objective / Expected Output	Responsible Person / Role	Timing / Frequency	Applicable Legislation / Standard
1. Define Project Governance Structure	Establish a clear governance framework outlining reporting lines, oversight mechanisms, and decision-making hierarchy for the design, construction, operation, and maintenance phases.	Ensure accountability, coordination, and compliance with legal and technical standards.	Developer / Project Manager	Project initiation	Energy Regulation Act (2019); ISO 45001
2. Appoint Project Management Team	Form a multidisciplinary project management team, including technical, environmental, social, health & safety, and financial specialists.	Provide leadership, coordination, and technical oversight during implementation.	Project Manager / Developer	Prior to project mobilisation	Electricity Act (2019); ERB Licensing Regulations (2022)
3. Define Roles and Responsibilities	Prepare a Responsibility Matrix to define who is Responsible, Accountable, Consulted, and Informed for all key project activities.	Clarify duties and avoid overlaps or accountability gaps.	Project Manager / Human Resource (HR) Officer	Design stage	ISO 45001; National Energy Policy (2019)
4. Appoint Health and Safety Officer	Designate a qualified Health & Safety Officer to implement the OHS programme, conduct risk assessments, and lead emergency preparedness.	Promote a safe, healthy, and compliant working environment.	Contractor / Developer	Construction and operation	OHS Act (2010); Factories Act (Cap. 441)
5. Appoint Site Engineer / Construction Manager	Assign a site-based engineer to supervise construction works, ensure adherence to design standards, and verify safety compliance.	Maintain construction quality, integrity, and safety standards.	Contractor / Project Manager	Construction phase	Electricity (Safety and Technical Standards) Regulations (2022)
6. Appoint Procurement and Logistics Officer	Manage sourcing, supplier evaluation, transport, and material storage, ensuring sustainability, safety, and regulatory compliance.	Ensure transparent, efficient, and compliant procurement processes.	Procurement Officer / Finance Manager	Design and construction	Public Procurement Act (2020); ERB Guidelines

Key Step / Activity	Description	Objective / Expected Output	Responsible Person / Role	Timing / Frequency	Applicable Legislation / Standard
7. Establish Reporting Lines	Define internal reporting structure (e.g., Health & Safety Officer reports to Project Manager; Site Engineer to Construction Manager).	Facilitate communication, accountability, and timely decision-making.	Project Manager / HR Officer	Organisa-tional setup	ISO 45001
8. Develop Organisational Chart	Create and periodically update an organisational chart showing management, technical, and support teams.	Promote transparency and clarity in the project structure.	Project Manager / HR Officer	Design stage; Review annually	ISO 45001; ERB Licensing Conditions
9. Define Contractor Responsibilities	Include OHS and compliance clauses in all contracts, requiring contractors to follow the developers' management systems.	Align contractors with safety and environmental obligations.	Developer / Legal Officer	Pre-con-struction	OHS Act (2010); Environmental Management Act (2011)
10. Training and Competence Development	Conduct induction and role-specific training (technical, safety, environmental, and social). Maintain competence records.	Ensure all workers are qualified and aware of safety and compliance procedures.	HR / Health & Safety Officer	Before and during proj-ect imple-mentation	OHS Act (2010); Environmental and Social Standards (ESS) 2 (Labour and Working Conditions)
11. Establish Communication and Coordination Mechanisms	Schedule regular coordination meetings, toolbox talks, and stakeholder updates to review progress and safety.	Maintain effective collaboration and early issue resolution.	Project Manager / Health & Safety Officer	Weekly or monthly	ISO 45001; ESS 10 (Stakeholder Engagement)
12. Documentation and Record Keeping	Maintain project records including meeting minutes, training logs, incident reports, and audit findings.	Demonstrate compliance and provide traceability for audits.	Admin Officer / Health & Safety Officer	Continuous	OHS Act (2010); ISO 45001
13. Performance Evaluation and Review	Periodically assess performance against KPIs for safety, environment, and social indicators. Implement corrective actions.	Achieve continuous performance improvement and regulatory compliance.	Developer / Project Manager	Annually	ISO 45001; ERB Reporting Requirements
14. Continuous Improvement	Update governance systems and responsibilities based on audit findings, lessons learnt, and new regulatory changes.	Maintain adaptive management and ensure ongoing compliance.	Project Manager / Health & Safety Officer	Continuous	ISO 45001

Table 5.2: *Sample project specific organisational structure and core responsibilities*

Level	Position / Role	Core Responsibilities
Top Management	Project Director / Developer	Strategic oversight, compliance assurance, financing, and stakeholder relations.
Middle Management	Project Manager / Health & Safety Manager / Construction Manager	Coordinate implementation, supervision, reporting, and compliance with OHS requirements.
Technical Team	Site Engineer / Electrical Engineer / Procurement Officer	Supervise technical works, ensure engineering standards and safety practices.
Support Team	Health & Safety Officer / Community Liaison Officer / Admin	Handle H&S and maintain communication with communities.
Field Workers	Technicians / Labourers / Security / Drivers	Execute field tasks safely and report incidents or non-compliance to supervisors.

06 Health & Safety Operational Procedures

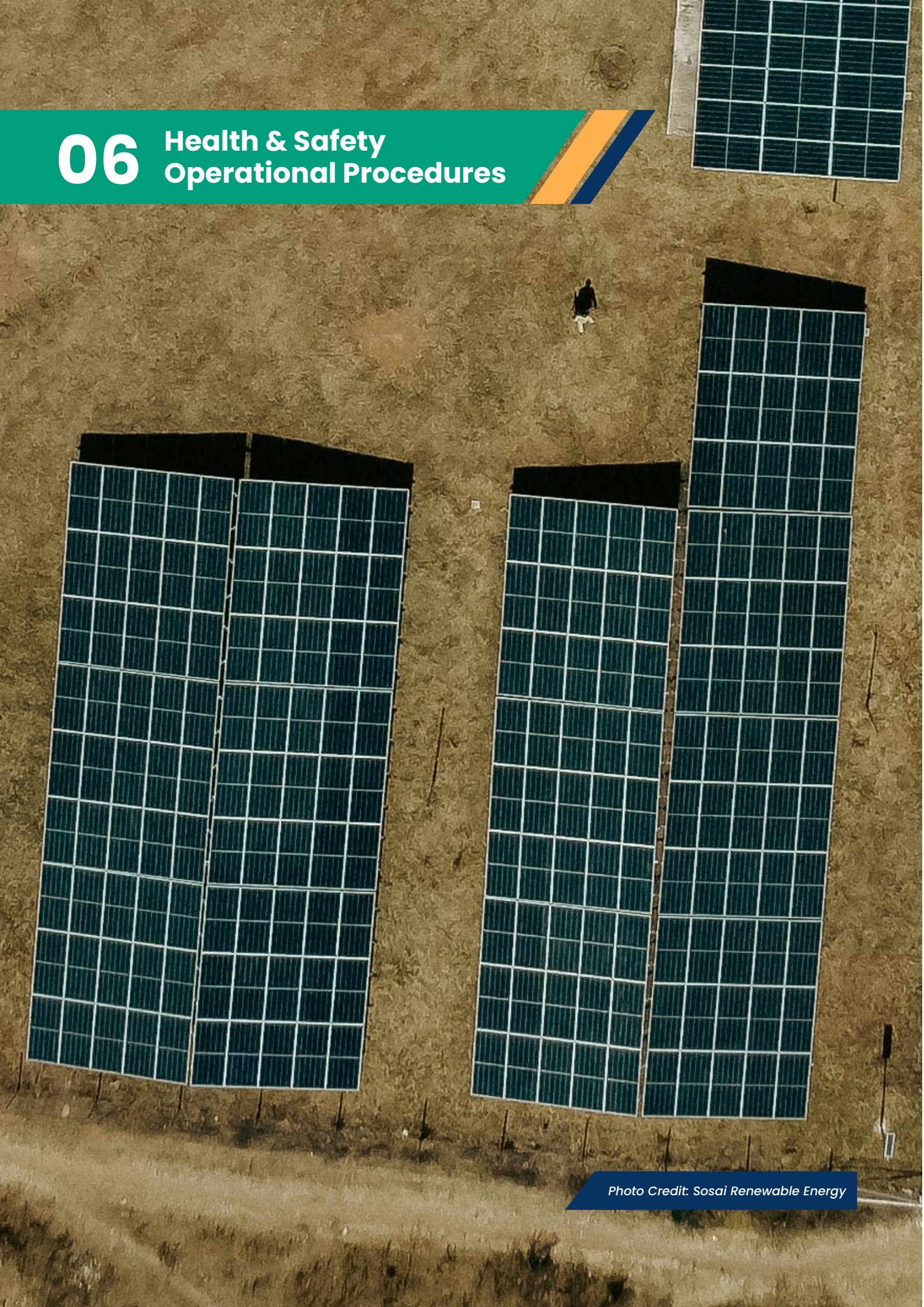

Photo Credit: Sosai Renewable Energy

6. Health & Safety Operational Procedures

This section contains the SOPs that implement H&S requirements. The SOPs include Training, Competence, and Awareness; Project Implementation Controls; Health & Safety Arrangements; Incident and Accident Reporting and Investigation; Monitoring and Audit Procedures; and Document and Record Control.

6.1 Training, Competence, and Awareness

Training, Competence, and Awareness will ensure personnel and contractors are competent for their roles and understand H&S requirements. The Health & Safety Manager and Health & Safety Officer will maintain the Training Matrix. Refer to Annex "ii. Training – Competence Tracker".

Table 6.1: *Training, competence, and awareness requirements for minigrid personnel*

Phase	Personnel / Role	Required Training & Competence	Relevant Certification / Authority	Awareness & Additional Requirements.
1. Design Phase	Project Developer / Manager	Project management, stakeholder engagement, environmental and social safeguards	Not applicable (experience in energy or infrastructure project development preferred)	Awareness of Energy Regulation Act (2019), ERB licensing procedures, and community engagement requirements under Environmental Management Act (2011)
	Electrical / Power Systems Engineer	Bachelor of Science (BSc) in Electrical/Power Engineering; knowledge of renewable integration and protection design	Engineering Institution of Zambia (EIZ) Registration; ERB Licensing for energy projects	Awareness of Electricity (Safety and Technical Standards) Regulations, 2022 and Zambia Electrical Code
	Civil / Structural Engineer	BSc in Civil/Structural Engineering; foundation and load analysis	EIZ Registered Engineer	Awareness of ZABS structural standards, soil stability, and foundation safety
2. Construction Phase	Project Supervisor / Site Engineer	Technical diploma or degree in engineering, with site management and safety training	EIZ / ERB Registered Engineer or Technician	Awareness of OHS Act (2010) and construction safety practices
	Electrical Technicians	Certificate/Diploma in Electrical Installation; electrical safety and first aid	ERB Licensed Electrician (Class A/B)	Knowledge of Lock-Out/ Tag-Out (LOTO) procedures, grounding, PPE use, and Electricity Act (2019) compliance
	Construction Workers / Labourers	Basic construction safety and first-aid training	Employer-based or National IV Association/Technical Education, Vocational and Entrepreneurship Training Authority (TEVETA) Certification	Awareness of hazard communication, PPE, site safety rules, and emergency evacuation
	Health & Safety Officer	Diploma/Degree in Occupational Health & Safety or National Examination Board in Occupational Safety and Health (NEBOSH) Certificate	OHSI Certified Health & Safety Officer	Awareness of OHS Act (2010), fire prevention, risk assessment, OHS experience in relevant industry and incident reporting

Phase	Personnel / Role	Required Training & Competence	Relevant Certification / Authority	Awareness & Additional Requirements.
3. Operation Phase	Minigrid Operator / Manager	Training in power system operations, customer service, and safety procedures	ERB Operational License (where applicable)	Awareness of tariff structures, consumer protection, and grievance redress mechanisms
	Electrical Technician / Plant Operator	Certificate/Diploma in Electrical or Renewable Energy Systems	ERB Licensed Technician / EIZ Registered Technologist	Knowledge of switchgear operation, electrical safety, and load management
	Control Room Attendant	Technical training in system monitoring, control, and data logging	Internal competency certification	Awareness of Supervisory Control and Data Acquisition (SCADA)/data systems, fault response, and reporting procedures
	Fire Safety / Security Officer	Fire prevention and emergency response training	Zambia Fire Service Certified Officer	Awareness of Fire Services Act (Cap. 219), evacuation routes, and use of firefighting equipment, OSH experience in relevant industry
	Customer Relations / Community Liaison Officer	Training in community engagement and customer complaint management	Internal certification / REA training	Awareness of Rural Electrification Act (2003) and community benefit-sharing principles
4. Maintenance Phase	Maintenance Engineer	Degree/Diploma in Electrical or Mechanical Engineering	EIZ or ERB Certification	Competence in preventive/ corrective maintenance of PV, inverter, and battery systems
	Electrical Maintenance Technician	Certificate/Diploma in Electrical Maintenance and Safety	ERB Licensed Electrician	Awareness of electrical isolation, inspection, and PPE requirements
	Solar Technician	Training in solar PV installation, troubleshooting, and safety	TEVETA or ERB-Accredited Solar PV Training (T1/T2/T3)	Familiarity with direct current (DC)/alternate current (AC) systems, inverter safety, and ZABS PV standards
	Health & Safety Officer	Occupational health & safety management and auditing	OHSI Certified Health & Safety Officer / NEBOSH Certification	Awareness of OHS Act (2010) fire prevention, and emergency preparedness, OHS experience in relevant industry
	First Aiders	Certified first-aid and emergency response training	OHSI / Red Cross Approved Training Institution	Awareness of injury management, emergency protocols, and reporting requirements

6.2 Project Implementation Controls

Project implementation controls establish built-in safety measures that ensure protection and effective management of health & safety risks throughout the design, construction, operation, and maintenance stages of the project.

