ENVIRONMENTAL MANAGEMENT PLAN (EMP) REPORT for

40MW MYANMAR SHWEKYIN SOLAR POWER PLANT

Connected to Shwekyin Substation

Proposed By

MYANMAR SHWEKYIN SOLAR POWER COMPANY LIMITED

Prepared By

eguard ENVIRONMENTAL SERVICES

MYANMAR SHWEKYIN SOLAR POWER COMPANY LIMITED

E Guard Environmental Services Co., Ltd

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Report Review Form

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Summary: EMP Report This document represents Environmental Management Plan (EMP) report as required for construction and operation of 30 MW ground mounted solar power plant project.	**Approved by: U Soe Min** 

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Data analysis, impact assessment, devising mitigation measures and report formulation were carried out based on the information/plan/processes provided by the project proponent, available secondary data and information, and onsite observation and measurement of E Guard's environmental study team in line with the relevant national and international guidelines and standards. While we do take effort to ensure that the information contained in this report is reliable and accurate, we disclaim no responsibility for errors and omissions which might occur despites of our reasonable skill and care.

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Commitment to follow and compliance with Environmental Conservation Law, Rules, Environmental Impact Assessment Procedure, National Environmental Quality (Emission) Guidelines, Relevant Environmental Standards and Mitigation Measures stated in the Environmental Management Plan (EMP) of EMP Report

With regards to the above matter, we, E Guard Environmental Services Co., Ltd. Has prepared the Environmental Management Plans (EMP) Report for 40 MW Ground Mounted Solar Power Plant Project connected to Shwekyin Substation, proposed by Myanmar Shwekyin Solar Power Co., Ltd., Our company strongly commits that this EMP report has been prepared by following Environmental Conservation Law (2012), Environmental Conservation Rules (2014), Environmental Impact Assessment Procedure (2015), National Environmental Quality (Emission) Guidelines (2015) and relevant environmental standards through successful implementation of mitigation measures and environmental monitoring plans stated in the Environmental Management Plan (EMP) of EMP Report.

Aye Thiha
Managing Director
E guard Environmental Services

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%	: Percentage
µg/m^3	: Micro Gram per Cubic meter
AC	: Alternating Current
BOD	: Biochemical Oxygen Demand
CCTV	: Closed-Circuit Television
CO	: Carbon Monoxide
CO_2	: Carbon Dioxide
COD	: Chemical Oxygen Demand
CSR	: Corporate Social Responsibility
dB (A)	: Decibel unit
DC	: Direct Current
ECD	: Environmental Conservation Department
EMoP	: Environmental Monitoring Plan
EMP	: Environmental Management Plan
EPGE	: Electric Power Generation Enterprise
GPS	: Global Positioning System
HSE	: Health, Safety and Environment
HVAC	: Heating, Ventilation and Air Conditioning
km	: Kilometer
kV	: Kilovolt
kW	: Kilo Watt
kWh	: Kilo Watt Hour
L/m^2	: Liter per Square Meter
L/s	: Liter per Second
m^3	: Cubic Meter
m^3/h	: Cubic Meter per Hour
mg/l	: Milligram per Liter
mm^2	: Millimeter Square
MOEE	: Ministry of Electricity and Energy
MONREC	: Ministry of Natural Resources and Environmental Conservation
MJ/m^2	: Mega Joule per Square Meter
MWac	: Mega Watt

MWh	: Mega Watt Hour
MWp	: Mega Watt Peak
NO_2	: Nitrogen Dioxide
ºC	: Degrees Celsius
pH	: Pond us Hydrogenium
PM	: Particulate Matter
ppm	: Part Per Million
PV	: Photovoltaic
SCADA	: Supervisory Control and Data Acquisition
SO_2	: Sulfur Dioxide
TSP	: Total Suspended Particulates
UPS	: Uninterruptable Power Supply
WHO	: World Health Organization

အကျဉ်းချုပ်အစီရင်ခံစာ

ဤပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီရင်ခံစာသည် Myanmar Shwekyin Solar Power Company Limited မှ အကောင်အထည်ဖော်ဆောင်ရွက်မည်ဖြစ်သော ရွှေကျင်ဓာတ်အားခွဲရုံသို့ လျှပ်စစ်ဓာတ်အားဖြန့်ဖြူးမည့် ၄၀ မဂ္ဂါဝပ် နေရောင်ခြည်စွမ်းအင်သုံးလျှပ်စစ်ဓာတ်အားထုတ်လုပ်ခြင်း စီမံကိန်းအတွက်ပြင်ဆင်ရေးဆွဲ ထားခြင်း ဖြစ်သည်။ စီမံကိန်းအကောင်အထည်ဖော်သူသည် လျှပ်စစ်နှင့် စွမ်းအင်ဝန်ကြီးဌာနမှ ခေါ်ယူသော တင်ဒါအား အောင်မြင်ခဲ့သဖြင့် အဆိုပြုစီမံကိန်းအတွက် တည်ဆောင်ရန်နှင့် လုပ်ငန်းလည်ပတ်ရန် ခွင့်ပြုမိန့်ရရှိခဲ့ပါသည်။ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန၏ သဘောထားမှတ်ချက်များအရ အဆိုပြု စီမံကိန်းသည် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီရင်ခံစာ တင်ပြရန်လိုအပ်ပြီး E Guard Environmental Services Co., Ltd. သည် အဆိုပြုစီမံကိန်းအတွက် အစီရင်ခံစာပြင်ဆင်ရေးဆွဲကာ ပတ်ဝန်းကျင်ဆိုင်ရာလေ့လာမှုများ ပြုလုပ်ခဲ့ပါသည်။ ဤအစီရင်ခံစာတွင် လေ့လာမှုများသည် နေရောင်ခြည်စွမ်းအင်သုံး လျှပ်စစ်ဓာတ်အား ထုတ်လုပ်ခြင်း စီမံကိန်းတည်ဆောက်ခြင်းနှင့် ဓာတ်အားဖြန့်ဖြူးရန် ကောင်းကင်ဓာတ်အားလိုင်း သွယ်တန်းခြင်း၊ စီမံကိန်းမှ နေရောင်ခြည်စွမ်းအင် အသုံးပြု၍ လျှပ်စစ်ဓာတ်အားထုတ်လုပ်ခြင်းနှင့် ရွှေကျင် ဓာတ်အားခွဲရုံသို့ ၂၃၀ ကေဗွီ ကောင်းကင်ဓာတ်အားလိုင်းဖြင့် လျှပ်စစ်ဓာတ်အားဖြန့်ဖြူးခြင်း လုပ်ငန်းများအတွက် ပြုလုပ်ခဲ့ခြင်းဖြစ်သည်။ လေ့လာမှု နယ်ပယ်အားစီမံကိန်းဗဟိုမှ ၁ ကီလိုမီတာ အချင်းဝက်ရှိသောဧရိယာအတွင်းနှင့် ကောင်းကင်ဓာတ်အားလိုင်းတည်ဆောက်ခြင်းအတွက် ဓာတ်အားလိုင်း တစ်လျှောက် တစ်ဖက်တစ်ချက် မီတာ ၂၀၀ ဟု သတ်မှတ်လေ့လာခဲ့ခြင်းဖြစ်ပြီး ထိုဧရိယာသည် စီမံကိန်းကြောင့်ဖြစ်ပေါ်လာနိုင်သည့် ပတ်ဝန်းကျင်နှင့် လူမှုစီးပွားဆိုင်ရာ သက်ရောက်မှုများအတွက် လုံလောက်မှုရှိသည်။

