International ESIA for an Integrated Renewable Energy Project

180MW Wind Power and Battery Energy Storage System, Tsogttsetsii soum, Mongolia

Chapter 9 Unplanned Events Impact Assessment

PREPARED FOR

Net Zero Energy LLC
MCS and URECA

DATE
2 November 2026

REFERENCE
0747189



DOCUMENT DETAILS

The details entered below are automatically shown on the cover and the main page footer. PLEASE NOTE: This table must NOT be removed from this document.	
DOCUMENT TITLE	International ESIA for an Integrated Renewable Energy Project
DOCUMENT SUBTITLE	180MW Wind Power and Battery Energy Storage System, Tsogttsetsii soum, Mongolia
PROJECT NUMBER	0747189
DATE	2 November 2026
VERSION	05
AUTHOR	ERM-Hong Kong, Limited
CLIENT NAME	Net Zero Energy LLC (MCS and URECA)

DOCUMENT HISTORY

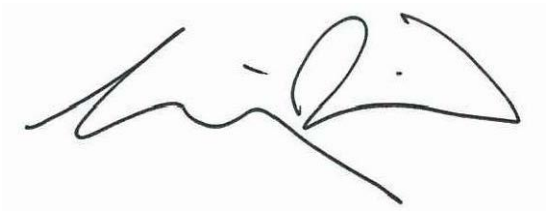
				ERM APPROVAL TO ISSUE		
VERSION	REVISION	AUTHOR	REVIEWED BY	NAME	DATE	COMMENTS
Version	00	Var.	Tom Glenwright	Craig Reid	28 November 2025	Draft
Version	01	Var.	Tom Glenwright	Craig Reid	19 December 2025	Addressed NZE comments
Version	02	Var.	Tom Glenwright	Craig Reid	08 May 2026	Addressed IFC comments
Version	03	Var.	Tom Glenwright	Craig Reid	15 May 2026	Final. Addressed NZE comments
Version	04	Var.	Tom Glenwright	Craig Reid	16 October 2026	Final. Addressed IFI's comments
Version	05	Var.	Tom Glenwright	Craig Reid	2 November 2026	Final. Addressed IFI's comments

SIGNATURE PAGE

International ESIA for an Integrated Renewable Energy Project

180MW Wind Power and Battery Energy Storage System, Tsogttsetsii soum, Mongolia

Chapter 9 Unplanned Events Impact Assessment
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Craig A. Reid
Partner

ERM-Hong Kong, Limited

2507 One Harbourfront

18 Tak Fung Street

Hong Kong

Tel: +852 2271 3000

Fax: +852 3015 8052

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ACRONYMS AND ABBREVIATIONS

Acronyms	Description
AADT	Annual Average Daily Traffic
[redacted]	[redacted]
AIS	Air Insulated Switchgear
ALARP	As Low As Reasonably Practicable
AoI	Area of Influence
APLIC	Avian Powerline Interaction Committee
BESS	Battery Energy Storage System
BMP	Biodiversity Management Plan
BOD	biochemical oxygen demand

Acronyms	Description
CAF	Central Asian Flyway
CAQMP	Construction Air Quality Management Plan
CCRA	Climate Change Risk Assessment
CD	Community Development
CH	Critical Habitat
CHA	Critical Habitat Assessment
CIA	Cumulative Impact Assessment
CIP	Climate Impact Platform
CITES	Convention on International Trade in Endangered Species
CLO	Community Liaison Officer
CMIP6	Coupled Model Intercomparison Project Phase 6
CMS	Conservation of Migratory Species of Wild Animals
CO	Carbon monoxide
COD	chemical oxygen demand
CR	critically endangered
CRM	Citizen's Representative Meeting
CRM	Collision Risk Model
CSMP	Cold Stress Management Plan
DEIA	Detailed Environmental Impact Assessment
DFID	International Development
DSF	Development Support Fund
E&S	Environmental and Social
EAAA	Ecologically Appropriate Area of Analysis
EAAF	East Asian-Australasian Flyway
EBRD	European Bank for Reconstruction and Development
EC	Electrical Conductivity
EEO	Extent of Occurrence
EHS	Environment, Health and Safety
EIA	Environmental Impact Assessment
EN	Endangered
EPC	Engineering Procurement and Construction
EPRP	Emergency Preparedness and Response Plan
ERM	ERM-Hong Kong, Limited

Acronyms	Description
ESA	European Space Agency
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESMS	Environment and Social Management System
ETI	Ethical Trading Initiative
FERP	Flood Emergency Response Plan
FFDI	Arthur Forest Fire Danger Index
FGD	focus group discussion
FPIC	Free, Prior and Informed Consent
GBV	Gender-based violence
GCD	Global Climate Database
GHG	Green House Gas
GIIP	good international industry practice
GIS	Geographic Information System
GM	grievance mechanism
GPN	This Good Practice Note
GRM	Grievance Redress Mechanism
HCO	Bicarbonate
HSEQ	Health, Safety, Environment, and Quality
HSMP	Heat Stress Management Plan
HSS	Health, Safety and Security
HSSE	Health, Safety, Security and Environment
HVAC	Heating, Ventilation, and Air Conditioning
IA	Impact Assessment
IAQM	Institute of Air Quality Management
IBA	Important Bird and Biodiversity Areas
IBAT	Integrated Biodiversity Assessment Tool
IFC	International Finance Corporation
ILO	International Labour Organisation
IMAR	Inner Mongolia Autonomous Region
IPA	Important Plant Areas
ISMP	Invasive Species Management Plan
IUCN	International Union for Conservation of Nature

Acronyms	Description
KBA	Key Biodiversity Areas
KII	Key Informant Interview
LC	Least Concern
LiDAR	Light Detection and Ranging
LLC	Limited Liability Company
LO	Land Officer
LRP	Livelihood Restoration Plan
LRP	Livelihood Restoration Plan
LVIA	Landscape & Visual Impact Assessment
MCS	Mongolian Consulting Service
MECC	Ministry of Environment and Climate Change
MNS	Mongolian National Standard
MRIA	Mongolian Renewables Industries Association
MRL	Mongolian Red List
MSDS	Material Safety Data Sheet
MW	Mega Watt
MWEA	Mongolian Wind Energy Association
NASA	National Aeronautic Space Administration
NDC	Nationally Determined Contributions
NDC	National Dispatching Centre
NE	not evaluated
NGO	Non-governmental Organization
NH4+	Ammonium
NO2	Nitrogen dioxide
NO2-	Nitrite
NO3-	Nitrate
NOAA	Atmospheric Association
NPTG	National Power Transmission Grid Company
NPTG	National Power Transmission Grid Company
NREC	The National Renewable Energy Centre
NSR	Noise sensitive receiver
NT	Near threatened
NZE	Net Zero Energy LLC