Table 6.2: *Project implementation controls*

Project Phase	Implementation Activity	Specific Control Measures / Procedures	Objective / Purpose	Responsible Party	Reference Regulation / Standard
1. Design Phase	Electrical System Design	Apply Zambia Electrical Code and ERB-approved standards; include load calculation, protection design, earthing, and surge protection.	Ensure safe, reliable, and compliant electrical installations.	Electrical Engineer	Electricity (Safety and Technical Standards) Regulations (2022); Electricity Act (2019)
	Structural Design	Design solar mounting and support structures to meet ZABS and international wind, seismic, and load standards.	Maintain structural integrity and withstand environmental stresses.	Civil / Structural Engineer	ZABS Standards; EIZ Guidelines
	Risk Assessment	Conduct design-stage risk assessment identifying hazards and mitigation measures for electrical, fire, and environmental risks.	Integrate preventive and control measures early in project design.	Health & Safety Officer / Developer	OHS Act (2010); ISO 45001
2. Construction Phase	Site Safety Management	Develop site-specific safety plan; conduct safety inductions; conduct toolbox talks Refer to Annex "iii. Safety Induction Checklist" and Annex "v. Toolbox Meeting Form".	Prevent injuries, incidents, and unsafe work practices.	Contractor / Health & Safety Officer	OHS Act (2010); Factories Act (Cap. 441)
	Permit-to-Work (PTW) System	Apply PTW for high-risk activities (working at height, electrical works, confined space). Refer to Annex "iv. Permit to Work Form".	Control hazardous work and ensure supervision.	Site Engineer / Health & Safety Officer	OHS Act (2010); Electricity (Safety and Technical Standards) Regulations (2022)
	Electrical Safety	Enforce use of insulated tools, LOTO, certified electricians, and signage for live systems.	Prevent electrocution, burns, and electrical fires.	Electrical Supervisor	Electricity Act (2019); OHS Act (2010)
	Fire Safety	Install extinguishers, provide fire training, establish assembly points, and conduct drills.	minimise fire risks and ensure rapid response.	Health & Safety Officer / Site Manager	Fire Services Act (Cap. 219); OHS Act (2010)

Project Phase	Implementation Activity	Specific Control Measures / Procedures	Objective / Purpose	Responsible Party	Reference Regulation / Standard
	PPE Management	Provide and enforce use of helmets, gloves, boots, high-visibility vests, and harnesses.	Reduce exposure to physical, chemical, and electrical hazards.	Health & Safety Officer / Contractor	OHS Act (2010); ISO 45001
	Emergency Preparedness	Maintain first-aid kits, emergency contacts, evacuation procedures, and trained first aiders.	Ensure effective and timely response to emergencies.	Health & Safety Officer	First Aid Rules (under OHS Act); ISO 45001
	Protection Systems Operations	At commissioning, test the protection systems to ensure they are working.	To ensure functioning of protective devises from faults, overloads, lightning, and abnormal operating conditions.	Electrical Engineer (Commis-sioning)	Electricity (Safety and Technical Standards) Regulations (2022); Electricity Act (2019)
	Traffic, Access and Community Safety	Manage deliveries, speed limits, temporary signage, and safe pedestrian routes; notify communities of heavy movements.	Protect public safety and reduce nuisance.	Contractor / Logistics Officer	Local Government Permitting
3. Operation Phase	System Monitoring and Control	Use data loggers or SCADA systems for performance and fault monitoring.	Detect anomalies early and maintain system reliability.	Operator / Control Room Technician	ERB Licensing Conditions; Original Equipment Manufacturer (OEM) Guidelines
	Preventive Maintenance Programme	Schedule regular inspections of PV arrays, inverters, wiring, and batteries. Document maintenance activities.	Extend equipment lifespan and ensure consistent performance.	Operator / Main-tenance Engineer	Electricity (Safety and Technical Standards) Regulations (2022); OEM Manuals
	Emergency Response Plan	Develop and implement emergency response plan for fire, electrical faults, and flooding. Conduct annual drills. Refer to Annex "vi. Emergency Drill Report".	Reduce response time and safeguard personnel and assets.	Health & Safety Officer / Operator	OHS Act (2010); Fire Services Act (Cap. 219)

Project Phase	Implementation Activity	Specific Control Measures / Procedures	Objective / Purpose	Responsible Party	Reference Regulation / Standard
	Load Management	Balance energy supply and demand through smart metering and load scheduling.	Ensure stable, efficient, and continuous power supply.	Electrical Engineer / Operator	Energy Regulation Act (2019); ERB Guidelines
	Data and Reporting	Record operational data, incidents, maintenance logs, and submit reports to ERB and Zambia Environmental Management Agency (ZEMA).	Demonstrate compliance and facilitate decision-making.	Operator / Developer	ERB Reporting Requirements; Environmental Management Act (2011)
4. Maintenance Phase	Preventive and Corrective Maintenance	Replace batteries, service inverters, inspect wiring, and clean PV panels per schedule.	Maintain optimal system performance and reduce downtime.	Maintenance Engineer / Technician	OEM Guidelines; ERB Standards
	Work at Height and Electrical Isolation	Use harnesses, fall protection, and LOTO procedures during elevated or energised tasks.	Protect workers from falls and electrical hazards.	Maintenance Technician / Health & Safety Officer	OHS Act (2010); ISO 45001
	Spare Parts and Tools Control	Maintain certified and traceable inventory of parts and tools. Ensure calibration and inspection.	Guarantee availability and reliability of spare components.	Storekeeper / Maintenance Supervisor	ERB / OEM Requirements
	Fire and First Aid Preparedness	Ensure extinguishers and first-aid kits are functional and inspected regularly. Train staff in their use.	Enable rapid and effective emergency response.	Health & Safety Officer	Fire Services Act (Cap. 219); OHS Act (2010)
	Training and Refresher Courses	Conduct refresher training on safety, emergency response, and technical updates.	Maintain competence and reinforce safety culture.	Developer / Health & Safety Manager	OHS Act (2010); ISO 45001
	Documentation and Record Keeping	Keep updated maintenance records, safety checklists, and incident reports.	Ensure traceability and regulatory compliance.	Operator / Maintenance Engineer	OHS Act (2010); ERB Reporting Requirements

6.3 Health & Safety Arrangements

The main objective of Health & Safety Arrangements is to provide operational guidance in preventing occupational injuries and manage health risks during construction, operation and maintenance of the minigrid. The Health & Safety Officer will oversee implementation and monitoring while the Project Manager enforces compliance.

Table 6.3: *Detailed description of the health & safety arrangements*

Project Phase	Health & Safety Arrangement	Description / Key Actions	Objective / Purpose	Responsible Person / Entity	Relevant Regulation / Standard
1. Pre-Construction Phase	Health & Safety Planning	Develop a Health, Safety, and Environmental (Health & Safety) Management Plan as part of the project design.	Identify, assess, and mitigate hazards before mobilisation.	Developer / Design Engineer / Health & Safety Officer	OHS Act No. 36 of 2010; Environmental Management Act No. 12 of 2011
	Risk Assessment and Method Statements	Conduct detailed risk assessments and prepare safe work method statements for design and pre-construction activities.	Ensure hazards are controlled before implementation.	Health & Safety Officer / Design Team	OHS Act (2010) (Part IV, Section 25)
	Design for Safety	Incorporate safety features in design—proper access, guard rails, signage, ventilation, and safe electrical layouts.	Reduce risks during construction and operation.	Design Engineer	OHS Act (2010); ZABS Electrical Installation Code Zambian Standard (ZS) 385
	Competence and Training	Engage qualified, registered professionals (EIZ, ERB, ZEMA). Verify competence through certification.	Ensure technical integrity and legal compliance.	Developer / Design Lead	Engineering Institution of Zambia Act (2010); Energy Regulation Act No. 12 of 2019
	Emergency and Evacuation Planning	Include emergency exits, assembly points, and first aid facilities in site layout and design.	Enhance preparedness for incidents.	Design Engineer / Health & Safety Officer	Fire Safety Act Cap 125; OHS Act (2010)
2. Construction Phase	Site Induction and Toolbox Talks	Conduct site induction and continuous toolbox talks for all workers. Refer to Annex "iii. Safety Induction Checklist" and Annex "v. Toolbox Meeting Form".	Promote awareness and safety culture.	Site Health & Safety Officer / Contractor	OHS Act (2010), Sec. 18; Factories Act Cap 441
	PTW System	Enforce PTW for high-risk activities (e.g., electrical, working at height). Refer to Annex "iv. Permit To Work Form".	Control hazardous work safely.	Site Engineer / Health & Safety Officer	OHS Act (2010); Fire Safety Act Cap 125

Project Phase	Health & Safety Arrangement	Description / Key Actions	Objective / Purpose	Responsible Person / Entity	Relevant Regulation / Standard
	PPE	Provide and enforce use of PPE (helmets, gloves, harnesses, boots, safety glasses).	Prevent injuries and ensure compliance.	Contractor / Health & Safety Officer	OHS Act (2010), Sec. 29
	First Aid and Medical Arrangements	Provide trained first aiders, first-aid kits, and on-site medical support.	Facilitate prompt response to injuries or illness.	Health & Safety Officer / Contractor	OHS Act (2010); First Aid Rules (Statutory Instrument No. 28 of 1973)
	Fire Prevention and Response	Provide extinguishers, conduct drills, maintain emergency assembly areas. Refer to Annex ""vi. Emergency Drill Report".	Prevent and control fire hazards.	Site Manager / Fire Marshal	Fire Safety Act Cap 125; ZABS ZS 385
	Worker Health and Hygiene	Provide sanitation, potable water, eating areas, and shaded rest zones.	Promote worker well-being and hygiene.	Contractor / Developer	OHS Act (2010), Sec. 47; Public Health Act Cap 295
	Incident Reporting and Investigation	Record, report, and investigate all incidents, near-misses, and dangerous occurrences.	Promote accountability and learning.	Health & Safety Officer / OHSI Repre-sentative	OHS Act (2010), Sec. 33; Workers Compensation Act No. 10 of 1999
3. Operation Phase	Standard Operating Procedures (SOPs)	Develop SOPs for switching maintenance, emergency shutdown, and system monitoring.	Prevent accidents and ensure operational reliability.	Plant Operator / Manager	Energy Regulation Act (2019); ERB Licensing Conditions
	Routine Inspections and Audits	Conduct regular H&S audits, fire safety checks, and electrical tests.	Detect unsafe conditions early.	Health & Safety Officer / ERB Inspector	OHS Act (2010); ZABS ZS 385 and ZS 393
	Emergency Preparedness and Response	Maintain updated emergency plans, trained staff, and contact lists.	Improve readiness and quick response.	Health & Safety Manager / Operator	OHS Act (2010); Fire Safety Act Cap 125
	Electrical Safety and LOTO	Apply LOTO and maintain signage during service or repair.	Prevent electrocution and arc flash.	Electrical Technician / Operator	ZABS Electrical Code ZS 385; OHS Act (2010)
	Health and Hygiene	Ensure potable water, clean control rooms, and sanitation facilities.	Promote occupational health and hygiene.	Operator / Maintenance Manager	OHS Act (2010); Public Health Act Cap 295
	Record Keeping and Reporting	Maintain training logs, inspection reports, and incident records.	Support legal compliance and audits.	Operator / Developer	ERB Licensing Rules; OHS Act (2010)