အဆိုပြုစီမံကိန်းသည် အင်္ဂနီကျေးရွာအုပ်စု၊ ရွှေကျင်မြို့နယ်၊ ပဲခူးခရိုင်၊ ပဲခူးတိုင်းဒေသကြီး၊ မြန်မာနိုင်ငံတွင် တည်ရှိသည်။ စီမံကိန်း၏တည်နေရာမှာ မြောက်လတ္တီကျူ ၁၈ ဒီဂရီ ၀ မိနစ် ၄၃.၅၀ စက္ကန့်နှင့် အရှေ့ လောင်ဂျီကျူ ၉၆ ဒီဂရီ ၀ မိနစ် ၁၃.၀၉ စက္ကန့် တွင်တည်ရှိပြီး ပင်လယ်ရေမျက်နှာပြင် အထက် ၃၀ မီတာ တွင်တည်ရှိပါသည်။ အဆိုပြုစီမံကိန်း၏ တည်ဆောက်ရေး လုပ်ငန်းများတွင် box-type transformer များ၊ string inverter များ၊ ဆိုလာပြားများတပ်ဆင်ရန်ထောက်တိုင်များ၊ ဘက်စုံသုံးအဆောက်အဦး၊ လျှပ်စစ် ဓာတ်အားထုတ်လုပ်ခြင်းနှင့် ဖြန့်ဖြူးခြင်းအတွက်ကိရိယာများတပ်ဆင်ခြင်း၊ လျှပ်စစ်ဓာတ်အား ဖြန့်ဖြူးရန် ၂၃၀ ကေဗွီ ကောင်းကင်ဓာတ်အားလိုင်းသွယ်တန်းရန် တာဝါတိုင်တည်ဆောက်ခြင်းတို့ ပါဝင်သည်။ အဆိုပြု စီမံကိန်း၏ ပြန်လှန်လျှပ်စီးစွမ်းရည်မှာ ၄၈.၃၈၄ မဂ္ဂါဝပ်နှင့် တိုက်ရိုက်လျှပ်စီးစွမ်းရည်မှာ ၄၀ မဂ္ဂါဝပ်ဖြစ်ပြီး box-type transformer (၈) လုံးဖြင့် လျှပ်စစ် ဓာတ်အားထုတ်လုပ်သွားမည်ဖြစ်သည်။ စီမံကိန်းအဆိုပြုသူသည် စီမံကိန်းအကောင်အထည် ဖော်ရန် လိုအပ်သောမြေနေရာ ၁၆၄ ဧက (၆၆ ဟက်တာ) အား တရားဝင်ငှားရမ်းထားပြီးဖြစ်ပါသည်။ စီမံကိန်းအဆိုပြုသူသည် စီမံကိန်းတွင် အသုံးပြုရန် ဆိုလာပြား (၈၉,၆၀၀) ပြား၊ series inverter (၂၀) sets၊ box-type transformer (၈) လုံးနှင့်

ဆိုလာပြားများတပ်ဆင်ရန် ထောက်တိုင်ပေါင်း (၃၂၀၀) ခုအား တပ်ဆင်တည်ဆောက်သွားမည်ဖြစ်ပြီး တည်ဆောက်ခြင်းလုပ်ငန်းများ ဆောင်ရွက်ရန် အချိန်မှာ ၈ လ ဖြစ်ပါသည်။

အဆိုပြုစီမံကိန်းအား Myanmar Shwekyin Solar Power Company Limited မှ အကောင်အထည်ဖော်ဆောင်ရွက်မည်ဖြစ်သည်။ တည်ဆောက်ခြင်းလုပ်ငန်းများပြီးစီးပါက အဆိုပြုစီမံကိန်းသည် နေရောင်ခြည်စွမ်းအင်မှ လျှပ်စစ်ဓာတ်အားထုတ်လုပ်မည်ဖြစ်ပြီး ရွှေကျင်ဓာတ်အားခွဲရုံသို့ ၂၃၀ ကေဗွီ ကောင်းကင်ဓာတ်အားလိုင်းမှတစ်ဆင့် လျှပ်စစ်ဓာတ်အားဖြန့်ဖြူးသွားမည်ဖြစ်ကာ လုပ်ငန်းလည်ပတ်မည့်ကာလမှာ နှစ် ၂၀ ဖြစ်ပါသည်။ သက်ဆိုင်ရာစီမံကိန်းအကောင်အထည်ဖော်သူများ၏ ဒါရိုက်တာအဖွဲ့ဝင်များနှင့် ဖွဲ့စည်းပုံများ၊ အဆိုပြုစီမံကိန်း၏ ဖွဲ့စည်းပုံနှင့် ရင်းနှီးမြှုပ်နှံမှု အစီအစဉ်များအား **အခန်း (၃)** တွင် အသေးစိတ်ဖော်ပြထားပါသည်။

ဤပတ်ဝန်းကျင် စီမံခန့်ခွဲမှုအစီရင်ခံစာ ပြင်ဆင်ရာတွင်ပါဝင်သော ကျွမ်းကျင်ပညာရှင်များနှင့် ၎င်းတို့၏ တာဝန်များနှင့် ကျွမ်းကျင်မှုများအား **အခန်း (၄)** တွင်အသေးစိတ်ဖော်ပြထားပါသည်။

အဆိုပြုစီမံကိန်း တည်ဆောက်ခြင်းနှင့် လုပ်ငန်းလည်ပတ်ခြင်းတို့တွင် ပတ်ဝန်းကျင်အားထိခိုက်မှု ကာကွယ်ရန်လိုက်နာရမည့် နိုင်ငံတော်၏တည်ဆဲဥပဒေနှင့် စည်းမျဉ်းစဉ်းကမ်းများအား **အခန်း (၅)** တွင် အသေးစိတ်ဖော်ပြထားပါသည်။