Acronyms	Description
O&M	Operation and Maintenance
OHL	Overhead Transmission Line
OHS	Occupational Health and Safety
OT	Oyu Tolgoi
PA	protected area
PAD	project affected districts
PAPs	Project Affected Persons
PI, mg/L	Phosphate
PM	Particulate matter
POP	persistent organic pollutants
PPA	Power Purchase Agreement
PPE	Personal protective equipment
PS	Performance Standards
RAP	Resettlement Action Plan
RCIA	Rapid Cumulative Impact Assessment
RCS	Real Case Scenario
RILI	rainfall-induced landslide index
RoW	Right of Way
SCADA	Supervisory Control and Data Acquisition
SNH	Scottish Natural Heritage
SO	Social Officer
SO2	Sulphur dioxide
SO4	Sulphate
SPA	Strictly Protected Area
SRTM	Shuttle Radar Topography Mission
STE	Serrated Trailed Edge
TDS	Total Dissolved Solids
TIP	Trafficking in Persons
TL	Transmission Line
TNC	The Nature Conservancy
TOR	Terms of Reference
UNEP	United Nations Environmental Programme
UNFCCC	United Nations Framework Convention on Climate Change

Acronyms	Description
USD	United States dollars
UV	Ultra-violet
VEC	Valued Environmental and Social Components
VP	Vantage Point
VU	Vulnerable
WBG	World Bank Group
WBGT	Wet Bulb Globe Temperature
WCS	Worst Case Scenario
WCS	Wildlife Conservation Society
WHO	World Health Organisation
WPF	Wind Power Farm
WPFW	West Pacific Flyway
WRI	World Resource Institute
WSDI	Warm spell duration index
WTG	Wind Turbine Generator
WWF	World Wide Fund for Nature

9. UNPLANNED EVENTS IMPACT ASSESSMENT

9.1 OVERVIEW

For the purpose of this ESIA Report, an unplanned event is defined as a reasonably foreseeable event that is not planned to occur as part of the Project, but which may conceivably occur as a result of the Project activities (e.g., accidents), even with a low probability.

Unplanned events may occur during any phase of the Project. This Chapter provides a high-level assessment of potential unplanned events associated with the Project, based on the Project description and good international industry practices (GIIP), and provides an assessment of the potential impacts on the receiving environment.

It may be noted that analysis and proposed measures for climate and natural hazards (earthquake, flood, extreme cold and dzud, extreme heat, dust storm, wildfire) was presented in ***Section 7.3*** of ***Chapter 7***.

9.2 ASSESSMENT APPROACH AND CRITERIA

Impacts resulting from unplanned events are defined as being a combination of the likelihood (or frequency) of incident occurrence and the consequences of the incident should it occur.

The approach for assessing the impact of the unplanned events is staged as follows and further described in this chapter:

- Background;
- Existing controls;
- Likelihood assessment;
- Significance of impact;
- Additional mitigation measures; and
- Residual impacts.

The Project scope is first reviewed to identify the potential hazards to the environment due to any accidental events. For each of the scenario, the assessment of likelihood and the extent of the consequence effect is then carried out. The assessment takes a qualitative approach based on professional judgement and experience from similar projects.

Definitions used in the assessment for likelihood are set out in ***Table 9-1***.

TABLE 9-1: SIGNIFICANCE CRITERIA FOR UNPLANNED EVENTS – LIKELIHOOD

Likelihood Criteria	Likelihood describes the probability of an event or incident actually occurring or taking place. It is considered in terms of the following variables:
Low	The event or incident is reported in the industry but rarely occurs.
Medium	The event or incident does occur but is not common.
High	The event or incident is likely to occur several times during the Project's lifetime.

Chapter 4 of this ESIA Report outlines the definitions of impact magnitude and impact significance for planned Project activities. The definitions of negligible, small, medium, large

(for impact magnitude)/negligible, minor, moderate and major (for impact significance) are also applicable for unplanned events. It is not possible to completely eliminate the risk of unplanned events from occurring. However, the mitigation strategy to minimise the risk of the occurrence of unplanned events is outlined in ***Table 9-2***.

TABLE 9-2: MITIGATION STRATEGY FOR UNPLANNED EVENTS

Strategy	Description:
Control	It aims to prevent an incident happening or reduce the risk of it happening to 'As Low As Reasonably Practicable' (ALARP) through: • Reducing the likelihood of the event (e.g., preventative maintenance regimes, reducing chemical usage, traffic control and speed limits, community road safety awareness training, implementation of state-of-the-art failure preventative equipment, procedures and training); • Reducing the consequence (e.g., bunds to contain spilled fuels, fire protection); and • a combination of both.
Recovery / Remediation	Based on contingency and response plans, including Emergency Preparedness and Response Plan (EPRP) and Disaster and Emergency Response Plan (DERP).

In general, a variety of management plans and mitigation measures are developed to further reduce potential impacts to the environment as described in ***Chapter 13*** Environmental and Social Management Plan. Therefore, the potential impact of unplanned and non-routine events during construction and operations phases are assessed together.

9.3 HAZARD IDENTIFICATION

The following are considered the hazards that can be introduced to the Project Site and upon release to the environment during construction and operation phases of the Project:

- Diesel, engine oil, lubricants;
- Wastewater;
- Construction materials – concrete, steel, etc.;
- Vehicle movement;
- Noise and vibration;
- Uneven surfaces, open trenches, bores, piles etc.;
- Working at height;
- Heavy machinery and equipment;
- Lifting heavy objects;
- Electricity;
- Slips, trips and falls;
- Natural disasters;
- Undesired weather conditions;
- Working with hot and/or sharp objects;
- Exposure to hazardous substances;
- Manual handling;
- Working in confined spaces; and

- Working in remote areas.