Project Phase	Health & Safety Arrangement	Description / Key Actions	Objective / Purpose	Responsible Person / Entity	Relevant Regulation / Standard
	Community Health and Safety	Maintain fencing, signage, grievance channels, and community engagement.	Safeguard the public and build trust.	Developer / Community Liaison Officer	Environmental Management Act (2011); Energy Regulation Act (2019)
4. Maintenance Phase	Preventive Maintenance Safety Plan	Integrate safety protocols in all preventive and corrective maintenance tasks.	Reduce risk of equipment failure and injury.	Maintenance Engineer / Health & Safety Officer	OHS Act (2010); ERB Technical Rules
	Isolation and De-energisation	Enforce electrical isolation and lockout before maintenance.	Protect technicians from live systems.	Electrical Technician / Operator	ZABS Electrical Code ZS 385
	Working at Height Control	Use harnesses, scaffolds, and guard rails when maintaining PV arrays.	Prevent falls and injuries.	Maintenance Supervisor / Crew	OHS Act (2010), Work at Height Register
	Fire and First Aid Readiness	Ensure firefighting and first-aid equipment are functional. Conduct refresher drills.	Maintain high emergency readiness.	Maintenance Team / Health & Safety Officer	Fire Safety Act Cap 125; First Aid Rules (1973)
	Health Monitoring and Training	Provide periodic medical exams and refresher H&S training.	Ensure continued worker competence and health.	Health & Safety Manager / Developer	OHS Act (2010), Sec. 27
	Documentation and Review	Maintain maintenance logs, review safety performance, update risk assessments.	Promote continuous improvement.	Maintenance Engineer / Developer	OHS Act (2010); ERB Guidelines

6.4 Incident / Accident Reporting and Investigation

The Incident / Accident Reporting and Investigation arrangement will ensure timely reporting, investigation, corrective actions, and regulatory notifications for incidents and accidents. Any worker, site supervisor, or community member will report incidents immediately to site management, while the Health & Safety Manager leads investigations and regulator reporting, as required by the Electricity Act and ERB licence conditions (and relevant workplace H&S law). Records to be retained include an incident report form, investigation report, and corrective action register. Refer to Annex ""vii. Incident – Accident Notification Form" and Annex ""viii. Incident – Accident Investigation Report".

Personal data will be processed in a secure manner on a lawful basis, without consent, to comply with legal obligations or regulatory reporting. This will cover incident and accident notification, injury records, witness statements, and incident investigation reports. Necessary personal data that may be collected include name, job title, employee number; nature of injury or incident; date, time, and location; witness names; and medical

treatment. Medical information is 'sensitive personal data' and will require higher protection. Disclosure to authorities will be documented, have only the required information, and be secure. Only authorised personnel will have access to incident reports; unnecessary circulation will be avoided (e.g., on WhatsApp groups, open emails), and personal identifiers will be redacted when sharing lessons learnt.

Table 6.4: *Detailed incident and accident management procedure*

Key Step	Activity	Description of Action	Objective / Purpose	Responsible Person	Relevant Regulation / Standard
1. Incident Identification	Detect or observe incident/ accident	Any worker, supervisor, or community member who witnesses an incident (injury, fire, near miss, property damage, etc.) must immediately report it to the supervisor or safety officer.	Enable prompt response and containment.	All workers / Site staff	OHS Act (2010), Sec. 13
2. Initial Response	Provide first aid and secure the area	Trained first aider provides immediate care; isolate the area to prevent secondary accidents; if fire, activate extinguishers and emergency response.	Minimise injury severity and prevent escalation.	Site Supervisor / First Aider / Health & Safety Officer	First Aid Regulations (SI No. 168 of 1978); Fire Precautions Act (Cap 110)
3. Notification / Reporting	Internal reporting within site	Report incident verbally and through a written form to the Health & Safety Officer or Site Manager within 30 minutes.	Ensure management is aware and can coordinate response.	Worker / Supervisor	OHS Act (2010); Company Health & Safety Policy
	External notification (Regulatory)	Report all serious incidents (fatality, major injury, explosion, or fire) to the Department of OHSI and the ERB within 24 hours.	Fulfil legal obligations and enable regulatory investigation.	Health & Safety Officer / Developer	OHS Act (2010) Sec. 75; Energy Regulation Act (2019)
4. Incident Recording	Fill Incident/ Accident Report Form	Record date, time, location, persons involved, cause, injury details, witnesses, and actions taken.	Maintain accurate documentation for investigation and audits.	Health & Safety Officer / Supervisor	OHS Act (2010); Workers' Compensation Act (1999)
5. Scene Preservation	Secure and preserve evidence	Restrict access to the incident site until investigation is complete; take photographs and note observations.	Prevent loss of evidence for accurate investigation.	Health & Safety Officer / Site Security	OHS Act (2010), Sec. 77
6. Investigation	Conduct root cause analysis	The Health & Safety Officer leads an investigation with management, technical experts, and worker representatives to determine the root cause.	Identify causes and prevent recurrence.	Health & Safety Officer / Site Manager / ERB / OHSI	OHS Act (2010); ERB Health & Safety Guidelines

Key Step	Activity	Description of Action	Objective / Purpose	Responsible Person	Relevant Regulation / Standard
	Collect evidence	Gather statements, photos, inspection reports, and environmental data at the time.	Ensure comprehensive assessment.	Investigator / Health & Safety Officer	OHS Act (2010)
7. Corrective and Preventive Actions (CAPA)	Implement corrective actions	Fix unsafe conditions (e.g., repair, replace, retrain staff, revise SOPs).	Eliminate immediate hazards and prevent recurrence.	Site Manager / Contractor / Developer	OHS Act (2010); ISO 45001
	Develop preventive measures	Review training, supervision, and engineering controls to address root causes.	Strengthen safety culture and systems.	Health & Safety Manager / Developer	OHS Act (2010); ERB Health & Safety Standards
8. Follow-Up and Review	Monitor effectiveness of CAPA	Conduct follow-up inspections to confirm corrective actions are effective and sustained.	Verify long-term improvement.	Health & Safety Officer / Site Manager	OHS Act (2010), Sec. 81
	Review procedures	Update risk assessments, SOPs, and training programmes based on lessons learnt.	Continuous improvement in safety management.	Developer / Health & Safety Committee	OHS Act (2010); ISO 45001
9. Record Keeping	Maintain incident records	File reports, photos, witness statements, and CAPA records for at least five years.	Support audits, insurance, and compliance checks.	Developer / Health & Safety Officer	OHS Act (2010); Workers' Compensation Act (1999)
10. Communication and Feedback	Inform workers and stakeholders	Share investigation findings and preventive measures with all employees and relevant stakeholders.	Promote awareness and learning.	Health & Safety Officer / Developer	OHS Act (2010); ERB Safety Guidelines
11. Regulatory Reporting & Closure	Submit final report	Submit detailed incident investigation report and CAPA summary to OHSI and ERB.	Legal compliance and accountability.	Developer / Health & Safety Officer	OHS Act (2010); ERB Health & Safety Guidelines
	Close-out verification	Obtain acknowledgment or closure confirmation from regulators.	Document compliance completion.	Health & Safety Manager / Developer	OHSI / ERB Procedures

6.5 Monitoring and Audit Procedures

Monitoring and Audit Procedures verify implementation of H&S controls through routine monitoring and periodic audits. This includes routine site inspections and checklists (daily/weekly), monthly management reviews of monitoring data, annual internal audits, and corrective action tracking. Records retained include inspection checklists, audit reports, and management review minutes. Refer to Annex ""ix. Safety Inspection Checklist – Site" and Annex ""x. Audit Checklist – Health & Safety".

Table 6.5: *Monitoring and audit management procedure*

Phase	Step / Activity	Description of Action	Objective / Purpose	Responsible Person / Entity	Relevant Regulation / Standard
1. Planning Stage (Before Construction)	Establish a Monitoring Plan	Develop a project-specific Health & Safety Monitoring Plan detailing parameters, frequency, and reporting procedures.	Ensure structured and consistent monitoring from project inception.	Developer / Design Engineer / Health & Safety Officer	OHS Act (2010); Energy Regulation Act (2019)
	Define Performance Indicators	Identify KPIs (e.g., incident rates, near misses, PPE compliance, training completion).	Measure and evaluate safety performance over time.	Developer / Health & Safety Manager	ERB Licensing Conditions; ISO 45001
	Risk Assessment and Method Statements	Conduct task-specific risk assessments and prepare safe work method statements.	Identify potential hazards and define control measures.	Health & Safety Officer / Contractor	OHS Act (2010)
2. Construction Phase	Routine Site Monitoring	Carry out daily and weekly safety inspections focusing on PPE use, housekeeping, electrical safety, and excavation works.	Detect and correct non-conformities promptly.	Contractor / Health & Safety Officer	OHS Act (2010)
	Safety Performance Monitoring	Track safety indicators, such as incidents, near misses, and toolbox meeting attendance.	Promote a proactive safety culture and prevent accidents.	Health & Safety Officer / Site Supervisor	ISO 45001; OHS Act (2010)
	Record Keeping	Maintain inspection checklists, incident logs, and photo documentation.	Provide verifiable proof of compliance and continuous monitoring.	Health & Safety Officer	Environmental Management Act (2011); OHS Act, (2010)
	Internal Site Audits	Conduct monthly internal audits on compliance with H&S standards and corrective actions.	Identify and address safety management gaps early.	Developer / Health & Safety Manager	ISO 45001; Energy Regulation Act (2019)
	External / Compliance Audits	Facilitate inspections by ERB, ZEMA, or DoE as required under project licensing.	Ensure compliance with statutory and permit conditions.	Developer	ERB Licensing Regulations; ZEMA Environemntal Imapct Accessment (EIA) Regulations (2013)
3. Operation Phase	Occupational Health & Safety Monitoring	Conduct regular inspections of operational areas, emergency equipment, and worker welfare facilities.	Ensure safe and healthy working environment.	Health & Safety Officer / Site Manager	OHS Act (2010)
	Internal Health & Safety Audits	Perform semi-annual audits to review operational safety performance.	Evaluate system effectiveness and continuous compliance.	Health & Safety Manager / Internal Auditor	ISO 45001; ERB Safety Guidelines

Phase	Step / Activity	Description of Action	Objective / Purpose	Responsible Person / Entity	Relevant Regulation / Standard
	Emergency Preparedness Drills	Conduct periodic fire, electrical fault, and evacuation drills.	Test readiness and improve emergency response.	Health & Safety Officer / Site Manager	OHS Act (2010); ISO 45001
4. Maintenance Phase	Preventive Maintenance Inspections	Inspect solar panels, battery banks, earthing systems, and structures per schedule.	Maintain safety and reliability of equipment.	Maintenance Engineer / Technician	ERB Technical Standards; OEM Guidelines
	Safety Re-Audits	Conduct safety re-audits following major maintenance or upgrades.	Confirm safety compliance before resuming operation.	Developer / Health & Safety Officer	OHS Act (2010)
	CAPA Monitoring	Track and verify implementation of actions from previous audits or incidents.	Ensure closure of all identified risks and non-compliances.	Health & Safety Manager / Developer	ISO 45001
	Documen-tation and Reporting	Maintain maintenance logs, inspection records, and H&S reports.	Demonstrate regulatory and operational compliance.	Developer / Health & Safety Officer	ERB Reporting Requirements; OHS Act (2010)
5. Review and Continuous Improvement	Management Review Meetings	Hold quarterly health & safety review meetings to discuss audit outcomes, incidents, and improvements.	Foster accountability and continual improvement.	Developer / Senior Management	ISO 45001; OHS Act (2010)
	Annual Compliance Reporting	Submit annual health & safety compliance reports to ERB and DoE.	Meet legal and licensing obligations.	Developer / Health & Safety Officer	Energy Regulation Act (2019); OHS Act (2010)
	Capacity Building	Conduct refresher safety training and emergency response exercises based on audit findings.	Strengthen staff competence and safety awareness.	Health & Safety Manager / Developer	OHS Act (2010); ISO 45001
	Update Monitoring Plan	Review and update the Health and Safety Monitoring Plan annually or after major changes.	Maintain alignment with new regulations and lessons learnt.	Developer	ERB Guidelines; ZEMA EIA Regulations (2013)

6.6 Document and Record Control

Document and Record Control ensures controlled versioning, retention, and accessibility of H&S documentation. This includes the use of a central document repository with version control and defined retention periods (minimum five years for operational records, unless otherwise required). It also ensures backups and secure storage of regulatory submissions and permits. Records retained include the document register and archive index.