လက်ရှိစီမံကိန်းအခြေအနေများကို ကွင်းဆင်းလေ့လာခြင်းနှင့် ယခင်လေ့လာပြီးသော အချက်အလက်များရယူခြင်းသည် ပတ်ဝန်းကျင်ထိခိုက်မှုများ ဆန်းစစ်ခြင်းအတွက် အလွန်အရေးပါသည်။ ထို့ကြောင့် လက်ရှိစီမံကိန်း၏ ပတ်ဝန်းကျင်ဆိုင်ရာအခြေအနေများအား ကွင်းဆင်းလေ့လာခြင်းသည် ပတ်ဝန်းကျင် ဆိုင်ရာအခြေအနေများအားကွင်းဆင်းလေ့လာခြင်းသည် ပတ်ဝန်းကျင်ဆိုင်ရာလေ့လာမှုများ ပြုလုပ်ရာ တွင်အရေးပါသည်။ ထို့ကြောင့် E Guard Environmental Services Co., Ltd. သည် စီမံကိန်း၏ လေအရည်အသွေး၊ ရေအရည်အသွေးနှင့် ဆူညံသံပမာဏတို့အား ၂၀၂၁ ဇွန်လ ၁ ရက်နေ့နှင့် ၂ ရက်နေ့တို့တွင် ၂၄ နာရီ ဆက်တိုက်စောင့်ကြပ်ကြည့်ရှုသည့်နည်းဖြင့် တိုင်းတာခဲ့ပါသည်။ တိုင်းတာ ရရှိသောရလဒ်များအား အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များ နှင့် အခြားသော သက်ဆိုင်ရာလမ်းညွှန်ချက်များဖြင့် နှိုင်းယှဉ်လေ့လာခဲ့သည်။ လေထုတွင်း ဓာတ်ငွေ့ ပါဝင်မှုရလဒ်များအား နှိုင်းယှဉ်လေ့လာခြင်းအရ ဆာလဖာဒိုင်အောက်ဆိုဒ် (၀.၀၃၁μg/m^3)၊ နိုက်ထရိုဂျင်ဒိုင်အောက်ဆိုဒ် (၂၆.၄၀μg/m^3)၊ ကာဗွန်မိုနောက်ဆိုဒ် (၀.၀၁၁ppm) နှင့် ကာဗွန် ဒိုင်အောက်ဆိုဒ် (၃၈၆.၈၀ppm) တို့သည် သက်ဆိုင်ရာ လမ်းညွှန်ချက်တန်ဖိုးအတွင်းရှိကြောင်း လေ့လာတွေ့ရှိရပါသည်။ လေထုအတွင်း အမှုန်ပါဝင်မှု လေ့လာခြင်းရလဒ်များအရ PM_{10} (၁၇.၉၇μg/m^3) နှင့် $PM_{2.5}$ (၆.၆၃μg/m^3) တို့သည်လဲ အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာအရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်တန်ဖိုးရှိကြောင်း လေ့လာတွေ့ရှိရပါသည်။ ထို့ကြောင့် စီမံကိန်းပတ်ဝန်းကျင်လေထု အရည်အသွေးသည် စီမံကိန်း

စတင်ဆောက်လုပ်နေသည့် အချိန်တွင် ကောင်းမွန်လျက်ရှိကြောင်း တွေ့ရှိရပါသည်။ ရေအရည်အသွေး တိုင်းတာရန် စီမံကိန်းဧရိယာအတွင်းရှိ အဝီစိတွင်းမှရေနမူနာ ကောက်ယူခြင်းနည်းလမ်းဖြင့် တိုင်းတာခဲ့ပါသည်။ ရေအရည်အသွေး တိုင်းတာမှု ရလဒ်များအရ တိုင်းတာသော သက်မှတ်ချက်များသည် ကမ္ဘာ့ကျန်းမာရေးအဖွဲ့အစည်း၏ လမ်းညွှန်ချက် တန်ဖိုးများ အတွင်းတွင်ရှိပါသည်။ ဆူညံသံပမာဏ တိုင်းတာမှုအား စီမံကိန်းဧရိယာအတွင်း (ဆူညံသံထွက်ပေါ်သည့် နေရာ) နှင့် စီမံကိန်းဧရိယာပြင်ပ (ဆူညံသံခံစားရမည့်နေရာ) တို့တွင်တိုင်းတာခဲ့ပြီး စီမံကိန်းဧရိယာအတွင်း (ဆူညံသံထွက်ပေါ်သည့်နေရာ) တွင် နေ့အချိန်တိုင်တာရရှိမှုရလဒ် (၆၆.၀၇dBA) နှင့် ညအချိန် တိုင်းတာမှုရလဒ် (၃၉.၈၅dBA) တို့သည် လမ်းညွှန်ချက်တန်ဖိုးများအတွင်း ရှိကြောင်းလေ့လာ တွေ့ရှိရပါသည်။ စီမံကိန်းဧရိယာပြင်ပ (ဆူညံသံခံစားရမည့်နေရာ) တွင် နေ့အချိန် တိုင်းတာရရှိမှုရလဒ် (၆၃.၆၃dBA) နှင့် ညအချိန် တိုင်းတာရရှိမှုရလဒ် (၄၅.၅၂dBA) သည်လည်းလမ်းညွှန် ချက်တန်ဖိုးများအတွင်း ရှိကြောင်း လေ့လာတွေ့ရှိပါသည်။ ထို့ကြောင့်စီမံကိန်းပတ်ဝန်းကျင်ရှိ ဆူညံသံပမာဏသည် စီမံကိန်းစတင် ဆောက်လုပ်နေသည့်အချိန်တွင် အမျိုးသားပတ်ဝန်းကျင် ဆိုင်ရာအရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန် ချက်များအတွင်း ရှိကြောင်းတွေ့ရှိရပါသည်။ စီမံကိန်းတည်ဆောက်ခြင်းကာလတွင် တည်ဆောက်ရေး လုပ်ငန်းများကြောင့် စီမံကိန်း၏ပတ်ဝန်းကျင်လေထုအရည်အသွေး လျော့နည်းလာနိုင်ကြောင်းနှင့် ဆူညံသံ ပမာဏ မြင့်တက်လာနိုင်ကြောင်းတွေ့ရှိရပါသည်။ ထို့ပြင်ယခင်လေ့လာပြီးသော အချက်အလက်များ ဖြစ်သည့် ရာသီဥတု၊ စီမံခန့်ခွဲမှု၊ လူမှုစီးပွားရေး၊ မြေအသုံးချမှုနှင့် အခြားသောအချက်အလက်များကို **အခန်း (၆)** တွင် အသေးစိတ် ဖော်ပြထားပါသည်။