The following sections review the Project activities, and the unplanned events related to operational hazards include:

- Leakage and spill incident;
- Fire and explosion;
- Blade throw / ice throw;
- Equipment failure;
- Transmission line snapping and transmission pylon collapse; and
- Vehicle collision.

Although the impact significance of natural hazards (earthquake, flood, extreme cold and dzud, extreme heat, dust storm, wildfire) is not assessed in this section, in the event of a natural disaster, emergency response procedures are recommended to be in place as defined in the DERP.

9.3.1 LEAKAGE AND SPILL INCIDENT

9.3.1.1 BACKGROUND

Various hazardous materials will be used for the Project activities, such as fuels and lubricating oils used for operation and maintenance of machinery, cranes, pipe-laying cranes and plant, heavy good vehicles, fork-lift trucks, and fuel trucks. There is the potential for accidental release in the course of material storage and handling during the Project lifecycle. The spill locations may include areas used for maintenance, material and equipment laydown, parking, fuel storage and fuelling around the Project Site. In addition, the BESS uses liquid coolant. Accidental spills at these locations also have the potential to impact groundwater quality, soil quality and community health and safety. Lube oils are not expected to be readily biodegradable.

Furthermore, in the event of a BESS fire (also refer ***Section 9.3.2***), total flooding extinguishing system is clean-agent gas, not water based. Only if thermal runaway develops and fire services need to apply water externally for cooling or fire control, would water be generated by firefighting. Such firewater may contain battery-related contaminants, including metals, coolant and combustion products, and potentially per- and polyfluoroalkyl substances (PFAS) where firefighting foams are used. If not contained, firewater generated by firefighting has the potential to impact groundwater quality.

9.3.1.2 EXISTING CONTROLS

The planned mitigation measures related to spills as presented in the Detailed Environmental Impact Assessment (DEIA) include:

Measures to Reduce Air Quality Impacts:

- Ensure that vehicles, machinery, and equipment undergo annual inspections and regular maintenance to prevent harmful emissions.

Reducing the Impact on Soil Cover;

- Waste management: Collect household and construction waste, as well as chemical containers, separately and arrange for their transportation to the centralized waste disposal site in agreement with relevant authorities in Tsogttsetsii soum;
- Proper storage of hazardous materials: Store petroleum products, fuels, lubricants, and chemicals in designated containers as per standards to prevent soil contamination, and take management measures to prevent leaks and spills; and
- Immediate response to contamination: In case of chemical spills or contamination of the soil, immediately remove the contaminated soil, neutralize it, and dispose of it properly.

Measures to Reduce Negative Impacts from Waste;

- Preventing Soil Contamination from Machinery: Take measures to prevent spills of oil, lubricants, and fuel from machinery onto the soil. In case of spills, immediately clean the soil and neutralize the substances.

In addition, NZE has advised that if water-based fire suppression is required, runoff management will be implemented in accordance with NFPA standards.

9.3.1.3 LIKELIHOOD ASSESSMENT

Based on desktop study, the likelihood of spills/leaks in relation to onshore projects is **low**, i.e., the event or incident is reported in the industry but rarely occurs.

9.3.1.4 SIGNIFICANCE OF IMPACT

Incidental spills of fuels rarely occur in onshore projects. Spills most frequently occur due to malfunction of handling systems and poor handling practices during fuel transfers or due to incorrect storage of lubricants, fuels and paints. Damage of fuel tanks of heavy-duty vehicles and other construction equipment (e.g. generator) are also a potential source. Large releases of hazardous materials from equipment and storage are rare because those are designed and built specifically to prevent release. During operation, corrosion, dropped objects or other damage to small storage vessels, failure to secure valves and failure to maintain equipment and spillage of chemicals from BESS could be potential sources. Overall, it is unlikely that a spill would occur, and this has thus been factored into the assessment of impact significance.

Project activities with the potential to lead to accidental spills will generally be limited within the Project Site. It is possible that run-off from the Project Site could transport spilled materials on the ground to the groundwater, depending on the spill location and soil conditions. However, the likelihood of spilled materials released to the groundwater is expected to be very low given the Project is implementing existing mitigation measures (***Section 9.3.1.2***) such as regular inspection and maintenance of vehicles and equipment, and storage of materials in impermeable materials and storage of hazardous materials, paints and lubricants in bunded, impermeable surfaces. BESS will be built on a bunded impermeable surface to prevent infiltration with design consideration including drainage and retention of firewater runoff, if the need for water-based fire suppression occurred. Moreover, the potential spills will be limited to the capacity of the containers or fuel tank of the vehicles which is very unlikely to have any consequences for surrounding communities. The impact magnitude is therefore considered to be negligible. Sensitivity of the sensitive receiver (for groundwater, soil and local community) is considered medium given that a small number of settlements are identified within 500 m from the Project facilities. However, it is noted that the majority of the population living in the surroundings of the Project facilities is nomadic and will move according to the seasonality and

status of the pasture. Therefore, the household identified may change prior to commencement of construction and during construction period. The significance of impact associated with accidental spills and leaks is considered **negligible** (***Table 9-3***).

TABLE 9-3: LEAKAGE AND SPILL INCIDENT IMPACT

Impact	**Leakage and Spill Incident**				
Nature	Negative	Positive	Neutral		
Type	Direct	Indirect	Induced		
Duration	Temporary	Short-term	Long-term	Permanent	
Extent	Local	Regional	International		
Scale	Local				
Likelihood	Low	Medium	High		
Magnitude	Positive	Negligible	Small	Medium	Large
Resource/Receptor Sensitivity	Low	Medium	High		
Significance	Negligible	Minor	Moderate	Major	
	The impact significance is assessed as **negligible**				

9.3.1.5 ADDITIONAL MITIGATION MEASURES

Given the negligible impact significance, additional mitigations are not deemed strictly necessary. However, the following mitigation measures are recommended as good practice to minimize the identified impacts:

- Ensure regular inspection and maintenance of vehicles and equipment to be used in the Project's construction according to the schedule; check for cracks and fissures in the concrete platforms used by the vehicles; maintain and repair any damage and clean up flammable materials spilled at the site accordingly;
- Heavy machinery/vehicles and equipment should be properly maintained, and any flammable materials spilled on dry pebbles should be properly cleaned/removed to prevent contamination. Training should be provided to drivers and operators for oil and spill response and how to use spill kit;
- Materials that may pollute groundwater shall be stored on impermeable materials, to prevent flowing of materials through storm water drainage and rainwater; oil trap techniques should be utilized as appropriate;
- Flammable lubricant materials storage tank pipes and valves should be regularly checked for wear and tear and be replaced, if necessary;
- In the event of a spillage or leakage from the storage tanks, proper pumps for collecting and special absorbent materials should be adequately placed at the location. Trays and blind pits, if any, should be regularly inspected and cleaned to remove any accumulated residues;