Table 6.6: *List of documents to maintain and records to retain*

Phase	Step / Activity	Description of Action	Objective / Purpose	Responsible Person / Entity	Relevant Regulation / Standard
1. Establishment Stage (Before Construction)	Develop Document Control Procedure	Develop and implement a formal procedure for document creation, approval, distribution, revision, and archiving.	Ensure consistency, accuracy, and traceability of all project documentation.	Project Manager / Quality Manager	ISO 45001; Energy Regulation Act (2019)
	Define Document Categories	Classify documents (Technical, Environmental, Health & Safety, Legal, Financial, etc.) for organised management and easy retrieval.	Facilitate systematic control and retrieval of project information.	Quality Officer / Document Controller	ISO 45001
	Establish Document Templates	Develop standardised templates for reports, checklists, permits, and logs.	Ensure uniformity across all project documentation.	Quality Manager / Health & Safety Officer	ISO 45001
	Assign Document Control Roles	Appoint a Document Controller to manage document distribution, updates, and storage.	Establish accountability and control over documentation.	Developer / Project Manager	ISO 45001
2. Construction Phase	Document Creation and Approval	Prepare and approve documents, such as design drawings, permits, health & safety plans, and inspection forms before use.	Ensure that all documents are reviewed and authorised before implementation.	Engineers / Contractor / Health & Safety Manager	Occupational Health & Safety Act (2010); ERB Guidelines
	Document Numbering and Version Control	Assign unique identification numbers and maintain a revision log for all documents.	Prevent confusion and ensure use of the latest versions.	Document Controller / Quality Officer	ISO 45001
	Controlled Distribution	Issue approved documents to authorised personnel through secure digital or physical channels.	Prevent unauthorised use, duplication, or alteration.	Document Controller	ISO 45001
	Record Mainte-nance	Keep daily construction logs, inspection reports, and safety checklists in a centralised storage.	Provide verifiable evidence of compliance and project progress.	Site Supervisor / Health & Safety Officer	OHS Act (2010); En-vironmental Management Act (2011)

Phase	Step / Activity	Description of Action	Objective / Purpose	Responsible Person / Entity	Relevant Regulation / Standard
	Backup and Storage	Implement both physical and electronic backup systems for all project documents.	Safeguard records against loss, damage, or cyber threats.	Developer / IT Officer	ISO 45001; Data Protection Act (2021)
	Retention Schedule	Retain key records for a minimum of five years after project completion as per statutory requirements.	Meet regulatory and audit obligations.	Developer / Project Manager	OHS Act (2010); Energy Regulation Act (2019)
3. Operation Phase	Operational Document Manage-ment	Maintain updated operational manuals, SOPs, maintenance schedules, and safety procedures.	Ensure safe, consistent, and efficient operations.	Plant Operator / Health & Safety Manager	ERB (Minigrid and Embedded Generation) Regulations (2022)
	Perfor-mance Records	Keep records of energy generation, distribution, equipment uptime, and downtime incidents.	Enable data-driven performance tracking and reporting.	Plant Operator / Engineer	ERB Reporting Guidelines (2022)
	Health & Safety Records	Maintain logs of inspections, incidents, safety drills, and waste management activities.	Demonstrate compliance and accountability in safety performance.	Health & Safety Officer	OHS Act (2010); ISO 45001
	Audit and Compliance Records	Keep records of internal and external audits (ERB, ZEMA, DoE).	Support statutory compliance verification and certification.	Developer / Health & Safety Officer	ERB Guidelines; ZEMA EIA Regulations (2013)
4. Maintenance Phase	Mainte-nance Records	Record details of all preventive and corrective maintenance activities, including date, responsible personnel, and parts used.	Track system reliability and maintenance effectiveness.	Maintenance Technician / Engineer	ERB Minigrid Regulations (2022)
	Equipment Calibration and Testing Records	Retain calibration and inspection certificates for testing equipment (e.g., meters, electrical tools).	Ensure operational accuracy and worker safety.	Maintenance Engineer / Health & Safety Officer	OHS Act (2010); ISO 45001
	Spare Parts and Inventory Records	Maintain logs of spare parts inventory, usage, and procurement details.	Enhance maintenance efficiency and cost management.	Storekeeper / Maintenance Supervisor	ISO 45001
5. Review and Archiving Stage	Periodic Review of Documents	Conduct annual reviews to update or retire obsolete documents.	Keep documentation current and relevant to ongoing operations.	Document Controller / Health & Safety Manager	ISO 45001

Phase	Step / Activity	Description of Action	Objective / Purpose	Responsible Person / Entity	Relevant Regulation / Standard
	Disposal of Records	Securely dispose of expired or redundant documents after the retention period using shredding or deletion protocols.	Protect confidentiality and comply with data protection laws.	Document Controller / Developer	Data Protection Act (2021)
	Audit of Document Control System	Carry out internal audits annually to evaluate document management effectiveness.	Identify nonconformities and improve the system.	Quality Manager / Internal Auditor	ISO 45001; ERB Guidelines
	Continuous Improve-ment	Implement recommendations and lessons learnt from audits and reviews.	Foster continual improvement and regulatory alignment.	Developer / Quality Manager	ISO 45001

07 Risk Management

Photo Credit: SmartEnergy

7. Risk Management

Risk Management involves a structured approach for identifying, assessing, and managing environmental and social risks. The Risk Register will be maintained and updated regularly. In summary, the Risk Assessment Methodology involves identifying hazards and potential impacts, assessing likelihood and consequence, assigning a risk rating, and then prioritising mitigation according to the mitigation hierarchy. The risk assessment includes climate risk considerations, such as extreme heat, lightning, and flooding.

Table 7.1: *Risk assement – design, construction, operation and maintenance phases*

Phase	Activity / Hazard	Potential Risk / Impact	Likeli-hood	Severity	Risk Rating	Mitigation / Control Measures	Responsible Person / Entity
1. Design Phase	Inadequate site assessment (flooding, shading, soil stability)	Poor energy output, foundation failure	Medium	High	High	Conduct detailed topographical, geotechnical, and hydrological surveys	Design Engineer / Developer
	Climate variability underestimated	Infrastruc-ture not resilient to heat, storms, floods	Medium	High	High	Use climate risk assessments; design for extreme weather; elevate equipment	Project Developer / Engineer
	Site selection in flood-prone areas	Flooding of powerhous-es, battery rooms	Medium	High	High	Flood mapping; avoid flood plains; raised platforms	Project Developer
	Faulty electrical design or undersized system	Equipment failure, fire, inefficiency	Low	High	Medium	Use ERB-licensed electrical engineer, adhere to Zambia Electrical Code	Electrical Engineer
	Incomplete load assessment	Power shortages or overloading	Medium	Medium	Medium	Conduct accurate demand surveys and community consultations	Design Team / Developer
	Poor site layout planning (fuel storage near genset)	Fire, explosion hazard	Low	High	Medium	Maintain minimum safe distances between genset, fuel tanks, and structures per National Fire Protection Association standards	Design Engineer / Health & Safety Officer
	Inadequate noise / emission mitigation design	Environ-mental pollution, community complaints	Medium	Medium	Medium	Incorporate acoustic enclosures, silencers, and emission control systems	Design En-gineer / Envi-ronmental Officer
	Lack of stakeholder consultation	Community resistance, project delays	Medium	High	High	Conduct stakeholder engagement and public participation in accordance with the Free, Prior, and Informed Consent principles.	Developer / Community Liaison

Phase	Activity / Hazard	Potential Risk / Impact	Likeli-hood	Severity	Risk Rating	Mitigation / Control Measures	Responsible Person / Entity
	Poor access road design	Logistics challenges, accidents	Medium	Medium	Medium	Design access routes with safety and drainage considerations	Design Engineer
2. Con-struction Phase	Excavation and trenching	Cave-ins, injuries, fatalities	Medium	High	High	Provide PPE, slope sides, trench barriers, supervision	Contractor / Health & Safety Officer
	Working at heights (panel installation)	Falls, fractures, fatalities	Medium	High	High	Use safety harnesses, scaffolding, fall-arrest systems	Contractor / Health & Safety Officer
	Electrical wiring and live testing	Electric shock, fire	Medium	High	High	Use ERB-certified electricians, isolate power before work	Electrical Supervisor
	Handling of heavy equipment (diesel generator, solar panels, batteries)	Muscle injuries, dropped loads, property damage	Medium	High	Medium	Use certified lifting gear, trained riggers, and signalmen; inspect cranes before use; provide manual handling training, mechanical lifts, and team lifting	Contractor / Site supervisor / Health & Safety Officer
	Fuel tank installation and connection	Fire, explosion, fuel leaks	Medium	High	High	Use approved tanks and fittings; ensure bonding/grounding, spill containment	Contractor / Health & Safety Officer
	Electrical connections and live testing	Electric shock, fire	Medium	High	High	De-energise circuits; use insulated tools; certified electricians only	Electrical Supervisor
	Welding and cutting during installation	Burns, fire, inhalation of fumes	Medium	Medium	Medium	Use PPE, fire watch, welding curtains; proper ventilation	Contractor / Health & Safety Officer
	Inadequate earthing and bonding	Electrical shock, equipment damage	Low	High	Medium	Install proper earthing system per standards, test resistance levels	Electrical Engineer
	Battery storage and handling	Chemical burns, toxic exposure	Low	High	Medium	Use PPE; proper ventilation; chemical spill kits	Contractor / Health & Safety Officer
	Fire hazards during installation	Injury, property loss	Low	High	Medium	Fire extinguishers on site; worker fire safety training	Health & Safety Officer

Phase	Activity / Hazard	Potential Risk / Impact	Likeli-hood	Severity	Risk Rating	Mitigation / Control Measures	Responsible Person / Entity
	Extreme rainfall	Slips, trips, excavation collapse	High	Medium	High	Weather monitoring; stop work during heavy rain; proper drainage	Contractor / Site Supervisor
	High temperatures / heatwaves	Heat stress, dehy-dration, reduced alertness	High	Medium	High	Work/rest cycles; shade; drinking water; PPE	Contractor
	Strong winds / storms	Falling structures, dropped loads, electrical hazards	Medium	High	High	Secure materials; suspend lifting works; wind-rated structures	Contractor
	Dust from drought conditions	Respiratory issues, reduced visibility	Medium	Medium	Medium	Dust suppression; masks; housekeeping	Contractor
	Lightning during installation	Electro-cution, equipment damage	Medium	High	High	Lightning protection; weather stop-work rules	Engineering Procurement, Construction Contractor
3. Operation Phase	Electrical faults / short circuits	Fire, injury, service disruption	Medium	High	High	Regular inspections; protective relays; circuit breakers	Operator / Maintenance Team
	Generator overloading / underloading	Reduced lifespan, overheating	Medium	Medium	Medium	Monitor load balance, use automatic load management	Operator
	Fuel leakage or spills	Fire, explosion, soil	Medium	High	High	Regular inspection of hoses and tanks; secondary containment, spill plan	Operator / Health & Safety Officer
	Excessive noise and vibration	Hearing damage, community nuisance	Medium	Medium	Medium	Maintain acoustic enclosures; provide hearing protection	Operator / Health & Safety Officer
	Exhaust emissions	Air pollution, health hazards	Medium	High	High	Routine servicing; emission control devices; compliance with statutory limits	Operator / Environmen-tal Officer
	Overheating of panels or inverters	Fire, system failure	Low	High	Medium	Provide adequate ventilation; use thermal sensors	Operator

Phase	Activity / Hazard	Potential Risk / Impact	Likeli-hood	Severity	Risk Rating	Mitigation / Control Measures	Responsible Person / Entity
	Battery failure or leakage	Explosion, toxic exposure	Low	High	Medium	Routine checks; temperature control; safe battery disposal per regulations	Operator / Health & Safety Officer
	Unauthorised grid connections	Electrocu-tion, reve-nue loss	Medium	Medium	Medium	Secure enclosures; install tamper alarms	Operator
	Fire outbreak	Damage to equipment, injuries	Low	High	Medium	Fire detection and suppression systems, training, drills	Operator / Health & Safety Officer
	Flooding of distribution lines	Electrocu-tion risk to public	Medium	High	High	Elevated poles; insulation; automatic shutdown	Operator
	Heat affecting batteries in the Battery Energy Storage System	Thermal runaway, fire, explosion	Medium	High	High	Temperature control; fire suppression; thermal monitoring	Operator
	Increased storms	Line damage, falling poles	Medium	High	High	Stronger poles; routine inspections; vegetation control	Operator
	Climate-related disasters	Inadequate emergency prepared-ness	Medium	High	High	Emergency plans; drills; coordination with community	Operator
4. Main-tenance Phase	Routine system inspection	Electric shock, falls	Medium	High	High	De-energise circuits; PPE; qualified personnel	Maintenance Technician
	Cleaning of panels	Falls, glass cuts	Medium	Medium	Medium	Use non-slip shoes, safety harness, gloves, step ladders	Maintenance Technician
	Replacement of faulty batteries	Chemical exposure	Low	High	Medium	PPE; proper ventilation; trained staff	Maintenance Supervisor
	Oil and filter changes	Spillage, skin irritation	Medium	Medium	Medium	Use drip trays; PPE; proper disposal per waste regulations	Maintenance Supervisor
	Replacement of worn-out parts (belts, hoses)	Mechanical injuries	Medium	Medium	Medium	De-energise unit; use tools properly; PPE	Maintenance Technician
	Lack of maintenance documentation	Missed faults, safety lapses	Medium	Medium	Medium	Maintain inspection logs and maintenance schedules	Maintenance Supervisor

Phase	Activity / Hazard	Potential Risk / Impact	Likeli-hood	Severity	Risk Rating	Mitigation / Control Measures	Responsible Person / Entity
	Worker fatigue / inadequate training	Errors, accidents	Medium	Medium	Medium	Provide periodic refresher training, rotation schedules	Developer / Operator
	Extreme weather during repairs	Increased injury risk	Medium	Medium	Medium	Weather-based maintenance planning	Operator
	Flooded access roads	Delayed emergency response	Medium	High	High	Alternative access plans; local response teams	Operator / Local Authority

08 Monitoring, Evaluation and Reporting

Photo Credit: Hydrobox

8. Monitoring, Evaluation and Reporting

Monitoring ensures that health & safety measures are effective and that the company meets its regulatory obligations. This section outlines KPIs, monitoring methods, data quality assurance, and reporting timelines. Where incidents recur, CAPAs are not closed out within set timelines, or there is any breach of regulations, an escalation will be triggered to enable higher-level authority to take corrective action (refer to Table 8.2).