စီမံကိန်းတည်ဆောက်ခြင်းနှင့် လုပ်ငန်းလည်ပတ်ခြင်းတို့ကြောင့် ပတ်ဝန်းကျင်ဆိုင်ရာအရင်းအမြစ်များ၊ ဂေဟစနစ်များ၊ လူသားများနှင့် စွန့်ပစ်ပစ္စည်းစွန့်ပစ်မှုတို့အပေါ် ထိခိုက်နိုင်သော ဖြစ်နိုင်ခြေရှိသည့်သက်ရောက်မှုများအားခွဲခြားခဲ့ပြီး ထိုသက်ရောက်မှုများအား International Association for Impact Assessment (IAIA) ၏ သက်ရောက်ခြင်းနည်းလမ်းများကို အသုံးပြု၍ဆန်းစစ်ခဲ့သည်။ သက်ရောက်မှုများ ဆန်းစစ်လေ့လာရာတွင် အဆိုပြုစီမံကိန်းအတွက် တည်ဆောက်ခြင်းကာလနှင့် လုပ်ငန်းလည်ပတ်သည့် ကာလဟု ကာလ (၂) ခု ခွဲခြားလေ့လာခဲ့ပါသည်။ စီမံကိန်းပိတ်သိမ်းခြင်းကာလသည် ယခုအစီရင်ခံစာတွင် မပါဝင်သော်လည်း စီမံကိန်းပိုင်ရှင်အနေဖြင့် စီမံကိန်းပိတ်သိမ်းခြင်းမပြုမီ စီမံကိန်းပိတ်သိမ်းခြင်းအစီအစဉ် အား ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဌာနသို့ ကြိုတင်တင်ပြရမည်ဖြစ်ကြောင်းကို တတိယအဖွဲ့အစည်း အနေဖြင့် အကြံပြုဆွေးနွေးထားပါသည်။

တည်ဆောက်ခြင်းကာလ တွင် ဓာတ်အားဖြန့်ဖြူးရန်နေရာနှင့် ဘက်စုံသုံးအဆောက်အဦး တည်ဆောက် ခြင်း၊ ဆိုလာပြားများ၊ ဆိုလာပြားတပ်ဆင်ရန်ထောက်တိုင်များ၊ string inverter များ၊ box-type transformer များတပ်ဆင်ခြင်း၊ ရွှေကျင်ဓာတ်အားခွဲရုံသို့ လျှပ်စစ်ဓာတ်အားဖြန့်ဖြူးရန် ကောင်းကင်ဓာတ်အားလိုင်း တာဝါတိုင်များဆောက်လုပ်ခြင်းနှင့် ဓာတ်အားလိုင်းသွယ်တန်းခြင်းတို့ပါဝင် သည်။ တည်ဆောက်ခြင်းကာလ

မှာ ၈ လ ဖြစ်ပါသည်။

လုပ်ငန်းလည်ပတ်သည့်ကာလ တွင် နေရောင်ခြည်မှ လျှပ်စစ်ဓာတ်အားထုတ်လုပ်ပြီး ရွှေကျင်ဓာတ်အားခွဲရုံသို့ ၂၃၀ကေဗွီ ကောင်းကင်ဓာတ်အားလိုင်းဖြင့်လျှပ်စစ်ဓာတ်အားဖြန့်ဖြူးခြင်းတို့ပါဝင်ပြီး လုပ်ငန်းလည်ပတ်မည့်ကာလ မှာ နှစ် ၂၀ ဖြစ်ပါသည်။

နေရောင်ခြည်စွမ်းအင်ထုတ်လုပ်သော အဆောက်အဦးများ တည်ဆောက်ခြင်းကာလတွင် မြေဆီလွှာအရည်အသွေးအပေါ်သက်ရောက်မှု၊ လုပ်ငန်းခွင်ဘေးအန္တရာယ်ကင်းရှင်းရေးနှင့် လုံခြုံရေး၊ ပတ်ဝန်းကျင်ဘေးအန္တရာယ်ကင်းရှင်းရေးနှင့် လုံခြုံရေး၊ အစိုင်အခဲစွန့်ပစ်ပစ္စည်းစွန့်ပစ်ခြင်းနှင့် အန္တရာယ်ရှိသောစွန့်ပစ်ပစ္စည်းစွန့်ပစ်ခြင်းတို့တွင် **အလယ်အလတ်သက်ရောက်မှု** ဟုတွေ့ရှိရပါသည်။ လေအရည်အသွေး၊ ဆူညံသံနှင့် တုန်ခါမှုများ၊ မီးဘေးအန္တရာယ်နှင့် စွန့်ပစ်ရေစွန့်ပစ်ခြင်းများတွင် **နည်းပါးသောသက်ရောက်မှု** ဟုတွေ့ရှိရပါသည်။

လုပ်ငန်းလည်ပတ်သည့်ကာလတွင် လုပ်ငန်းခွင်ဘေးအန္တရာယ်ကင်းရှင်းရေးနှင့် လုံခြုံရေးသည် **မြင့်သည့်သက်ရောက်မှု** ဟုတွေ့ရှိရပါသည်။ ရေအရည်အသွေး၊ ပတ်ဝန်းကျင်ဘေးအန္တရာယ် ကင်းရှင်းရေးနှင့် လုံခြုံရေး၊ မီးဘေးအန္တရာယ်၊ စွန့်ပစ်ရေစွန့်ပစ်ခြင်းနှင့် အန္တရာယ်ရှိသောစွန့်ပစ် ပစ္စည်းစွန့်ပစ်ခြင်းတို့တွင် **အလယ်အလတ်သက်ရောက်မှု** ဟုတွေ့ရှိရပါသည်။ အခြားသက်ရောက် မှုများဖြစ်သော ရေအရည်အသွေး၊ မြေဆီလွှာအရည်အသွေး၊ ဆူညံသံနှင့် တုန်ခါမှု၊ အစိုင်အခဲ စွန့်ပစ်ပစ္စည်းစွန့်ပစ်ခြင်းတို့သည် **နည်းပါးသော သက်ရောက်မှု** ဟုတွေ့ရှိရပါသည်။

ကောင်းကင်ဓာတ်အားလိုင်း **တည်ဆောက်ခြင်းကာလ** တွင် လေအရည်အသွေး၊ ရေအရည်အသွေး၊ ဆူညံသံနှင့် တုန်ခါမှု၊ လုပ်ငန်းခွင် ဘေးအန္တရာယ်ကင်းရှင်းရေးနှင့် လုံခြုံရေး၊ အစိုင်အခဲစွန့်ပစ် ပစ္စည်းစွန့်ပစ်ခြင်း၊ စွန့်ပစ်ရေစွန့်ပစ်ခြင်းများတွင် **နည်းပါးသောသက်ရောက်မှု** ဟု တွေ့ရှိရပါသည်။