- Ensure controls are in place to prevent leaving the vehicle unattended while refueling and regularly check that the valve of the tank containing flammable lubricant materials is closed tight;
- Contaminated soil will be dug and disposed as hazardous waste;
- Chemicals will be handled and stored in compliance with the Material Safety Data Sheet (MSDS);
- All chemical wastes will be segregated into clearly marked containers prior to disposal site by a licensed waste management contractor, as per the relevant MSDSs;
- Monthly monitoring the implementation of all proposed mitigation measures specified in EPRP should be conducted properly;
- Daily inspection of any secondary containment of oil/chemical on site and ensure good maintenance procedures to minimize small leaks and spills; and
- Spill drills will be made as described in the EPRP.
- Response in the event of a spill will be implemented as described in the EPRP and DERP.
- Drainage design to allow segregation and retention structures adequately sized to collect firewater runoff as far as practicable, and collected firewater is tested and disposed of via licensed waste contractor as appropriate. Procedures for collection and disposal of contaminated firewater at BESS will be included in the EPRP.

9.3.1.6 RESIDUAL IMPACTS

Following the implementation of the above-mentioned mitigation measures, the residual impacts are expected to remain **negligible**.

9.3.2 FIRE AND EXPLOSION

9.3.2.1 BACKGROUND

Wind turbine generators (WTGs) are built with flammable materials. Damage of the WTGs, transmission line due to lighting strikes, or malfunctioned equipment might result in fire and explosion. The primary fire hazard associated with lithium-ion BESS is thermal runaway, a self-sustaining exothermic reaction that may occur within a battery cell under abnormal conditions (e.g. over-charging, internal short circuit, mechanical damage, overheating). Once initiated, thermal runaway has the potential propagate to neighbouring cells, modules, or containers if not effectively isolated. Unlike conventional fires, lithium-ion battery fires can burn for extended periods and have the potential to release flammable and toxic gases, including hydrogen and carbon monoxide, which potentially pose challenges to conventional firefighting. During the operation phase, 50 MW BESS will be used. During the construction phase, the Project will install a temporary 350KV BESS coupled to PV array for power supply to some of the temporary ancillary facilities.

As assessed in ***Section 7.3,*** wildfire is assessed to be a natural hazard that is unlikely material risk to the project.

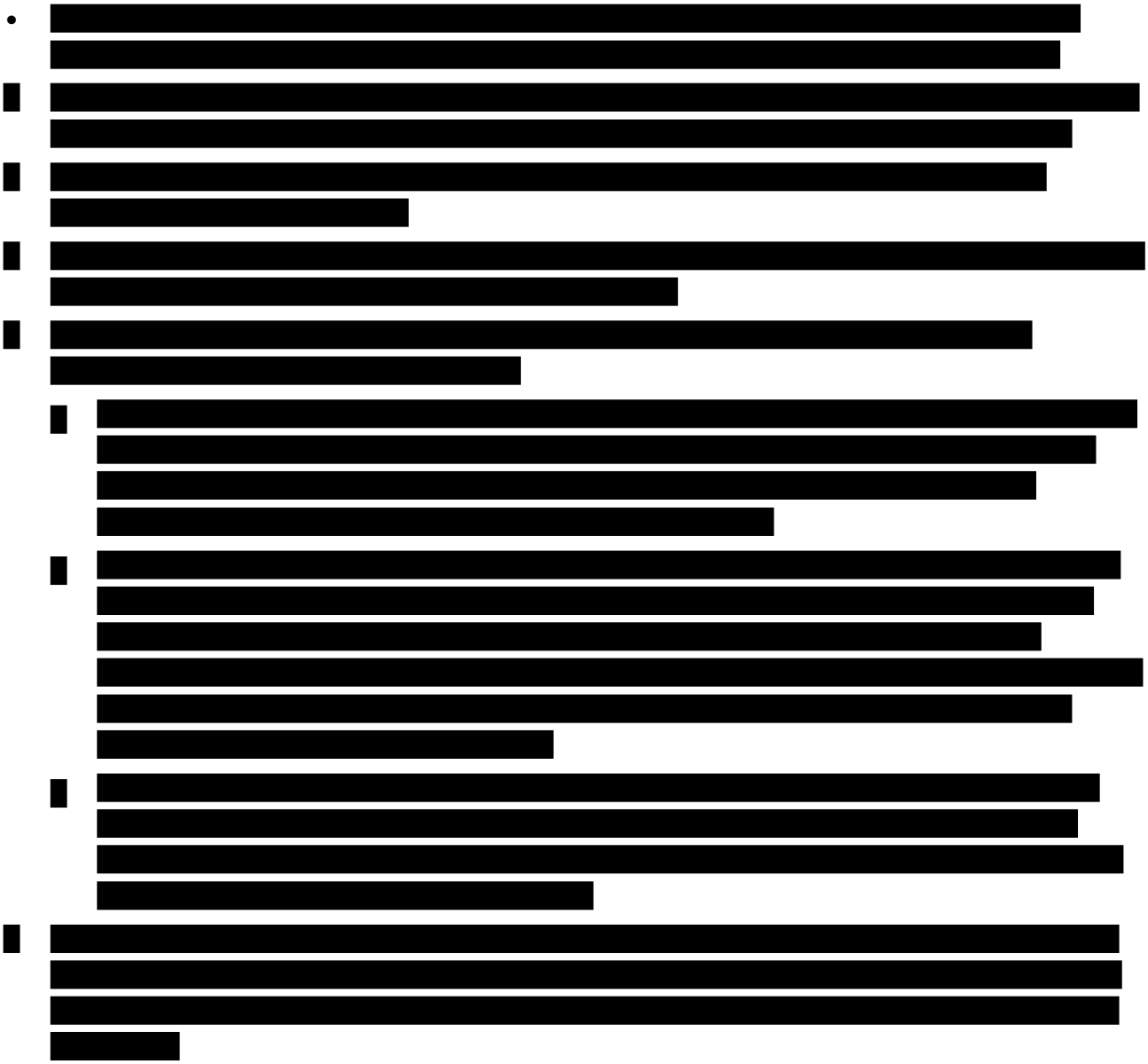
These incidents are not predicted to occur during normal construction and operation phases, but rather unlikely and exceptional. Impacts to air quality, and occupational health and safety (OHS) may arise from fire and explosion. Impacts to groundwater arising from firewater runoff (if water used) are assessed in ***Section 9.3.1.***