Table 8.1: *Monitoring, evaluation and reporting procedure*

Phase	Key Step	Description of Action	Objective / Purpose	Responsible Person / Entity	Frequency / Timeline	Relevant Regulation / Standard
1. Planning / Pre-Construction	Assign Monitoring & Evaluation (M&E) Roles	Appoint an M&E Officer or Health & Safety Manager responsible for project monitoring, evaluation, and reporting systems.	Ensure accountability, coordination, and proper oversight of safety and performance.	Developer / Contractor	Pre-construction	ISO 45001; Energy Regulation Act (2019)
2. Construction Phase	Health & Safety Monitoring	Inspect PPE usage, signage, housekeeping, scaffolding, and site access controls.	Minimise incidents and ensure compliance with OHS Act.	Health & Safety Officer / Site Supervisor	Daily	OHS Act (2010); ISO 45001
	Incident and Accident Reporting	Record and investigate all incidents and near misses, maintain corrective action logs.	Enhance safety culture and prevent recurrence.	Health & Safety Officer / Contractor	As Occurs	OHS Act (2010); ISO 45001
	Internal Site Inspections	Conduct internal audits of compliance with safety, environmental, and social safeguards.	Identify non-conformities early and implement corrective actions.	Developer / Health & Safety Manager	Monthly	ISO 45001; ERB Guidelines
3. Operation Phase	Occupational Health & Safety Evaluation	Review incidents, inspect emergency equipment, and conduct fire and evacuation drills.	Maintain a safe, healthy, and compliant working environment.	Health & Safety Officer / Safety Committee	Monthly / Quarterly	OHS Act (2010); ISO 45001
	Performance Reporting to ERB	Report on energy generation, system efficiency, outages, and incidents to ERB.	Fulfil operational and licensing obligations.	Developer / Plant Operator	Quarterly / Annually	ERB Minigrid & Embedded Generation Regulations (2022)
	Annual Health & Safety Compliance Audit	Conduct annual safety & health audits through registered auditors and submit to OHSI.	Evaluate performance of the Health & Safety Management System.	Registered Health & Safety Auditor	Annually	OHS Act (2010); ISO 45001

Phase	Key Step	Description of Action	Objective / Purpose	Responsible Person / Entity	Frequency / Timeline	Relevant Regulation / Standard
	Community Engagement and Feedback	Maintain open communication channels with host communities regarding performance and grievances.	Promote transparency and local support.	Developer / Community Liaison Officer	Quarterly	ERB Stakeholder Guidelines
4. Maintenance Phase	Reporting of Maintenance Activities	Document all preventive and corrective maintenance activities and submit summaries to ERB.	Maintain transparency and ensure ongoing equipment safety.	Maintenance Engineer / Supervisor	Quarterly	ERB Regulations (2022)
	Equipment Testing and Calibration Records	Verify calibration and testing of key electrical and safety equipment.	Ensure accuracy and operational reliability.	Maintenance Engineer / Health & Safety Officer	Annually	OHS Act (2010); ISO 45001
5. Reporting and Review Stage	Internal Reporting	Compile daily, weekly, and monthly monitoring summaries covering health & safety, environment, and performance metrics.	Inform management decisions and corrective actions.	Health & Safety Officer / M&E Officer	Weekly / Monthly	ISO 45001
	External / Regulatory Reporting	Submit required reports to ERB, ZEMA, and DOHS per license and environmental permit conditions.	Demonstrate compliance and maintain legal standing.	Developer / Consultant	As per regulatory timelines	ERB Act (2019); ZEMA EIA Regulations (2013); OHS Act (2010)
	Evaluation and Lessons Learnt	Conduct an annual review of project outcomes against M&E indicators and audit findings.	Identify successes, failures, and opportunities for improvement.	Developer / M&E Officer	Annually	ISO 45001
	Management Review and Continuous Improvement	Present M&E findings to management and update systems, policies, and controls accordingly.	Strengthen safety and environmental performance through continuous improvement.	Senior Management / Developer	Annually	ISO 45001; ERB Guidelines

Table 8.2 *Escalation trigger matrix – recurring incidents, CAPA non-closure and regulatory breach*

Category	Trigger / Condition	Threshold / Timeline	Escalation Level	Escalated To	Required Action
Recurring Incidents	Same type of incident	2 occurrences within 3 months	Level 1	Site Manager / Health & Safety Officer	Review controls, toolbox talk, reinforce procedures
	Same type of incident	3 occurrences within 6 months	Level 2	Project / Operations Manager	Formal investigation, revise risk assessment, strengthen CAPA
	Incident recurs after CAPA closure	Any recurrence	Level 3	Senior Management	Independent review, effectiveness audit, possible work pause
	Serious incident recurrence (injury, fire, electrocution)	Any repetition	Level 4	Top Management / Regulator	Stop work, notify regulator, full system review
CAPA Non-Closure	CAPA overdue	7–14 days	Level 1	Site Supervisor / HSE Officer	Reminder, revised completion date
	CAPA overdue	>30 days	Level 2	Project Manager	Written justification, management intervention
	Safety-critical CAPA overdue	>60 days	Level 3	Senior Management	Allocate resources, enforce accountability
	Repeated overdue CAPAs	>2 overdue per quarter	Level 4	Executive / Board	Performance action, internal audit
	CAPA linked to serious incident not closed	Any delay	Immediate escalation	Executive / Regulator	Stop work until CAPA closed
Regu-latory Breaches	Missed statutory reporting deadline	Any delay	Level 2	Project Manager	Immediate submission, corrective action
	Minor regulatory non-compliance	Single occurrence	Level 2	Operations Manager	Correct within agreed timeframe
	Repeated non-compliance	Same issue cited twice	Level 3	Senior Management	Compliance audit, corrective programme
	Regulatory notice / improvement order	Any issuance	Level 4	Executive Management	Formal response, regulator engagement
	Prohibition notice, fines, or licence risk	Any occurrence	Level 5 (Crisis)	Board / Legal Counsel	Stop operations, legal response, corrective actions review

09 Emergency Preparedness and Response

Photo Credit: SmartEnergy

9. Emergency Preparedness and Response

The Emergency Preparedness and Response will ensure timely, effective response to emergencies to protect life, property and the environment. Refer to Annex ""vi. Emergency Drill Report".

Table 9.1: *Emergency preparedness and response procedure*

Phase	Step / Activity	Description of Action	Objective / Purpose	Responsible Person / Entity	Frequency / Timeline	Relevant Regulation / Standard
1. Planning and Preparedness (Before Construction)	Develop Emergency Response Plan (ERP)	Prepare a written ERP covering fire, electrocution, battery/ chemical spills, medical emergencies, security incidents and natural hazards (floods, storms).	Provide a clear, structured response framework so incidents are managed quickly and safely.	Developer / Project Manager / Health & Safety Manager	Prior to site mobilisation (approved before works start)	Occupational Health & Safety Act (2010); Energy Regulation Act (2019)
	Identify Emergency Scenarios	Carry out a site risk assessment to identify likely emergency events (electrical fault, battery thermal runaway, chemical spill, fire, flood, lightning).	Ensure preparedness for the full range of credible emergencies.	Health & Safety Officer / Design Engineer / Environmental Specialist	Before construction and updated during design reviews	OHS Act (2010)
	Establish Emergency Organisation	Appoint Emergency Response Team (ERT) roles: Incident Commander, First Aiders, Fire Wardens, Communications Lead and External Liaison.	Define responsibilities and decision lines for faster, coordinated response.	Project Manager / Health & Safety Officer	Pre-construction; confirmed at mobilisation	OHS Act (2010); ISO 45001
	Provide Emergency Equipment	Procure and position fire extinguishers (appropriate classes), spill kits, first-aid kits, stretchers, PPE, signage and alarms.	Ensure availability of lifesaving and containment tools on site.	Contractor / Health & Safety Officer / Plant Manager	Installed before any site works; inspected weekly/ monthly	OHS Act (2010); ERB technical guidance
	Emergency Communication System	Establish internal comms (radios, phones), external contact lists (ambulance, nearest hospital, police, fire brigade), and alarm procedures.	Enable rapid notification and coordination with external responders.	Health & Safety Manager / Site Supervisor	Completed pre-mobilisation; contact lists reviewed quarterly	OHS Act (2010)
2. Construction Phase	Conduct Emergency Drills	Run fire, evacuation and spill response drills with all workers and subcontractors; record observations.	Test readiness, identify gaps and reduce response times.	Health & Safety Officer / ERT / Contractor	Quarterly (or more frequently for high-risk activities)	OHS Act (2010); ISO 45001
	Employee Induction and Training	Provide site-specific emergency briefings, evacuation routes, muster points and basic first-aid/fire training for all arrivals.	Build awareness, competence and confidence to act in an emergency.	Health & Safety Officer / Contractor	At induction and refresher sessions, monthly/ quarterly	OHS Act (2010)

Phase	Step / Activity	Description of Action	Objective / Purpose	Responsible Person / Entity	Frequency / Timeline	Relevant Regulation / Standard
	Site Access and Evacuation Planning	Keep emergency access routes, assembly points, and exits clear; signpost all routes and provide muster boards.	Facilitate timely evacuation and allow emergency services access.	Site Supervisor / Health & Safety Officer	Continuous (daily checks)	OHS Act (2010)
	Incident Reporting and Investigation	Report, log and investigate incidents / near misses within set timelines; produce corrective action plans.	Identify root causes and prevent recurrence.	Health & Safety Officer / Project Manager	Report within 24 hours; investigation within 7 days	OHS Act (2010); Environmental Management Act (2011)
	Liaison with Local Authorities	Notify and coordinate with local health facilities, police, fire services and district disaster management where required.	Ensure prompt external support and compliance with local response protocols.	Project Manager / Health & Safety Officer	Established pre-mobilisation; ongoing as needed	Local disaster management frameworks; ERB licensing conditions
3. Operation Phase	Review and Update ERP	Review ERP to reflect operational risks (battery rooms, inverter faults, community access) and revise contact lists, roles and procedures.	Keep the ERP current and practical for live operations.	Plant Manager / Health & Safety Officer / Developer	Annually or after any major change / incident	Energy Regulation Act (2019); OHS Act (2010)
	Fire Prevention and Control	Inspect and service fire extinguishers, smoke detectors, emergency lighting and electrical isolation points; ensure clear signage.	Reduce likelihood and severity of fires in operational areas.	Health & Safety Officer / Technician	Monthly inspections; annual servicing	OHS Act (2010); ERB technical standards
	Medical Emergency Preparedness	Maintain first-aid facilities, trained first aiders on shift, and clear transfer arrangements to local health facilities.	Ensure injured persons receive prompt care.	Plant Manager / First Aiders	Continuous (first aiders on every shift); training annually	OHS Act (2010)
	Electrical and Battery Safety Monitoring	Monitor battery temperature, ventilation, earthing, insulation and electrical protections; implement thermal sensors / alarms.	Early detection and prevention of thermal runaway, short circuits and electrocution.	Electrical Engineer / Operator	Daily visual checks; weekly/ bi-weekly electrical tests	OHS Act (2010); ERB minigrid register
	Emergency Drills and Refresher Training	Run emergency simulations with staff and local community (where appropriate) to practise response and communication.	Maintain skills, refine procedures and improve community coordination.	Health & Safety Officer / Community Liaison	Bi-annual or as agreed with community	OHS Act (2010); ISO 45001