လုပ်ငန်းလည်ပတ်သည့်ကာလတွင် လေအရည်အသွေး၊ ဆူညံသံနှင့် တုန်ခါမှု၊ မီးဘေးအန္တရာယ် တို့သည် နည်းပါးသောသက်ရောက်မှုနှင့် မြေဆီလွှာအရည်အသွေး အပေါ်သက်ရောက်မှုကို **အလွန်နည်းပါးသော သက်ရောက်မှု** ဟု တွေ့ရှိရပါသည်။

ဆိုးကျိုးသက်ရောက်မှုများအား သက်ရောက်မှုလျော့ချရန်အတွက် လျော့ချရန်နည်းလမ်းများသည် အရေးကြီးပါသည်။ ထိုလျော့ချရန်နည်းလမ်းများအား ဆောင်ရွက်ရန်လိုအပ်သော ဆောင်ရွက်ချက်များနှင့် နည်းပညာများအား သက် ရောက်မှုအမျိုးအစားပေါ် မူတည်၍ဖော်ပြထားပါသည်။ အဆိုပြုစီမံကိန်းသည် အလုပ်အကိုင်အခွင့်အလမ်းများဖန်တီးပေးနိုင်ခြင်း၊ စီးပွားရေးအခွင့်အလမ်းများဖန်တီးပေးနိုင်ခြင်း၊ အခွန် ငွေရရှိနိုင်ခြင်း၊ လူမှုစီးပွားတာဝန်ယူမှုအစီအစဉ်များကြောင့် ဒေသတွင်းဖွံ့ဖြိုးတိုးတက်လာနိုင်ခြင်း၊ ကာဗွန် ထုတ်လွှတ်မှုလျော့ချခြင်း၊ သယံဇာတများထိန်းသိမ်းခြင်းနှင့် ပတ်ဝန်းကျင်နှင့် လိုက်လျောညီထွေသော

စီးပွားရေးများအစပြုနိုင်ခြင်းစသည့် ကောင်းကျိုးသက်ရောက်မှုများ လည်းရရှိနိုင်ပါသည်။

လျှော့ချရန်နည်းလမ်းများနှင့် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်များအား အကောင်အထည်ဖော် ဆောင်ရွက်ရာတွင် လိုအပ်သောအခြေခံလိုအပ်ချက်များနှင့် တာဝန်ရှိသူများအား ဤအစီရင်ခံစာ တွင်ဖော်ပြထားပါသည်။ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်အား သက်ရောက်မှုများလေ့လာဆန်းစစ်ချက်များနှင့် သက်ရောက်မှုအဆင့်များကိုအခြေခံ၍ စီမံကိန်း၏တည်ဆောက်ခြင်းကာလနှင့် လုပ်ငန်းလည်ပတ်သည့် ကာလတို့အတွက် ကျန်းမာရေးနှင့် ဘေးအန္တရာယ်ကင်းရှင်းရေးမူဘောင်များနှင့် ရေးဆွဲထားခြင်းဖြစ်သည်။ စီမံကိန်းအကောင်အထည်ဖော်သူသည် အဆိုပြုစီမံကိန်းအား အောက်ဖော်ပြပါအစီအစဉ်များပါဝင်သော ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်နှင့်အညီ အကောင်အထည်ဖော်ဆောင်ရွက်ရမည်။

- ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်
- ပတ်ဝန်းကျင်စောင့်ကြပ်ကြည့်ရှုမှုအစီအစဉ်
- လူမှုစီးပွားတာဝန်ယူမှုအစီအစဉ်
- မီးဘေးအန္တရာယ်ကာကွယ်ရေးအစီအစဉ်
- အရေးပေါ်ကိစ္စများအတွက်တုံ့ပြန်ရေးနှင့် ကြိုတင်ပြင်ဆင်ရေးအစီအစဉ်
- မကျေလည်မှုများကို ဖြေရှင်းပေးမည့်အစီအစဉ်

ထို့အပြင် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်နှင့် ပတ်ဝန်းကျင်စောင့်ကြပ်ကြည့်ရှုမှုအစီအစဉ်များ ဆောင်ရွက်ရန်ခန့်မှန်းကုန်ကျစရိတ်များကိုလည်း ထည့်သွင်းဖော်ပြထားပါသည်။ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအစဉ် သည် စီမံကိန်း၏မကောင်းသောသက်ရောက်မှုများ၊ သက်ရောက်မှုရင်းမြစ်များ၊ လျှော့ချရန်နည်းလမ်းများ၊ ကျန်ရှိသောသက်ရောက်မှုများနှင့် တာဝန်ယူဆောင်ရွက်မည့်ပုဂ္ဂိုလ်တို့အား တည်ဆောက်ခြင်းကာလနှင့် လုပ်ငန်းလည်ပတ်သည့်ကာလတို့အတွက် ဖော်ပြထားခြင်းဖြစ်သည်။ ပတ်ဝန်းကျင်စောင့်ကြပ်ကြည့်ရှုမှုအစီအစဉ်သည် လေနှင့် ရေအရည်အသွေး၊ ဆူညံသံပမာဏနှင့် ပတ်ဝန်းကျင်ဆိုင်ရာစစ်ဆေးခြင်းများအား စောင့်ကြပ်ကြည့်ရှုရန်အမျိုးအစား၊ အကြိမ်အရေအတွက်နှင့် တာဝန်ယူဆောင်ရွက်ရမည့် ပုဂ္ဂိုလ်တို့အား ဖော်ပြထား ခြင်းဖြစ်သည်။ လူမှုစီးပွားတာဝန်ယူမှုအစီအစဉ်သည် ဒေသခံပြည်သူများအတွက် ဖွံ့ဖြိုးရေးလုပ်ငန်းများ ဆောင်ရွက်ပေးရန်နှင့် အဆိုပြုစီမံကိန်းသည် စီမံကိန်းအကောင်အထည် ဖော်သူသာမက ဒေသခံပြည်သူများ ကိုလည်း အကျိုးပြုနိုင်ကြောင်း ဖော်ပြရန်ဖြစ်သည်။ မီးဘေးအန္တရာယ်ကာကွယ်ရေး အစီအစဉ်သည် အဆိုပြု စီမံကိန်း၏တွင် မီးဘေးအန္တရာယ် လျှော့ချနိုင်ရန်ဖော်ပြထားခြင်းဖြစ်သည်။ အရေးပေါ်ကိစ္စများ တုံ့ပြန်ရေးနှင့် ကြိုတင်ပြင်ဆင်ရေးအစီအစဉ်သည် အရေးပေါ်ကိစ္စရပ်များဖြစ်ပေါ်ပါက မည်သို့ ဆောင်ရွက်ရမည်ကို ဖော်ပြထားခြင်းဖြစ်သည်။ မကျေလည်မှုများကိုဖြေရှင်းပေးမည့်အစီအစဉ်သည် အဆိုပြုစီမံကိန်းနှင့် ပတ် သက်သော မကျေလည်မှုများကို မည်သို့ဖြေရှင်းပေးရမည်ကို ဖော်ပြထားခြင်းဖြစ်သည်။

ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီရင်ခံစာပြင်ဆင်ရေးဆွဲရာတွင် စီမံကိန်းအကြောင်းအရာများကို ရှင်းလင်းတင်ပြခြင်းသည်အရေးကြီးပြီး သက်ဆိုင်သူများ၏ အကြံဉာဏ်နှင့် အမြင်များကို အစီရင် ခံစာတွင်ထည့်သွင်းစဉ်းစားရေးဆွဲရမည်ဖြစ်သည်။ ထို့ကြောင့် အဆိုပြုစီမံကိန်းအတွက် အများပြည်သူ သဘောထားရယူခြင်း အခမ်းအနားကို ၂၀၂၂ ခုနှစ်၊ ဇွန်လ (၂) ရက်နေ့တွင် အင်္ဂနီကျေးရွာအုပ်စု၊ ရွှေကျင်မြို့နယ်ရှိ စီမံကိန်း ဧရိယာအတွင်း၌ ကျင်းပခဲ့ပါသည်။ အခမ်းအနားကို နေ့လယ် ၂ နာရီခန့်တွင် စတင်ပြီး ၃ နာရီခန့် တွင် ပြီးစီးခဲ့ပါသည်။ အများပြည်သူသဘောထားရယူခြင်းအခမ်းအနား၏ ရည်ရွယ်ချက်မှာ စီမံကိန်းအကြောင်း အရာများ၊ စီမံကိန်းကြောင့်ဖြစ်ပေါ်လာနိုင်သောသက်ရောက်မှုများ၊ လျော့ချရန်နည်းလမ်းများ ဖော်ပြရန်နှင့် ဒေသခံပြည်သူများ၏အကြံဉာဏ်နှင့် သုံးသပ်ချက်များ ရယူရန်ဖြစ်ပါသည်။ စီမံကိန်းအကောင်အထည် ဖော်သူသည် အခမ်းအနားသို့တက်ရောက်ရန် ဒေသခံ ပြည်သူများအား ကျေးရွာအုပ်ချုပ်ရေး အဖွဲ့မှတစ်ဆင့် ဖိတ်ကြားခဲ့ပါသည်။ အခမ်းအနားအား ကိုဗစ်-၁၉ ရောဂါဖြစ်ပွားနေစဉ်ကာလအတွင်း ကျင်းပခဲ့ခြင်းကြောင့် တက်ရောက်သူအရည်အတွက်၊ နေရာနှင့် လူစုဝေးရန်လမ်းညွှန်ချက်များကဲ့သို့သော အခက်အခဲအချို့ရှိခဲ့ပါ သည်။ အင်္ဂနီကျေးရွာအုပ်စုမှ ဒေသခံပြည်သူများ၊ စီမံကိန်းအကောင်အထည်ဖော်သူ၏ ကိုယ်စားလှယ်များ နှင့် E Guard Environmental Services Co., Ltd မှ ပညာရှင်အဖွဲ့တက်ရောက်ခဲ့ပြီး တက်ရောက်သူ စုစုပေါင်း ၂၈ ဦး ရှိပါသည်။ စီမံကိန်းဆိုင်ရာ အချက်အလက်များနှင့် ဤပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီရင်ခံစာ ကို အဆိုပြုစီမံကိန်း၊ E Guard Environmental Services Co., Ltd ၏ရုံးနှင့် အောက်ပါ website link https://tinyurl.com/solar-shwekyin တို့တွင် အများပြည်သူနှင့် စီမံကိန်းနှင့် သက်ဆိုင်သူများဖတ်ရှု လေ့လာနိုင်ရန်ဖော်ပြထားပါသည်။

နိဂုံးချုပ်အားဖြင့် အဆိုပြုစီမံကိန်းသည် အလုပ်အကိုင်အခွင့်အလမ်းများဖန်တီးပေးနိုင်ခြင်း၊ စီးပွားရေး အခွင့်အလမ်းများဖန်တီးပေးနိုင်ခြင်း၊ အခွန်ငွေရရှိနိုင်ခြင်း၊ လူမှုစီးပွားတာဝန်ယူမှု အစီအစဉ်များကြောင့် ဒေသတွင်းဖွံ့ဖြိုးတိုးတက်လာနိုင်ခြင်း၊ ကာဗွန်ထုတ်လွှတ်မှုလျော့ချခြင်း၊ သယံဇာတများထိန်းသိမ်းခြင်းနှင့် ပတ်ဝန်းကျင်နှင့် လိုက်လျောညီထွေသောစီးပွားရေးများအစပြုနိုင်ခြင်းစသည့် ကောင်းကျိုးသက်ရောက်မှု များကို ဖြစ်ပေါ်စေနိုင်ပါသည်။ တည်ဆောက်ခြင်းကာလနှင့် လုပ်ငန်းလည်ပတ်သည့်ကာလတို့တွင် ဖြစ်ပေါ် နိုင်သော ဆိုးကျိုးသက်ရောက်ရောက်မှုများကိုလည်း လျော့ချရန်နည်းလမ်းများနှင့် ပတ်ဝန်းကျင် စီမံခန့်ခွဲမှု အစီအစဉ်များကို အသုံးပြု၍လျော့ချနိုင်ပါသည်။ ပတ်ဝန်းကျင်စောင့်ကြပ်ကြည့်ရှုမှုအစီအစဉ်အား စီမံကိန်း ပတ်ဝန်းကျင်အရည်အသွေးများအား စောင့်ကြပ်ကြည့်ရှုရန် အကောင်အထည်ဖော်ဆောင်ရွက်ရမည်။ စီမံကိန်းအကောင်အထည်ဖော်သူသည် ဤအစီရင်ခံစာအား ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာနမှ စိစစ် သုံးသပ်ပြီးပါက ပေးပို့လာမည့်သဘောထားမှတ်ချက်များနှင့် အကြံပြုချက်များကိုလိုက်နာရမည်။ ဤ အစီရင်ခံစာကိုသက်ဆိုင်ရာမှ အတည်ပြုပြီးပါက စီမံကိန်းအကောင်အထည်ဖော်သူမှ ပတ်ဝန်းကျင်စီမံ ခန့်ခွဲမှုအစီအစဉ်များအား အကောင်အထည်ဖော်ဆောင်ရွက်ခြင်းသည် စီမံကိန်းအားပတ်ဝန်းကျင်အပေါ် ထိခိုက်မှုအနည်းဆုံး ဖြစ်စေရန်လည်ပတ်ခြင်းအတွက် အလွန်အရေးပါသည်။ စီမံကိန်း အကောင်အထည် ဖော်သူသည် ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်၏ ပတ်ဝန်းကျင်ဆိုင်ရာတည်ဆဲဥပဒေ၊ နည်းဥပဒေ၊