9.3.2.2 EXISTING CONTROLS

The planned mitigation measures related to fire safety as presented in the Detailed Environmental Impact Assessment (DEIA) for 50MW operation phase BESS include:

- Maintenance and Equipment Integrity: Ensure the quality and integrity of machinery and equipment, conducting regular maintenance services;
- Fire Safety and Electrical Connections: Choose fire-resistant materials for construction and ensure proper electrical connections following technology standards. Plan and prepare for fire extinguishing measures in advance;
- Contingency Plans for Emergencies: Prepare a detailed contingency plan for possible accidents, specifying who is responsible for each task, and organize a rapid-response team to address emergencies; and
- Fire Hazard Prevention: Keep flammable materials away from lighting equipment and heating sources.

Furthermore, NZE has advised the following are embedded design measures for the operation phase 50MW BESS to, prevent, isolate and suppress fire and prevent explosion.



- [redacted]

[redacted]

Details on the design of the operation phase 50MW BESS to achieve an acceptable level of safety and manage hazards throughout its lifecycle will be documented by NZE in BESS Design Safety Basis (DSB) document. The DBS will bring together outcomes of hazard studies including Hazard and Operability (HAZOP), Layer of Protection Analysis (LOPA) and quantitative risk assessments (where needed) and demonstrate how safety is incorporated into the design though prevention, isolation, mitigation and emergency response measures. Through these studies, for instance, any additional emergency response measures tailored to the limited emergency response capacity in the remote project area will be included in the EPRP and DERP.

9.3.2.3 LIKELIHOOD ASSESSMENT

Based on desktop study, the likelihood of fire and explosion in relation to onshore wind and BESS projects is low, i.e., the event or incident is reported in the industry but rarely occurs.

9.3.2.4 SIGNIFICANCE OF IMPACT

Fire and explosion events are anticipated to pose fatality risks to people. In terms of environmental impact, fire and explosion may lead to the loss of containment, resulting in contaminated or polluted soil, and deterioration of groundwater quality through leaching process, if not properly addressed and asset damage. Air quality will also deteriorate due to the large plume of particles and other pollutants produced by such events. Fire and explosion will also pose health and safety risks to workers and to the local communities.

The impact magnitude is expected to be negligible through the implementation of the planned mitigation measures and the likelihood is low once those mitigation measures are in place. Receptors, including workers and a small number of settlements within 500 m[1] of the operation phase 50MW BESS and OHL route are of high sensitivity. The significance of impact from fire and explosion is considered to be **negligible** (***Table 9-4***).

TABLE 9-4: FIRE AND EXPLOSION IMPACT

Impact	**Fire and Explosion Impact Assessment**		
Nature	Negative	Positive	Neutral

[1] It may be noted that adoption of 500m fire and explosion Area of Influence for this assessment is a conservative and precautionary approach for identifying potentially affected receptors.

Impact	Fire and Explosion Impact Assessment			
Type	Direct	Indirect	Induced	
Duration	Temporary	Short-term	Long-term	Permanent
Extent	Local	Regional	International	
Scale	Local			
Likelihood	Low	Medium	High	
Magnitude	Positive	Negligible	Small	Medium	Large
Resource/Receptor Sensitivity	Low	Medium	High	
Significance	Negligible	Minor	Moderate	Major
	The impact significance is assessed as **negligible**			

9.3.2.5 ADDITIONAL MITIGATION MEASURES

Given the negligible impact significance, additional mitigations are not deemed strictly necessary. However, the following mitigation measures are recommended as good practice to minimize the identified impacts:

- Place fire protection equipment, primary tools and fire extinguishers in appropriate places;
- Ensure that workers and staff are trained on a regular basis for cases of fire prevention, rescue, and firefighting operations. Provide training to the workers and staff for knowledge and skills, ensure practice and readiness for cases of fire on a regular basis;
- Pre-communicate and coordinate with local firefighting brigade/station;
- Restrict smoking to controlled areas only;
- Implement all required safety and management requirements relating to the transportation, storage and handling of explosives (if any);
- Fuel tanks and chemical storage areas should be provided with locks and be sited on sealed areas. Establishment of secondary containment for fuel storage and hazardous materials, which have pollution prevention facilities;
- Conduct fire and evacuation drills;
- A monthly audit program shall be established to check the implementation of emergency response and evacuation plan, staff training, equipment inspection, and firefighting drills;
- Procedures for fire prevention will be implemented as described in the Fire Prevention Plan (FPP); and
- For the 350KV BESS, use a certified BESS complying with IEC 62619, UL 1973, UL 9540 or equivalent; equipped with integrated Battery Management System (BMS) allowing automatic shutdown upon detection of abnormal conditions; and with nearby portable electrical fire extinguishers or built in clean-agent suppression system.
- Response in the event of a BESS thermal runaway / fire incident will be implemented as described in the EPRP and DERP.

9.3.2.6 RESIDUAL IMPACTS

Following the implementation of the above-mentioned mitigation measures, the residual impacts are expected to remain **negligible**.

9.3.3 BLADE THROW/ ICE THROW

9.3.3.1 BACKGROUND

Failure of the rotor blade could result in 'blade throw', which might pose risk to public safety. Wind turbine blade failure can result from external factors like erosion, lightning, exceeding design limits in extreme wind conditions, material defects, and fatigue. Neglected erosion may compromise the blade's structure, while lightning strikes can weaken its strength. Ongoing mechanical stresses and flaws in design or materials can gradually create weak points, increasing the risk of blade throw.

In addition, wind turbines can accumulate ice under certain cold and humid weather conditions, creating safety risks when the ice is shed referred to as 'ice throw'. Ice may fall due to gravity or be thrown outward by rotating blades, especially during changes in temperature, wind, or solar radiation. This can pose risks to areas beneath and around turbines, potentially causing injury to community and workers.