Phase	Step / Activity	Description of Action	Objective / Purpose	Responsible Person / Entity	Frequency / Timeline	Relevant Regulation / Standard
	Community Awareness	Inform surrounding communities about alarms, evacuation points, safe distances from battery stores and reporting channels.	Reduce community exposure during incidents and improve cooperation.	Community Liaison Officer / Developer	Annually and after major changes	Energy Regulation Act (2019)
4. Maintenance Phase	Maintenance Emergency Procedures	Require LOTO, isolation checks and ERT notification before, during and after maintenance on live equipment.	Prevent accidental energisation and protect maintenance teams.	Maintenance Engineer / Health & Safety Officer	Every maintenance activity	OHS Act (2010); ERB technical guidance
	Inspection of Emergency Equipment	Test extinguishers, alarms, spill kits and first-aid supplies for functionality and expiry dates.	Ensure all emergency tools work when needed.	Maintenance Supervisor / Health & Safety Officer	Monthly checks; annual servicing	OHS Act (2010)
	Update Contact Lists	Verify and update phone numbers for hospitals, ambulance, fire, police and key suppliers.	Maintain reliable external communication.	Document Controller / Health & Safety Officer	Quarterly	OHS Act (2010)
	Review of Past Emergencies	Analyse incident reports and drill outcomes; close CAPA (corrective and preventive actions).	Learn from events and improve preparedness.	Developer / Safety Committee / Health & Safety Manager	Annually and immediately after major incidents	ISO 45001
	Documentation and Reporting	Maintain incident logs, drill reports, equipment inspection records and training registers.	Provide auditable evidence of preparedness and response actions.	Health & Safety Officer / Document Controller	Continuous; reports compiled monthly/ quarterly	OHS Act (2010); ERB reporting requirements
5. Continuous Improvement	Post-Emergency Evaluation	Conduct debriefs and after-action reviews immediately after drills or incidents; capture lessons learnt.	Identify gaps and practical improvements to procedures and training.	Project Manager / Health & Safety Officer / ERT	Immediately after event	ISO 45001
	Corrective and Preventive Actions (CAPA)	Implement, track and verify completion of remedial actions from investigations and audits.	Prevent recurrence and strengthen overall safety posture.	Developer / Health & Safety Manager / Contractor	Ongoing; tracked to closure	OHS Act (2010); ISO 45001
	ERP Review and Re-approval	Revalidate ERP and re-approve by senior management after annual review or major changes.	Maintain leadership buy-in and ensure ERP remains compliant and effective.	Developer / Senior Management / Health & Safety Manager	Annually or after major change	Energy Regulation Act (2019); ISO 45001

10 Continuous Improvement

Photo Credit: Hydrobox

10. Continuous Improvement

AMDA and its members commit to ongoing improvement of H&S through a structured programme of monitoring, audits, corrective actions, management review (refer to Table 10.1) and safety culture maturity assessment framework (refer to Table 10.2).

Table 10.1: *Continuous improvement procedure*

Phase	Step \ Activity	Description of Action	Responsible Person / Entity	Frequency / Timeline	Relevant Regulation / Standard	Behaviour-Based Safety Mechanism
1. Planning and Establishment	Define Improvement Objectives	Set measurable objectives and targets for safety performance.	Project Manager / Developer	At project planning stage	ISO 45001; OHS Act (2010)	Include behavioural safety goals (e.g., % of safe observations, near-miss reporting rate).
	Develop KPIs	Identify KPIs, such as incident frequency, lost time incident frequency rate, trainings and inspections done.	Health & Safety Manager / Technical Lead	Prior to implementation	ISO 45001; OHS Act (2010)	Add behavioural KPIs: number of observed safe behaviours, participation in safety talks, PPE compliance rate.
	Allocate Responsibilities	Assign specific improvement responsibilities to staff, departments, and contractors.	Project Manager / Health & Safety Officer	Start of each phase	ISO 45001	Assign roles for safety observations, peer coaching, and feedback delivery.
2. Implementation and Monitoring (Construction Phase)	Conduct Regular Inspections	Carry out safety inspections to identify improvement opportunities.	Health & Safety Officer / Site Engineer	Weekly / Monthly	OHS Act (2010); Factories Act Cap 441	Integrate behavioural observations during inspections to identify safe and unsafe practices.
	Collect Performance Data	Gather data on incidents, trainings and inspections done.	Site Supervisor / Health & Safety Officer	Continuous	ISO 45001	Record safe behaviours and near-misses separately to track behavioural trends
	Conduct Toolbox Talks and Feedback Sessions	Encourage workers to share improvement ideas and challenges during daily meetings.	Health & Safety Officer / Supervisor	Daily / Weekly	ISO 45001	Focus discussions on observed behaviours, reinforce safe actions, and coach on risky practices.

Phase	Step \ Activity	Description of Action	Responsible Person / Entity	Frequency / Timeline	Relevant Regulation / Standard	Behaviour-Based Safety Mechanism
	Record Non-Conformities	Document any deviations from standards, procedures, or project specifications.	Health & Safety Officer	Ongoing	ISO 45001; OHS Act (2010)	Include behavioural non-conformities (e.g., failure to follow LOTO or PPE usage).
	Implement Corrective Actions	Take immediate steps to address identified non-conformities or inefficiencies.	Project Manager / Contractor	As required	OHS Act (2010)	Ensure corrective actions address unsafe behaviours, not just outcomes.
3. Operation Phase	Review Health & Safety Performance	Evaluate incident data, training records, and emergency response outcomes.	Health & Safety Manager / Developer	Quarterly	OHS Act (2010); ISO 45001	Analyse behavioural trends in incidents and near-misses; recognise safe practices.
4. Maintenance Phase	Review Maintenance Logs	Analyse recurring faults or failures in PV systems, batteries, or inverters.	Maintenance Engineer / Health & Safety Officer	Quarterly	Energy Regulation Act (2019)	Observe and log behaviours during maintenance (e.g., safe battery handling, proper LOTO).
	Refresher Training	Provide periodic retraining on safety, technical, and emergency response practices.	Health & Safety Officer / HR Manager	Annually	ERB Minigrid Technical Standards	Include be-havioural safety training and reinforcement exercises.
5. Evaluation and Review	Conduct Internal Audits	Perform internal audits covering safety management.	Health & Safety Manager	Annually	OHS Act (2010)	Audit adherence to safe behaviours; include peer observation reports.
	Manage-ment Review Meetings	Hold review meetings to evaluate performance, risks, and improvement actions.	Developer / Project Manager	Annually	ISO 45001	Highlight behavioural safety results alongside traditional metrics.
	Benchmark-ing	Compare project performance with similar minigrid projects or industry best practices.	Developer / Technical Advisor	Annually	ISO 45001	Include behavioural safety performance comparisons (safe behaviours, participation rates).

Phase	Step \ Activity	Description of Action	Responsible Person / Entity	Frequency / Timeline	Relevant Regulation / Standard	Behaviour-Based Safety Mechanism
6. CAPA	Identify Root Causes	Investigate underlying causes of incidents, complaints, or performance gaps.	Health & Safety Officer	As needed	ERB Guidelines; ISO 45001	Focus on unsafe behaviours contributing to incidents.
	Develop and Implement CAPA	Implement corrective measures (engineering, procedural, or training-based).	Project Manager / Site Supervisor	Within 30 days of finding	OHS Act (2010)	Include behaviour-focused interventions: coaching, peer feedback, reinforcement.
	Monitor CAPA Effectiveness	Review and verify effectiveness of corrective measures.	Health & Safety Officer / Auditor	Within 3 months of CAPA	ISO 45001	Track whether behaviour change is sustained; update KPIs accordingly.
7. Communication and Learning	Share Lessons Learnt	Document and disseminate lessons learnt across project teams and stakeholders.	Health & Safety Officer / Project Manager	Quarterly	ISO 45001	Include examples of positive and corrective behaviours observed.
	Update Documentation and SOPs	Revise operational procedures and manuals based on new insights and audit results.	Document Controller / Quality Assurance Manager	Ongoing	ISO 45001	Incorporate safe behaviour guidelines and checklists into SOPs.
	Recognise Good Performance	Reward individuals or teams achieving improvement targets.	Developer / Management	Annually	ISO 45001	Recognise individuals or teams demonstrating safe behaviours consistently.
8. Continuous Improvement Review Cycle	Continuous Monitoring	Track progress of improvement actions and KPIs.	Developer / Health & Safety Manager	Continuous	Organisational Policy; ISO 45001	Include behavioural safety metrics as part of KPIs (e.g., safe observations, near-miss reporting rate).

Table 10.2: *Safety culture maturity assessment framework*

Maturity Level	Characteristics of Maturity Level	Indicators at Project Site	Recommended Actions to Improve Maturity Level
1. Reactive	Safety addressed only after incidents occur; little proactive planning.	Frequent near misses: incidents trigger action; no behavioural observations; workers follow rules only when reminded.	Introduce basic training, incident reporting, and mandatory PPE compliance. Begin logging near-misses and unsafe behaviours.
2. Compliant	Meets regulatory requirements and standards; safety is a legal obligation.	Safety inspections done on schedule; documentation in place; PPE and procedures generally followed; some reporting of near misses.	Strengthen behavioural monitoring, conduct toolbox talks, and encourage proactive reporting of hazards. Assign responsibilities for Behaviour-Based Safety (BBS) activities.
3. Proactive	Actively identifies and mitigates risks; focus on safe behaviours.	Observations of worker behaviour conducted regularly; safety discussions in toolbox talks; corrective actions include behavioural interventions; near-miss trends analysed.	Integrate BBS KPIs, provide feedback coaching, involve workers in hazard identification, and monitor behavioural compliance systematically.
4. Continuous Improvement	Safety fully integrated into operations; everyone participates and ownership is shared.	Safety discussions are part of daily work; safe behaviours recognised and rewarded; near-misses and incidents are learning opportunities; behaviour data actively used for improvement; management visibly leads by example.	Maintain continuous improvement loops, conduct peer-to-peer observations, benchmark against industry best practices, recognise and reward positive behaviours, and embed safety in every decision.

11. Annexes – Forms, Checklists and Reports Templates

i. Legal and Regulatory Compliance Tracker

#	Licence / Permit / Certificate	Issuing Authority / Agency	Validity / Renewal Frequency	Responsible Person / Department	Date Obtained	Expiry / Renewal Due	Compliance Status (Compliant / Pending)	Remarks / Follow-Up Actions
1	Company Registration / Incorporation Certificate	Patents and Companies Registration Agency (PACRA)	Permanent	Legal / Admin Officer				
2	Business Levy / Trading Licence	Local Authority (City / Municipal Council)	Annual	Admin / Operations Manager				
3	Import Permit for Equipment / Duty Exemption (if applicable)	Zambia Revenue Authority (ZRA)	Per shipment	Procurement / Logistics				
4	Construction Permit (Minigrid Infrastructure)	Local Authority / Council (Planning Department)	One-time (per site)	Project Manager				
5	Generation Licence (Minigrid)	Energy Regulation Board (ERB)	3–5 years (renewable)	Operations / Project Manager				
6	Distribution / Supply Licence (Minigrid)	Energy Regulation Board (ERB)	3–5 years (renewable)	Operations Manager				
7	Workplace Registration Certificate	Ministry of Labour and Social Security (Factory Inspectorate)	Annual	HSE Officer				
8	Fire Safety Certificate	Local Authority Fire Department	Annual	HSE Officer				
9	Occupational Health & Safety Audit	Ministry of Labour and Social Security	Annual	HSE Officer				

ii. Training – Competence Tracker

Phase	Personnel / Role	Required Training & Competence	Relevant Certification / Authority	Awareness & Additional Requirements	Training Status (Planned / In Progress / Completed)	Date Completed	Certificate / License No.	Remarks / Action Required
1. Design Phase	Project Developer / Manager	Project management, stakeholder engagement, environmental & social safeguards	N/A (Experience in energy project development preferred)	Energy Regulation Act (2019), ERB licensing, Envrionmental Management Act (2011), public consultation requirements				
	Electrical / Power Systems Engineer	BSc Electrical / Power Engineering, power system design	Engineering Institution of Zambia (EIZ) registration	Zambian Electricity Grid Code, renewable energy integration standards				
	Civil / Structural Engineer	BSc Civil Engineering, structural design	Engineering Institution of Zambia (EIZ)	Structural integrity, foundation safety, wind & seismic considerations				
2. Construction Phase	Project Supervisor / Site Engineer	Diploma or Degree in engineering, construction safety training	EIZ registered Engineer / Technician	Occupational Health & Safety Act No. 36 of 2010, Fire Safety Regulations				
	Electrical Technicians	Certificate/ Diploma in Electrical Installation	Energy Regulations Board (ERB) / EIZ registered electrician	Electrical hazards, Lock-Out/Tag-Out (LOTO), PPE use, Zambian Wiring Regulations				
	Construction Workers / Laborers	Basic construction safety & first aid	Employer-based certification	Hazard communication, PPE, emergency evacuation procedures				
	Safety Officer	Diploma/ Degree in Occupational Health & Safety	Occupational Health & Safety institue (OHSI – Zambian) / NEBOSH	Risk assessment, fire safety, accident & incident reporting				