မူဝါဒများနှင့် လမ်းညွှန်ချက်များကို စီမံကိန်းလည်ပတ်စဉ်ကာလတစ်လျှောက်လုံး လိုက်နာဆောင်ရွက်ရမည်ဖြစ်ပါသည်။

CHAPTER 1 - EXECITIVE SUMMARY

This Environmental Management Plan (EMP) report is prepared for 40MW ground mounted solar power plant connected to Shwekyin Substation, prepared by Myanmar Shwekyin Solar Power Company Limited, under the consortium of ITS Holding (China) International Co., Ltd. The project proponent won the tender form Ministry of Electricity and Energy and obtained permit for construction and electricity generation from solar energy of the proposed project. According to the instruction from Environmental Conservation Department (ECD), this proposed project requires to submit Environmental Management Plan (EMP) report and E Guard Environmental Services Co., Ltd. prepared EMP report and carried out environmental studies for the proposed project. In this EMP, a study was made to cover construction of solar power plant and overhead transmission line as well as operation of solar power plant to generate electricity from solar energy and distribute to the Shwekyin Substation with 230kV overhead transmission line. The scope of the study area for the proposed project is roughly defined to the area within 1km radius from the center of the project and for the study area of 230kV overhead transmission line is 200m along the route and this area will be enough to cover for most environmental and socio-economic impacts of the project.

The proposed project is located at Ingani Village Tract, Shwekyin Township, Bago District, Bago Region, Myanmar. Project is situated between 18°0'43.50"N and 96°52'13.09"E and average altitude is about 30m. The construction of the proposed project includes box transformer foundation, supporting bracket and foundation of solar power station, multiple-use building and outdoor equipment foundation construction as well as construction and stringing of 230kV overhead transmission line. The project proponent has acquired the land slot to construct the 40MW ground mounted solar power plant and total land requirement for the project is 164acres (66hectares). The photovoltaic power station is connected to the Shwekyin Substation with 230kV transmission line. The construction phase of the project will take six months.

The proposed project is developed by Myanmar Shwekyin Solar Power Company Limited, under the consortium of ITS Holding (China) International Co., Ltd. After construction period, proposed project will generate electricity from solar energy and distribute to the Shwekyin Substation with 230kV overhead transmission line and proposed operation period is 20 years. List of directors and organizational structure of respective project proponent, organizational structure and detail investment plan of the proposed project are also described.

The responsible persons of the study team for this EMP report preparation are described in **Chapter 4.**

National Laws and Regulations for environmental protection applicable for construction and operation of proposed project are comply and presented.

Primary and secondary data collections are very important to access environmental impacts. Primary data collection for environmental quality monitoring plays an important role for environmental studies. Therefore, E Guard Environmental Services conducted air quality, water quality and noise level measurements project location on 1st to 2nd June, 2022 (24hrs monitoring system). The observed values are compared with National Emissions Quality (Emission) Guidelines and other related guideline values. According to the comparison results of gaseous emission, the observed values of SO_2 is 0.031µg/m^3, NO_2 is 36.40µg/m^3, CO is 0.011ppm, CO_2 is 386.00ppm are lower than the respective guideline values. For dust emission, the observed values of PM_{10} are 17.97µg/m^3 and $PM_{2.5}$ is 6.63µg/m^3 are also within the guideline values of NEQEG. Therefore, it can be considered that the ambient air quality of the proposed project is quite good before the implementation of the project. The project did not start construction and wells are not dug yet at the time of water quality measurement. Therefore, E Guard Survey Team choose one well in the construction site for collecting groundwater. For groundwater quality, most of the parameter measured are within the WHO guideline value for drinking water. For noise level, monitoring was done at two points; at project site (source) and near the project site (receptor), results at source are lower than standard value not only at day time (66.07dBA) but also night time (39.85dBA). With regards to noise level at receptor, the results are lower than standard value not only at day time (63.63dBA) but also at night time 45.51dBA). Therefore, it can be considered that the noise level at the proposed project is within the guideline value of NEQEG before the implementation of the project. It is anticipated that ambient air quality will be decreased and noise level will be increased during the construction phase of the proposed project because of construction activities. In addition, secondary data like climate, administrative structure, socio-economic, land use and other secondary data are described in this report.

Potential impacts, such as impacts on environmental resources, ecological resources, human and waste disposal due to construction and operation processes were identified and their significance was assessed by using International Association of Impact Assessment (IAIA)'s impact assessment methodology. Potential impacts for the proposed projects are differentiated into two main phases as **Construction Phase** and **Operation Phase**. **Decommissioning Phase** is not included in this report but third party suggested that project proponent shall need to submit the decommissioning plan before project is termination.

Construction Phase: includes construction of switchyard and multiple-use building, installation of PV modules, tracking brackets, inverters, transformers, poles of overhead transmission line and stringing cables of overhead transmission line, which will connect to the Shwekyin Substation. The construction period of the proposed project is 6 months.

Operation Phase: includes generating electricity from solar energy and distributing to the Shwekyin Substation through 230kV overhead transmission line. The proposed operation period of the proposed project is 20 years.

During **Construction Phase** ground mounted solar power plant, impacts on soil, occupational health and safety, community health and safety, solid waste generation and hazardous waste generation can be found as **Moderate Impacts**. Impacts on air, noise and vibration, fire hazard and liquid waste generation can be found as **Low Impacts**. During **Operation Phase**, the impact on occupational health and safety can be categorized as **High Impact**. Impacts on water, community health and safety, fire hazard, liquid waste and hazardous generation can be found as **Moderate Impacts**. Other impacts such as air, soil, noise and vibration and solid waste generation are categorized as **Low Impacts**.

For **Construction and Operation Phase** of the overhead transmission line, impacts on soil, occupational health and safety and community health and safety are categorized as **Moderate Impacts**. For **Construction Phase**, impacts such as air, water, noise and vibration, occupational health and safety, community health and safety, solid waste generation, liquid waste generation can be found as **Low Impacts**. For **Operation Phase**, air, noise and vibration and fire hazard are as **Low Impacts** and, water and soil are as **Very Low Impacts**.