The IFC EHS Guidelines on Wind Energy (2015) suggests that turbines must be sited at an acceptable distance, i.e., setback distance between the wind turbines and sensitive receptors in order to maintain public safety. The minimum setback distance for blade throw is 1.5 x turbine height (tower + rotor radius), although modelling suggests that the theoretical blade throw distance can vary with the size, shape, weight, and speed of the blades, and the height of the turbine. In terms of setback distance for ice throw, the same setback distance is also applicable with reference to international industry guidance from European countries.

9.3.3.2 EXISTING CONTROLS

The Project layout is in compliance with the minimum setback distance requirement specified in IFC EHS Guidelines on Wind Energy (2015) and international industry guidance.

9.3.3.3 LIKELIHOOD ASSESSMENT

According to IFC EHS Guideline on Wind Energy (2015), the likelihood of blade throw is extremely low, i.e., the event or incident is reported in the industry but rarely occurs.

The likelihood of shedding ice and ice throw is reported in the industry, but potential for icing for the Project will be limited and extremely low likelihood given low precipitation and humidity conditions of the region in winter. NZE has conducted an ice accretion potential analysis using one year[2] of data collected from the met mast located at the Project Site. Based on thresholds of wet bulb temperature below 0°C, relative humidity above 90% and wind speed above 3 m/s, it was found there were zero hours when all three conditions occurred, thus indicating negligible likelihood of icing. Furthermore, NZE informed that no ice throw incidents have been recorded at the Tsettsi Wind Farm (located about 40 km to the north), which experiences the same prevailing climatic conditions as the Project, since its commissioning in October 2017 (i.e. no recorded ice throw incidents in 8.5 years of operation).

[2] Data from the period: April 22, 2025 – April 18, 2026

9.3.3.4 SIGNIFICANCE OF IMPACT

According to ***Table 9-5***, the calculated setback distance as per IFC EHS Guidelines for Wind Energy (2015) is 302 m. Although there are no temporary herder settlements within 302 m from the WTG Area, households and livestock migrate between winter and summer camps and the grazing areas, where they could traverse turbine areas via traditional movement routes and could subject to blade throw risks. While winter icing conditions may coincide with reduced grazing activity near turbines, the risk for ice throw is less significant. Considering that the impact is at local level and could potentially affect a small proportion of receptors, impact magnitude is small. The receptors are limited to the workers and local communities, with medium sensitivity. The impact significance is considered **minor** (***Table 9-6***).

TABLE 9-5: SETBACK DISTANCES AS PER IFC EHS GUIDELINES FOR WIND ENERGY

WTG Model	Turbine height:	Setback distances as per IFC EHS Guidelines for Wind Energy
[redacted]	110 m (hub height) 91 m (rotor radius) Total: 201 m	302 m (1.5 x 201 m)

TABLE 9-6: BLADE THROW/ICE THROW IMPACT

Impact	Blade Throw Impact Assessment				
Nature	Negative	Positive	Neutral		
Type	Direct	Indirect	Induced		
Duration	Temporary	Short-term	Long-term	Permanent	
Extent	Local	Regional	International		
Scale	Local				
Likelihood	Low	Medium	High		
Magnitude	Positive	Negligible	Small	Medium	Large
Resource/Receptor Sensitivity	Low	Medium	High		
Significance	Negligible	Minor	Moderate	Major	
	The impact significance is assessed as **minor**				

9.3.3.5 ADDITIONAL MITIGATION MEASURES

Given the minor impact significance, additional mitigations are not deemed strictly necessary. However, the following mitigation measures are recommended as good practice to minimize the identified impacts:

- Minimize the probability of a blade failure by selecting wind turbines that have been subject to independent design verification/certification (e.g., IEC 61400-1), and surveillance of manufacturing quality;
- Ensure that lightning protection systems are properly installed and maintained;

- A quarterly audit program (part of O&M contract with the WTG manufacturer) shall be established to check the implementation of regular technical inspection of the WTGs and blades' safety. Any identified gaps or opportunities will be followed up after the inspection until resolved. The auditing records will be kept on-site for future review and supervision;
- Implement periodic routine inspection and maintenance procedures (in line with international best practices);
- Equip the WTGs with vibration sensors that can react to any imbalance in the rotor blades and shut down the turbine if necessary;
- Monitor Project site conditions against meteorological icing thresholds;
- Develop protocol under EPRP to promptly issue alert to community in case of icing and requirement for no-go zone if alert in effect;
- Inform herders for awareness of ice throw/blade throw risk during stakeholder engagement including icing alert;
- Install warning signage around the 302 m buffer zone where the WTGs are located;
- Include ice throw hazard (e.g. Visual inspection and stand-off distance) in WTG maintenance protocol in the EPRP for worker safety;
- Implement safe controlled restart after icing in event of shut down (e.g. delay until ice shedding has occurred); and
- In the event of a blade throw incident, response will be made as described in the EPRP.

9.3.3.6 RESIDUAL IMPACTS

Following the implementation of the above-mentioned mitigation measures, the residual impacts are expected to be **negligible**.

9.3.4 EQUIPMENT FAILURE

9.3.4.1 BACKGROUND

The common equipment failures in relation to onshore wind projects are:

- Blade failure: caused by bird strikes, lightning strikes, and poor design, resulting in blade throw (see ***Section 9.3.3*** for more details); and
- Generator failure: mechanical or electrical failure of the bearings, voltage irregularities or cooling system failures can lead to excessive heat or even fire (see ***Section 9.3.2*** for more details).

These incidents are not predicted to occur during normal construction and operation phases but are rather unlikely and exceptional. Impacts to air quality and OHS might arise from equipment failure.

9.3.4.2 EXISTING CONTROLS

The planned mitigation measures for fire and explosion (***Section 9.3.2.2***), and blade throw (**Section 9.3.3.2**) are applicable to equipment failure.

9.3.4.3 LIKELIHOOD ASSESSMENT

Based on desktop study, the likelihood of equipment failure is low, i.e., an event or incident is reported in the industry but rarely occurs.

9.3.4.4 SIGNIFICANCE OF IMPACT

Blade throw caused by blade failure can lead to injuries or even fatalities. Meanwhile, generator failure might lead to fire, also causing impacts to air quality, and OHS. Please refer to ***Section 9.3.3*** and ***Section 9.3.2***, respectively for further discussions on blade throw, and fire and explosions.