Phase	Personnel / Role	Required Training & Competence	Relevant Certification / Authority	Awareness & Additional Requirements	Training Status (Planned / In Progress / Completed)	Date Completed	Certificate / License No.	Remarks / Action Required
3. Operation Phase	Minigrid Operator / Manager	Power system operation, customer service, safety management	ERB Operator / Generation Licence (where applicable)	Tariff aproval framework, safety procedures, community grievance mechanisms				
	Electrical Technician / Plant Operator	Certificate/ Diploma in Electrical or Renewable Energy Systems	ERB / EIZ Certified Electrician	Switchgear operation, load balancing, electrical safety				
	Control Room Attendant	Technical training in system monitoring and control	Internal competency certification	System performance monitoring, fault response, reporting protocols				
	Fire Safety / Security Officer	Fire prevention and emergency response training	Zambia Fire and Rescure Services – recognised training	Firefighting equipment use, evacuation routes, emergency drills				
4. Maintenance Phase	Maintenance Engineer	Degree/ Diploma in Electrical or Mechanical Engineering	EIZ registration	Preventive and corrective maintenance of solar PV, inverters, batteries				
	Electrical Maintenance Technician	Certificate/ Diploma in Electrical Maintenance	ERB / EIZ Licensed Electrician	Electrical isolation, inspection, PPE, arc flash & fire risks				
	Solar Technician	Training in solar PV installation & troubleshooting	ERB-recognised or accredited renewable energy training institution	DC/AC systems, inverter operation, battery safety standards				
	Health & Safety Officer	OHS management training	OHSI (Zambia) / NEBOSH	OHS Act compliance, fire safety, incident reporting				
	First Aiders	Occupational first-aid training	Zambia Red Cross / OHSI-approved institution	Emergency response, injury management, basic life safety				

iii. Safety Induction Checklist

Name as per ID:	Company / Contractor:
Job Title:	Date:

No.	Topic	Particulars	Checked (✓)
1	Project Overview	Familiarise all personnel with the site layout, project objectives (e.g., installation of 100 kW solar minigrid with battery storage), key areas (e.g., PV field, control house, storage area), and access routes. Identify restricted zones and main contact persons (site supervisor, safety officer).	
2	Company & Site Safety Policy	Communicate the organisation's commitment to "Zero Harm" and compliance with OSHA and EMCA standards. Reinforce worker responsibility for personal and co-worker safety. Example: no task should proceed without appropriate Method Statement, Risk Assessment and PPE.	
3	Emergency Procedures	Explain what to do in case of fire, electrical shock, medical emergency, or severe weather. Identify fire extinguishers, first -id kits, assembly points, and emergency contacts. Example: show map of evacuation routes.	
4	Hazard Identification & Reporting	Train workers to recognise and report hazards such as exposed cables, unstable scaffolds, or oil spills. Emphasise prompt reporting using hazard cards or verbally to the Health & Safety Officer.	
5	Personal Protective Equipment (PPE)	Explain mandatory PPE: helmet, reflective vest, gloves, safety boots, and goggles. Demonstrate proper use and care (e.g., when replacing damaged harnesses or gloves). Stress discipline—no entry to site without full PPE.	
6	Electrical Safety	Review risks of electric shock and arc flash. Demonstrate Lock-Out/Tag-Out (LOTO) procedures before maintenance. Only qualified personnel may work on live circuits. Example: turning off and locking inverter before wiring.	
7	Work at Heights	Train on safe use of ladders, scaffolds, and fall-arrest systems. Emphasise securing tools to prevent falling objects. Example: tie-off harness at 2 metre height when mounting PV panels.	
8	Manual Handling & Ergonomics	Demonstrate proper lifting posture to avoid back injury. Use mechanical aids or teamwork when handling heavy items like batteries (>25 kg). Encourage stretching and breaks.	
9	Traffic & Site Movement	Outline safe movement of vehicles, machinery, and pedestrians. Example: use spotters when reversing trucks, enforce 10 km/h speed limit on site, and mark walkways with barriers.	
10	Chemical & Battery Handling	Explain safe storage of diesel, lubricants, paints, and battery acid. Review use of gloves, goggles, and spill kits. Demonstrate neutralising acid spills with baking soda and proper disposal of waste electrolyte.	
11	Environmental Protection	Encourage segregation of waste (plastic, metal, hazardous, glass). Prevent oil or chemical spills, avoid cutting vegetation unnecessarily, and manage dust by wetting. Example: use spill kits to contain spillages.	
12	Health & Hygiene	Promote handwashing, hydration, rest breaks, and reporting of illnesses. Review hygiene in food areas and toilets. Example: isolate and report any communicable symptoms immediately.	

No.	Topic	Particulars	Checked (✓)
13	Toolbox Talks & Daily Briefings	Explain daily pre-work safety meetings to discuss tasks, hazards, and control measures. Example: morning brief on safe lifting before installing panels. Encourage worker input.	
14	Incident / Near-Miss Reporting	Define what constitutes an incident or near-miss and how to record it. Example: tripping without injury still requires reporting for corrective action.	
15	Community & Site Security Awareness	Promote respect for local communities—no trespassing, littering, or conflicts. Explain procedures for visitors and local engagement. Example: report strangers or theft immediately to site security.	
16	Fire Safety Awareness	Demonstrate use of fire extinguishers (CO_2, dry powder). Identify potential fire hazards (e.g., hot works, battery rooms). Example: no smoking near fuel or storage areas.	
17	First Aid & Welfare Facilities	Show location of first aid kits, clinics, toilets, rest shelters, and drinking water points. Introduce trained first aiders on site. Example: report all injuries to first-aid officer immediately.	

Sign-Off & Acknowledgement

Employee Name:	Signature:		Date:	
Induction conducted by:	Signature:		Date:	

NB: Workers and contractors confirm they have received induction, understood the content, and agrees to comply with site safety rules.

iv. Permit To Work Form

WORK PERMIT NUMBER:_____

Permit validity: From _____(date/time) to _____ (date/time)

The maximum period shall not exceed five working days.

1. OPERATOR	
☐ Internal	☐ Subcontractor
Number of operators:	Name:
	Address:
	Job Safety Analysis / Interference Risk Assessment Document n°:
	Person responsible for the work:
	Inspection date:

2. INTERVENTION	
Nature of work:	
Start (date):	End (date):
Time slot: from	to
Location of the operation:	
List of tools and equipment to be used:	

3. SPECIAL MEASURES			
Items	Yes	No	Comments
Fire or explosion risk	☐	☐	
Risk from work equipment	☐	☐	
Electrical work	☐	☐	
Falling from height	☐	☐	
Use of lifting equipment	☐	☐	
Confined space work	☐	☐	
Risk of drowning	☐	☐	
Other:	☐	☐	

4. SAFETY REQUIREMENTS					
Items	Yes	No	Items	Yes	No
Use of approved scaffold / MEWP	☐	☐	Qualification or training needed *(to detail)*:	☐	☐
Fall protection needed *(harness, guardrails)*	☐	☐	Fire-fighting equipment required	☐	☐
Electrical insulation	☐	☐	Beaconing of the work area	☐	☐
Earthing of the equipment required	☐	☐	Safety signage or warning required *(ex: smoking ban)*	☐	☐
Use of approved and certified equipment	☐	☐	Additional staff required for work or supervision	☐	☐
Inspection of all equipment and gears before use	☐	☐	Use of communication means	☐	☐
Removal or protection of potential flammable, combustible and dangerous materials	☐	☐	Other:	☐	☐

5. PERSONAL PROTECTIVE EQUIPMENT (PPE)		
☐ High-visibility and reflective vest	Gloves: ☐ for handling ☐ for chemicals ☐ for hot works ☐ isolated for electrical work	Respiratory protection: ☐ Dust mask ☐ Breathing mask with filter
☐ Safety shoes		
☐ Helmet / hard hat		
☐ Harness and/or lifeline		Eyes/face protection: ☐ Safety goggles ☐ Visor (eyeshade)
☐ Hearing protection (headset)		
☐ Overall:	☐ Leather apron	
☐ Other:	☐ Other:	☐ Other:

6. INSTRUCTIONS
These are H&S requirements to implement during the proposed work activity covered by this document. Specific guidelines and instructions are contained in the Interference Risk Assessment Document and/or Job Safety Analysis to be signed with the Subcontractor.
Each worker constantly seeks to ensure the level of safety of their activity by adopting safe behaviour: - Being attentive to hazardous situations encountered. - Stopping activities when safety is not assured.
Staff is properly competent, qualified and trained to their specific tasks and risks.
Safety initial induction session is required before works start for all operators.

It is forbidden to
Smoke on the premises except in areas provided for this purpose.
Consume or bring alcohol / drugs on site.
Use listening device (with headphones)
Work clothing and Personal Protective Equipment (PPE)
The staff wears appropriate and clean work clothing.
Staff wears appropriate PPE to the conditions and requirements of the work environment (safety shoes, gloves, glasses, etc.).
Traffic and parking
Comply with the current speed limit on the site.
Park vehicles at locations provided for this purpose.
Roads are kept clear at all times to allow access for emergency vehicles.
Pedestrians stay alert in the work areas/yards; use the pedestrian footpath and wears high-visibility warning vest.
Demarcation of the work area
Mark out and clearly identify any work area according to the type of work and environment (risk of falling objects, avoid obstacles, etc.).
Mark out work area to prevent access to unauthorised personnel (with waterproof and resistant materials).
All work areas, workstations and traffic areas are properly clean after operation.
Work equipment & tools
Materials and equipment are appropriate to the work, or the processes, in compliance with regulations and with mandatory periodic controls, and are maintained in safe operating condition and compliance.
Lone worker
No worker stays alone in an isolated work area.
Special permission is required to perform work outside the timeframe and during weekends and holidays.
Environment
All necessary measures are implemented to comply with environmental rules (waste, noise, water, spillage, etc.)
What to do in case of emergency
In abnormal situation of emergency, accident or fire, immediately notify the site representative (or HSE Representative) specifying the nature and location of the incident, accident or fire. External rescue services will be alerted by project manager if needed.
Rescue: Call first-aiders to render first aid.
Evacuation of the premises: Upon hearing the alarm signal or instructions, staff evacuates immediately to the assembly point following the instructions given.
Fire: Extinguish the fire with appropriate extinguishers without risks to personnel.
Fire: Extinguish the fire with appropriate extinguishers without risks to personnel.

7. VALIDATION AND APPROVAL			8. CLOSURE	
We certify that we have checked the equipment and working methods applicable and confirm that the operations must be carried out under the safety conditions as defined above.			We confirm that we have inspected the site where the operations in this permit took place and confirm that it presents no danger for people or the Environment.	
Date/hour:			Date/hour:	
Site in Charge	Operator	H&S Manager	Site in charge	H&S Manager
Name/signature	Name/signature	Name/signature	Name/signature	Name/signature

EMERGENCY NUMBERS:

_____

v. Toolbox Meeting Form

Project Location:	Date: / /	Time:	Facilitator:
☐ Construction	☐ Operation	☐ Distribution Lines	☐ Maintenance
☐ Transport	☐ Community	☐ Other: _____	

SUBJECTS		
Hazard Identification & Reporting ☐	Electrical Safety ☐	Emergency Procedures ☐
Traffic & Site Movement ☐	Work at Heights ☐	Chemical & Battery Handling ☐
Manual Handling & Ergonomics ☐	Incident / Near-Miss Reporting ☐	Health & Hygiene ☐
Personal Protective Equipment (PPE) ☐	First Aid ☐	Other subject (specify): ☐
Welfare Facilities ☐	Fire Safety Awareness ☐	

SPECIFIC POINTS DISCUSSED

	NAME	POSITION	SIGNATURE		NAME	POSITION	SIGNATURE
1				15			
2				16			
3				17			
4				18			
5				19			
6				20			
7				21			
8				22			
9				23			
10				24			
11				25			
12				26			
13				27			
14				28			

vi. Emergency Drill Report

1. General Information

Item	Details
Project / Site Name:	
Location:	
Date of Drill:	
Time of Drill:	
Type of Emergency Simulated:	☐ Fire ☐ Electrical Shock ☐ Chemical / Battery Spill ☐ Medical Emergency ☐ Security Incident ☐ Other (specify): _____
Weather Conditions:	
Duration of Drill:	
Drill Conducted By (Team / Trainer):	
Supervising Officer / Safety Officer:	

2. Drill Objectives

☐ Test response time and coordination among workers and emergency team
☐ Assess functionality of firefighting and first-aid equipment
☐ Evaluate evacuation and communication procedures
☐ Reinforce awareness of assembly points and muster discipline
☐ Test reporting and command structure effectiveness
☐ Other objectives: _____

3. Participants Summary

Category	Number Participated	Remarks
Project Staff		
Contractors / Subcontractors		
Visitors		
Community Representatives (if applicable)		

4. Attendance Register

No.	Full Name	Organisation / Company	Designation / Role	Contact / Phone	Signature
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

5. Description of the Drill Scenario

.....

.....

6. Actions Taken During Drill

Action Step	Description of Response	Time Taken / Observations
Alarm Raised		
Evacuation Initiated		
Muster / Assembly Conducted		
Fire / Hazard Control Attempted		
First Aid Provided		
Communication to Supervisor / Control Room		
External Services Contacted		
"All Clear" Declared		

7. Evaluation of Performance

Performance Area	OK / NOT OK	Comments / Observations
Alarm System Functioned		
Response Time		
Evacuation Procedure		
Muster Point Discipline		
Fire-Fighting / Spill Control		
First Aid Response		
Communication & Coordination		
Equipment Availability		
Overall Teamwork		

8. Lessons Learnt / Challenges Identified

- .....
- .....
- .....

9. Corrective and Preventive Actions

Issue Identified	Proposed Action	Responsible Person	Deadline / Target Date

10. Sign-Off

Name	Designation	Signature	Date
Drill Coordinator / Safety Officer			
Site Manager / Supervisor			
Observer / Auditor (if any)			

11. Attach photos

vii. Incident – Accident Notification Form

INCIDENT/ACCIDENT REF No: .....

LICENSEE (COMPANY): .....

LICENSEE'S RESPONSIBLE PERSON: .....

DATE OF INCIDENT/ACCIDENT: .....

TIME OF INCIDENT/ACCIDENT: .....

DATE OF NOTIFICATION: .....

ACCIDENT LOCATION (Locality, Sub-county, County:.....

GPS COORDINATES: .....

NAME OF PERSON(S) AFFECTED: .....

NATURE OF ACCIDENT/INCIDENT (Fatal, Non-fatal, Dangerous occurrence,

Environmental): .....

BRIEF DESCRIPTION OF ACCIDENT/INCIDENT: .....

.....

.....

.....

VOLTAGE LEVELS: .....

PROBABLE CAUSE OF ACCIDENT/INCIDENT:

.....

0B No. & POLICE STATION REPORTED: .....

NAMES AND CONTACTS OF WITNESS(ES): .....

METER No. (where accident occurred in a customer's premises):.....

TRANSMISSION/DISTRIBUTION LINE (where accident occurred on/near at Transmission/ Distribution line):

.....

MINIGRID (where accident occurred in a minigrid):

.....

.....

viii. Incident – Accident Investigation Report

INCIDENT/ACCIDENT REF No:	DATE OF INCIDENT/ACCIDENT:	ACCIDENT LOCATION (Locality, Sub- County, County:
LICENSEE (COMPANY):	TIME OF INCIDENT/ACCIDENT:	GPS COORDINATES:
LICENSEE'S RESPONSIBLE PERSON:	DATE OF NOTIFICATION:	OB No. & POLICE STATION REPORTED:

NATURE OF ACCIDENT/INCIDENT:	☐ Fatal	☐ Non-fatal	☐ Dangerous occurrence	☐ Environmental

AFFECTED PERSON (S)		WITNESSES & PERSONS INTERVIEWED			ACCIDENT INVESTIGATION TEAM	
NAME	DETAILS	NAME	DETAILS	CONTACTS	NAME	DETAILS

BRIEF DESCRIPTION OF ACCIDENT:	PRIOR EVENTS:	
	ACCIDENT EVENT:	
	EVENTS AFTER:	

ROOT CAUSE ANALYSIS

CAUSE OF ACCIDENT & FINDINGS (5 WHY ANALYSIS)	REMEDIAL ACTION TAKEN	PROPOSED CORRECTIONS	PROPOSED CORRECTIVE ACTION

PHOTOS OF ACCIDENT SCENE

ix. Safety Inspection Checklist – Site

1. General Information		**2. Inspection Objectives**
Project / Site Name:		☐ Assess compliance with site Health and Safety (H&S) requirements ☐ Identify unsafe acts, conditions, and potential hazards ☐ Verify condition and use of Personal Protective Equipment (PPE) ☐ Check effectiveness of control measures and housekeeping ☐ Confirm readiness of emergency response systems ☐ Recommend corrective and preventive actions
Location:		
Date of Inspection:		
Inspection Time:		
Phase:	☐ Construction ☐ Operation & Maintenance	
Weather Conditions:		
Inspected By (Name & Designation):		
Site Representative / Contractor:		
Report Reference No.:		

3. Site Areas / Activities Inspected

Area / Activity	Description	Status (Ongoing / Completed)
Solar PV Installation Area		
Battery / Control Room		
Inverter / Electrical House		
Generator Room		
Cable Trenching & Distribution Lines		
Workshop / Storage Yard		
Access Roads / Vehicle Movement		
Office / Welfare Facilities		

4. Inspection Checklist

No.	Inspection Item	Obser-vation / Descrip-tion	Status (Compliant / Non-Compliant)	Risk Level (High / Medium / Low)	Action Required	Responsible Person	Target Date
A. Personal Protective Equipment (PPE)	1. Workers wearing required PPE (helmets, gloves, safety boots, vests, goggles, harnesses)						
	2. PPE in good condition and properly used						
B. Electrical Safety	3. Temporary power lines and cables properly insulated and secured						
	4. Lock-Out/Tag-Out (LOTO) procedures followed during maintenance						
	5. Electrical panels labelled and free of obstructions						
C. Work at Heights	6. Scaffolds, ladders, and platforms inspected and tagged						
	7. Fall protection equipment available and used correctly						
D. Fire & Emergency Preparedness	8. Fire extinguishers available, accessible, and serviced						
	9. Emergency exits, and muster points clearly marked						
	10. First-aid kits stocked and accessible						
E. Housekeeping & Site Management	11. Work areas clean and free from obstructions						
	12. Materials and tools properly stored						

No.	Inspection Item	Obser-vation / Descrip-tion	Status (Compliant / Non-Compliant)	Risk Level (High / Medium / Low)	Action Required	Responsible Person	Target Date
F. Vehicle & Equipment Safety	13. Vehicles and machinery inspected, serviced, and operated safely						
	14. Operators licensed and trained						
G. Worker Health & Welfare	15. Adequate drinking water, sanitation, and shelter provided						
	16. First aiders identified and trained						

5. Summary of Key Observations

Positive Observations / Good Practices	Unsafe Conditions / Non-Conformities
-	-
-	-
-	-

6. Overall Site Safety Rating

Category	Rating	Remarks
PPE Compliance	☐ Excellent ☐ Good ☐ Fair ☐ Poor	
Electrical Safety	☐ Excellent ☐ Good ☐ Fair ☐ Poor	
Housekeeping	☐ Excellent ☐ Good ☐ Fair ☐ Poor	
Emergency Preparedness	☐ Excellent ☐ Good ☐ Fair ☐ Poor	
Overall Safety Performance	☐ Excellent ☐ Good ☐ Fair ☐ Poor	

7. Photos / Evidence (Attach as Annex if Available)

☐ Unsafe Conditions
☐ Corrective Measures in Progress
☐ Completed Actions

8. Sign-Off

Name	Designation	Signature	Date
Inspector / H&S Officer			
Site Supervisor / Contractor Representative			
Project / Site Manager			

x. Audit Checklist – Health & Safety

Project Name		Date		Name of Auditor	
Project Site		Names of Auditees			
Audit Area / Sub-Topic	Audit Question / Checkpoint	Objective	Evidence Required	Compliant (Yes/ No/N/A)	Remarks / Corrective Action
1. Legal and Regulatory Framework Has the project obtained all necessary licenses and permits for construction and operation? Are regulatory updates tracked and reviewed periodically?	Are all applicable national and local laws (Energy Act, OSHA, Environmental Management, etc.) identified and documented?	Ensure legal framework is recognised and accessible.	Legal register, reference list		
	Confirm legal authorisation.	Copies of licences / permits			
	Maintain compliance with new laws.	Update logs, review reports			
2. Policy Commitments Is the policy communicated to all employees and contractors?	Is there an approved HSE policy signed by top management?	Confirm leadership commitment.	HSE policy statement		
	Verify awareness and accessibility.	Training attendance, noticeboards			
3. Organisational Structure and Responsibilities Is an HSE officer appointed for the project?	Are HSE roles and responsibilities clearly defined?	Clarify accountability.	Organisa-tionchart, job descriptions		
	Verify dedicated personnel.	Appointment letter			
4. H&S Operational Procedures Are safe work permits used for high-risk activities (working at height, electrical, confined space)?	Are standard operating procedures (SOPs) available for key project activities (construction, electrical works, maintenance)?	Ensure operational control.	SOPs, work instructions		
	Confirm permit-to-work system.	Permit samples			
5. Training, Competence and Awareness Are toolbox talks conducted regularly? Are contractors evaluated for competence before engagement?	Are personnel trained on relevant HSE topics before starting work?	Ensure competent workforce.	Training matrix, certificates		
	Verify ongoing awareness.	Toolbox talk records			
	Ensure contractor compliance.	Prequalification records			
6. Project Implementation Controls Are construction activities supervised for HSE compliance?	Are project-specific HSE plans developed and approved?	Verify planning and risk control.	HSE plan, method statements		
	Confirm active supervision.	Inspection reports, site logs			
7. Health and Safety Arrangements Are PPEs issued and used correctly?	Are welfare facilities (first aid, sanitation, water, PPE) available and adequate?	Ensure worker wellbeing.	Site inspection checklist		
	Confirm PPE compliance.	PPE issue records, site observation			
8. Incident / Accident Reporting and Investigation Are all incidents investigated, and corrective actions implemented?	Is there a formal process for reporting incidents, near misses, and hazards?	Ensure timely reporting.	Incident report forms		
	Promote learning from events.	Investigation reports			

Audit Area / Sub-Topic	Audit Question / Checkpoint	Objective	Evidence Required	Compliant (Yes/ No/N/A)	Remarks / Corrective Action
9. Monitoring and Audit Procedures Are audit findings reviewed by management?	Are regular HSE inspections conducted?	Ensure proactive monitoring.	Inspection checklist, reports		
	Verify top management involvement.	Management review minutes			
10. Document and Record Control Are obsolete documents removed from circulation?	Are all HSE documents properly controlled and updated?	Maintain traceability and consistency.	Document register		
	Prevent use of outdated info.	Control log			
11. Risk Management Are control measures implemented and reviewed?	Is a risk assessment carried out for all project activities?	Identify and control hazards.	Risk register, job hazard analysis		
	Verify effectiveness.	Inspection reports			
12. Monitoring, Evaluation and Reporting Are reports submitted to management and regulators?	Are HSE performance indicators (LTIFR, near misses, training hours) tracked and reported?	Measure performance.	KPI dashboard, monthly report		
	Confirm transparency.	Submission logs			
13. Emergency Preparedness and Response Are emergency drills conducted periodically? Is firefighting and first-aid equipment inspected and maintained?	Is there an emergency response plan (ERP) for the site?	Ensure preparedness.	ERP document		
	Test readiness.	Drill records, reports			
	Verify functionality.	Equipment inspection logs			
14. Continuous Improvement Are improvement actions tracked to closure?	Are lessons learnt documented and shared after audits/incidents?	Promote organisational learning.	Lessons learnt register		
	Ensure accountability.	CAPA log			

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