The impact magnitude is expected to be negligible through the implementation of the planned mitigation measures and the likelihood is low once those mitigation measures are in place.

Receptors, i.e. workers working in the Project Site are of medium sensitivity. The significance of impact from equipment failure is considered to be **negligible** (***Table 9-7***).

TABLE 9-7: EQUIPMENT FAILURE IMPACT

Impact	**Blade Throw Impact Assessment**				
Nature	Negative	Positive	Neutral		
Type	Direct	Indirect	Induced		
Duration	Temporary	Short-term	Long-term	Permanent	
Extent	Local	Regional	International		
Scale	Local				
Likelihood	Low	Medium	High		
Magnitude	Positive	Negligible	Small	Medium	Large
Resource/Receptor Sensitivity	Low	Medium	High		
Significance	Negligible	Minor	Moderate	Major	
	The impact significance is assessed as **negligible**				

9.3.4.5 ADDITIONAL MITIGATION MEASURES

The additional mitigation measures for fire and explosion (***Section 9.3.2.5***), and blade throw (***Section 9.3.3.5***) are applicable to equipment failure. In addition:

- Response in the event of general equipment failure will be made as described in the EPRP.

9.3.4.6 RESIDUAL IMPACTS

Following the implementation of the above-mentioned mitigation measures, the residual impacts are expected to be **negligible**.

9.3.5 TRANSMISSION LINE SNAPPING AND TRANSMISSION PYLON COLLAPSE

9.3.5.1 BACKGROUND

During operation, there is a possibility of lines or transmission towers/parts snapping/swaying due to the collapse of transmission pylon. The risk is mainly influenced by poor foundation quality, material corrosion or damaged fittings. Transmission line snapping and transmission pylon collapse can result in injuries and fatalities.

9.3.5.2 EXISTING CONTROLS

The planned mitigation measures as presented in the DEIA include:

- Work Responsibilities and Expertise: Ensure that workers do not attempt tasks they are not qualified for. They should not perform non-assigned duties and should execute their tasks only after fully understanding instructions from the management;
- Prevention of Accidents: Provide regular guidance to all workers regarding safety procedures and organize training to prevent accidents;
- Internal Safety Regulations: Develop and enforce internal safety regulations, rules, and instructions, continuously monitoring compliance;
- Maintenance and Equipment Integrity: Ensure the quality and integrity of machinery and equipment, conducting regular maintenance services;
- Safety Notices and Warnings: Post safety warnings, notices, and signs at necessary locations, clearly visible to workers and the public. Inform the public about ongoing construction activities; and
- Safe Work Conditions and Regular Safety Training: Continuously provide clear information about construction processes, safety procedures, and worker protection, ensuring they have the proper protective clothing and equipment (e.g., goggles, ear protection, etc.).

9.3.5.3 LIKELIHOOD ASSESSMENT

Based on desktop study, the likelihood of transmission line snapping and transmission pylon collapse is low, i.e., the event or incident is reported in the industry but rarely occurs.

9.3.5.4 SIGNIFICANCE OF IMPACT

Transmission line snapping and transmission pylon collapse may result in injuries and/or fatalities. Additionally, any contacts (both intentional and unintentional) with the exposing snapped transmission line can result in electrocution. Snapping would affect people in the immediate proximity to the transmission line (within 10 m[3]). No herder household are located under or within the right of way of the Project transmission line.

Severed transmission lines pose a significant electrical hazard even after contact with the ground. The high voltage they carry can be transmitted through the surrounding environment, particularly in damp conditions. This phenomenon, known as ground potential rise, creates a zone of energized ground around the fallen line. Additionally, the high voltage can lead to electrical arcing, which can injure or kill individuals or animals in the immediate vicinity without direct contact with the line itself. Tower collapsing could damage structures within a distance equal to the tower height (between 27 m to 35 m).

However, the likelihood of this unplanned event is expected to be very low given the planned mitigation measures such as avoidance of the Substation and OHL construction near households, and inspection of components on a regular basis. The impact magnitude is therefore considered to be negligible. Sensitivity of the sensitive receiver is considered medium given there are a small number of settlements within 500 m from the OHL route, although it is noted they are nomadic, and they will move according to the seasonality and status of the

[3] OSHA 1926.1408 Available at: https://www.osha.gov/laws-regs/regulations/standardnumber/1926/1926.1408

pasture. The significance of impact associated with transmission line snapping and transmission pylon collapse is considered **negligible** (***Table 9-8***).

TABLE 9-8: TRANSMISSION LINE SNAPPING AND TRANSMISSION PYLON COLLAPSE IMPACT ASSESSMENT

Impact	**Transmission Line Snapping and Transmission Pylon Collapse**				
Nature	Negative		Positive		Neutral
Type	Direct		Indirect		Induced
Duration	Temporary	Short-term		Long-term	Permanent
Extent	Local		Regional		International
Scale	Local				
Likelihood	Low		Medium		High
Magnitude	Positive	Negligible	Small	Medium	Large
Resource/Receptor Sensitivity	Low		Medium		High
Significance	Negligible	Minor		Moderate	Major
	The impact significance is assessed as **negligible**				

9.3.5.5 ADDITIONAL MITIGATION MEASURES

Given the negligible impact significance, additional mitigations are not deemed strictly necessary. However, the following mitigation measures are recommended as good practice to minimize the identified impacts:

- Do not install the Substation, OHL and/or other high voltage equipment near households or settlement areas. Overhead transmission lines should be prohibited to be pulled above buildings of residential areas. Comply and operate with the requirements within electrical facility zone;
- Perform assembly of electric transmission lines controlling quality of the work, use of up to standard materials; inspect and monitor integrity on a regular basis as per schedule;
- Provide instructions and procedures about safety precautions to local communities;
- Install warning system, signal boards, lighting prevention system, anti-climbing devices on the tower;
- A yearly audit program shall be established to check the implementation of regular technical inspection of the transmission lines and transmission pylons' safety; and
- Response in the event of transmission line snapping and pylon collapse will be made as described in the EPRP and DERP.

9.3.5.6 RESIDUAL IMPACTS

Following the implementation of the above-mentioned mitigation measures, the residual impacts are expected to be **negligible**.

9.3.6 VEHICLE COLLISION

9.3.6.1 BACKGROUND

Site preparation would require a number of vehicle trips to deliver construction equipment and supplies, as well as daily trips of employees. Main causes of vehicle collision may include dark conditions, driver distraction, fatigue, other dangerous drivers, variable road conditions; rural areas with pedestrian road users and livestock on the road. The Project will moderately increase road traffic volumes, particularly during construction phase. That will result in changed traffic conditions and greater traffic speeds, increasing the risk of road traffic accidents, which could result in injuries or fatalities to road users, pedestrians, herds, and wild fauna.

9.3.6.2 EXISTING CONTROLS

The planned mitigation measures as presented in the DEIA include:

- Prevention of Accidents: Provide regular guidance to all workers regarding safety procedures and organize training to prevent accidents;
- Internal Safety Regulations: Develop and enforce internal safety regulations, rules, and instructions, continuously monitoring compliance;
- Maintenance and Equipment Integrity: Ensure the quality and integrity of machinery and equipment, conducting regular maintenance services;
- Training on Hazard Awareness: Ensure that all workers understand potential hazards during construction, regularly conduct safety training, and proactively plan and prepare for accident prevention and mitigation. Maintain readiness to manage the consequences of accidents; and
- Prohibition of Working in Low Light: Strictly prohibit working in dim light or complete darkness.

9.3.6.3 LIKELIHOOD ASSESSMENT

Based on desktop study, the likelihood of vehicle collision is medium, i.e., the event or incident does occur but is not common.

9.3.6.4 SIGNIFICANCE OF IMPACT

Vehicle collisions most frequently occur due to poor traffic management. Project activities with the potential to lead to vehicle collision will generally be limited within the Project Site and the Access Road and internal roads. During the construction period, there might be a number of heavy machines such as bulldozers, backhoes/excavators, and dump trucks within the Project Site. Vehicle collision, result in injuries or fatalities might arise if local traffic is mismanaged. The impact magnitude is considered to be small.

Receptor sensitivity is considered medium given that there are a small number of settlements within 500 m of the OHL route. However, at this stage it is not possible to assess whether the settlements will be within 500 m from the construction site of the anchor towers and suspension poles as the precise location will be determined later, during the detailed design stage. The majority of the population living in the surroundings of the Project facilities is nomadic and will move according to the seasonality and status of the pasture. Therefore, the household identified may change prior to commencement of construction and during

construction period. The significance of impact associated with vehicle collision is considered **minor** (***Table 9-9***).

TABLE 9-9: VEHICLE COLLISION IMPACT ASSESSMENT

Impact	**Vehicle collision**			
Nature	Negative	Positive	Neutral	
Type	Direct	Indirect	Induced	
Duration	Temporary	Short-term	Long-term	Permanent
Extent	Local	Regional	International	
Scale	Local			
Likelihood	Low	Medium	High	
Magnitude	Positive	Negligible	Small	Medium	Large
Resource/Receptor Sensitivity	Low	Medium	High	
Significance	Negligible	Minor	Moderate	Major
	The impact significance is assessed as **minor**			

9.3.6.5 ADDITIONAL MITIGATION MEASURES

Given the negligible impact significance, additional mitigations are not deemed strictly necessary. However, the following mitigation measures are recommended as good practice to minimize the identified impacts:

- Drivers should be fully trained for safe operations, vehicles should be inspected in accordance with the state regulations, maintenance should be performed on a regular basis with high standards, and vehicles should be inspected daily with a checklist before operated and meet all the requirements;
- In case of a vehicle accident, conduct root-cause analysis and avoid reoccurrences;
- Provide all traffic signs and safety infrastructures on the roads;
- Avoid bumps, loose rocks, steep slopes and blind bends on the Access Road and internal roads;
- Implement a policy prohibiting off-road travelling of vehicles during the construction phase, install road marks and enforce speed limits for travelling vehicles. For example, following the creation of 36 km of internal roads and right of way to be used in the construction of WTGs and OHL, further new pathways should not be created;
- Water spraying of road surfaces;
- When planning the route for travel during the construction phase, the surrounding landscape which the OHL passes through should be properly marked with speed limits and traffic signs;
- Road condition should be regularly inspected for any damaged road section; vehicles should be navigated to travel around the damaged road section; required road maintenance works should be carried out (if necessary);

- Provide local community with an understanding of the number and types of vehicles to be used during the construction of the Project and the internal traffic rules and routes prior to start of the construction;
- Communicate with the local community prior to construction phase, in order to inform on Project construction timeline, activities performed during the construction and operation phase of the Project;
- Adopt and implement health and safety controls, prevention procedures;
- Implement Health and Safety procedures and good safety practices for the transportation (e.g., alcohol policy, good driving practice, speed limit at 40 km/h);
- Use only licensed and experienced drivers and transport companies;
- Implement "No Night Driving Policy" (10pm-7am; and 10pm-10am for public holidays) for construction vehicles (during construction phase), when possible;
- All vehicles shall use designated roads only, and avoid traveling off roads;
- Monthly road condition monitoring along the transportation route to understand road quality during construction phase; and
- Response in the event of vehicle collision will be made as described in the EPRP.

9.3.6.6 RESIDUAL IMPACTS

Following the implementation of the above-mentioned mitigation measures, the residual impacts are expected to be **negligible**.

9.4 SUMMARY OF UNPLANNED EVENTS IMPACTS

Following a scoping exercise, this Chapter was focused on the interaction between Project activities and various resources/receptors that could result in significant impacts. ***Table 9-10*** below presents the outcomes of the comprehensive assessment of identified impacts as a result of the various phases of the proposed Project and summarize the unplanned events impacts.

TABLE 9-10: SUMMARY OF UNPLANNED EVENTS IMPACTS

Aspect	Significance of Impact	Significance of Residual Impact
Leakage and Spill Incident	Negligible	Negligible
Fire and Explosion	Negligible	Negligible
Blade Throw	Negligible	Negligible
Equipment Failure	Negligible	Negligible
Transmission Line Snapping and Transmission Pylon Collapse	Negligible	Negligible
Vehicle Collision	Minor	Negligible

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ERM-Hong Kong, Limited

2507 One Harbourfront
18 Tak Fung Street
Hong Kong
T: +852 2271 3000
F: +852 3015 8052

www.erm.com