Mitigation measures are important to minimize and reduce these potential negative impacts. They are also described requirements of impacts mitigation tasks and technologies according to the types of impacts scales. However, the proposed project can ensure some positive impacts such as providing job opportunities, business opportunities, revenue to government, CSR development, carbon emission reduction, resources conservation and green economy.

Institutional requirements and responsible persons for implementing mitigation measures and EMP are also described in this report. The Environmental Management Plan (EMP) was prepared based on findings of impacts and its significance and designed with the framework of health and safety for all two phases; construction phase and operation phase of the proposed project. The project proponent must manage the development of the proposed project by implementing the EMP, which is composed of five parts as follows:

- Environmental Management Plan
- Environmental Monitoring Plan
- Corporate Social Responsibility (CSR) Plan
- Firefighting Plan
- Emergency Response and Preparedness Plan and
- Grievance Redress Mechanism

Moreover, cost estimation for EMP and EMoP were also described in this report. The **Environmental Management Plan (EMP)** identifies potential negative environmental impacts, source of impacts, how to mitigate these impacts and residual impacts after mitigation and responsible persons for construction and operation phases. The **Environmental Monitoring Plan (EMoP)** identifies parameters, frequency and responsible persons to monitor for air quality, water quality, noise level and environmental auditing. The **Corporate Social**

Responsibility (CSR) Plan aims to create social welfare for local community and to prove that the implementation of the proposed project is beneficial for not only the project proponent but also for the local community. The **Firefighting Plan** aims to protect fire hazards of the proposed project. The **Emergency Preparedness and Response Plan** identify how to overcome emergency cases effectively. The **Grievance Redress Mechanism (GRM)** identifies the steps to solve complaints related with the proposed project.

It is important to disclose the information about the project during the preparation of EMP report and the opinions of all stakeholders should be considered in the finalization of the EMP report. So, public consultation meeting for the proposed project was held on 2nd June, 2022 at Project Site, Ingani Village, Ingani Village Tract, Shwekyin Township. The staring time was 02:00PM and finished at 03:00PM. The objective of the meeting is to disclose information of the project, potential impacts of project activities and mitigation measures and to receive public recommendations and feedbacks for the proposed project. The project proponent invited local people by negotiating with village administrators. As the public consultation meeting was held during COVID-19 Pandemic Period, there were some limitations related to number of attendees, venue and social distancing. Totally, 28 persons including local people from Ingani Village, representatives of project proponent and E Guard Environmental Services attended public consultation meeting and some attendees discussed with regards to the project. The project information and this Environmental Management Plan (EMP) report can be accessible via following link https://tinyurl.com/solar-shwekyin, at the project site and E Guard Environmental Service Co., Ltd.'s Office for disclosure to public and stakeholders.

In conclusion, the proposed project can ensure some positive impacts such as providing job opportunities, business opportunities, revenue to government, CSR development, carbon emission reduction, resources conservation and green economy. All of the negative impacts during construction and operation phases can be minimized by using mitigation measures and implementing Environmental Management Plan (EMP). Environmental Monitoring Plan (EMoP) must need to implement for monitoring the environmental quality of the proposed project. Finally, the project proponent must follow the comments and suggestions that will be given by ECD after reviewing this EMP report. Once EMP report is approved by concerned authorities, effective implementation of EMP by the project proponent is essential to implement the project environmental soundly. The project proponent shall abide environmental policy, laws, rules and instructions of the Republic of the Union of Myanmar throughout the lifespan of project.

CHAPTER 2 – PROJECT DESCRIPTION

This Environmental Management Plan (EMP) report is for the 40MW Ground Mounted Solar Power Plant Project connected to Shwekyin Substation, which is proposed by Myanmar Shwekyin Solar Power Company Limited. The project proponent, Myanmar Shwekyin Solar Power Company Limited is under the ITS Holding (China) International Co., Ltd. The project proponent won tender from the Ministry of Electricity and Energy with a Tender No. (EPGE PV 02/2021-2022) and obtained permit for construction and electricity generation from solar energy of the proposed project. The proposed project will contribute to fulfill a goal for achieving universal access to electricity by 2030 as per Myanmar National Electrification Plan (NEP). Myanmar has one of the lowest rates of electrification in Southeast Asia; over 61.8% of households in Myanmar have access to electricity and electricity generation projects, especially for electricity generation from renewable energy project are urgently required in Myanmar.

According to the Environmental Conservation Law (2012), it is the requirement of every development project in the country, to submit an Environmental Management Plan (EMP) or Initial Environmental Examination (IEE) or Environmental Impact Assessment (EIA) report to Ministry of Natural Resources and Environmental Conservation (MONREC) depending on the criteria for specific kind of economic activity, which was enacted in the Environmental Impact Assessment Procedure (2015). According to the instructions from Environmental Conservation Department (ECD), this proposed project required to submit Environmental Management Plan (EMP) Report to meet the environmental assessment requirement of the Environmental Policy, Environmental Conservation Law and other environmental related rules and procedures. Therefore, Myanmar Shawekyin Solar Power Company Limited was made a consultation with E Guard Environmental Services Co., Ltd for conducting the environmental studies for the proposed project.

The specific objectives of this study are:

(1) Identify the major impacts that may arise from the activities of the proposed project on natural environment and socio-economic environment of the project area,
(2) Describe the mitigation measures to minimize these impacts,
(3) Prepare and implement Environmental Management Plan and Environmental Monitoring Plan for the proposed project,
(4) Make sure that EMP is developed sufficiently and soundly for the proposed project and
(5) Implement the Corporate Social Responsibility Plan (CSR Plan), which plays an essential part for the improvement of the social welfare of community as well as development of the region.

2.1 Project Size and Location of the Project

The proposed project is located at Ingani Village Tract, Shwekyin Township, Bago District, Bago Region, Myanmar. Project is situated between 18°0'43.50"N and 96°52'13.09"E and average altitude is about 30m. The construction of the proposed project includes box transformer foundation, supporting bracket and foundation of solar power station, multiple-use building and outdoor equipment foundation construction as well as construction and stringing of 230kV overhead transmission line. The photovoltaic power station is connected to the Shwekyin Substation with 230kV transmission line.

Figure 2.1 - Location of the Project

Total land area of solar power plant is 163acres (66hectares) and the annual average total solar radiation in Bago Region is 6,300MJ/m^2-6,700MJ/m^2 and the annual average sunshine hour is over 2300h, therefore, annual total solar radiation level of the project site is rich.

Figure 2.2 – Project Boundary

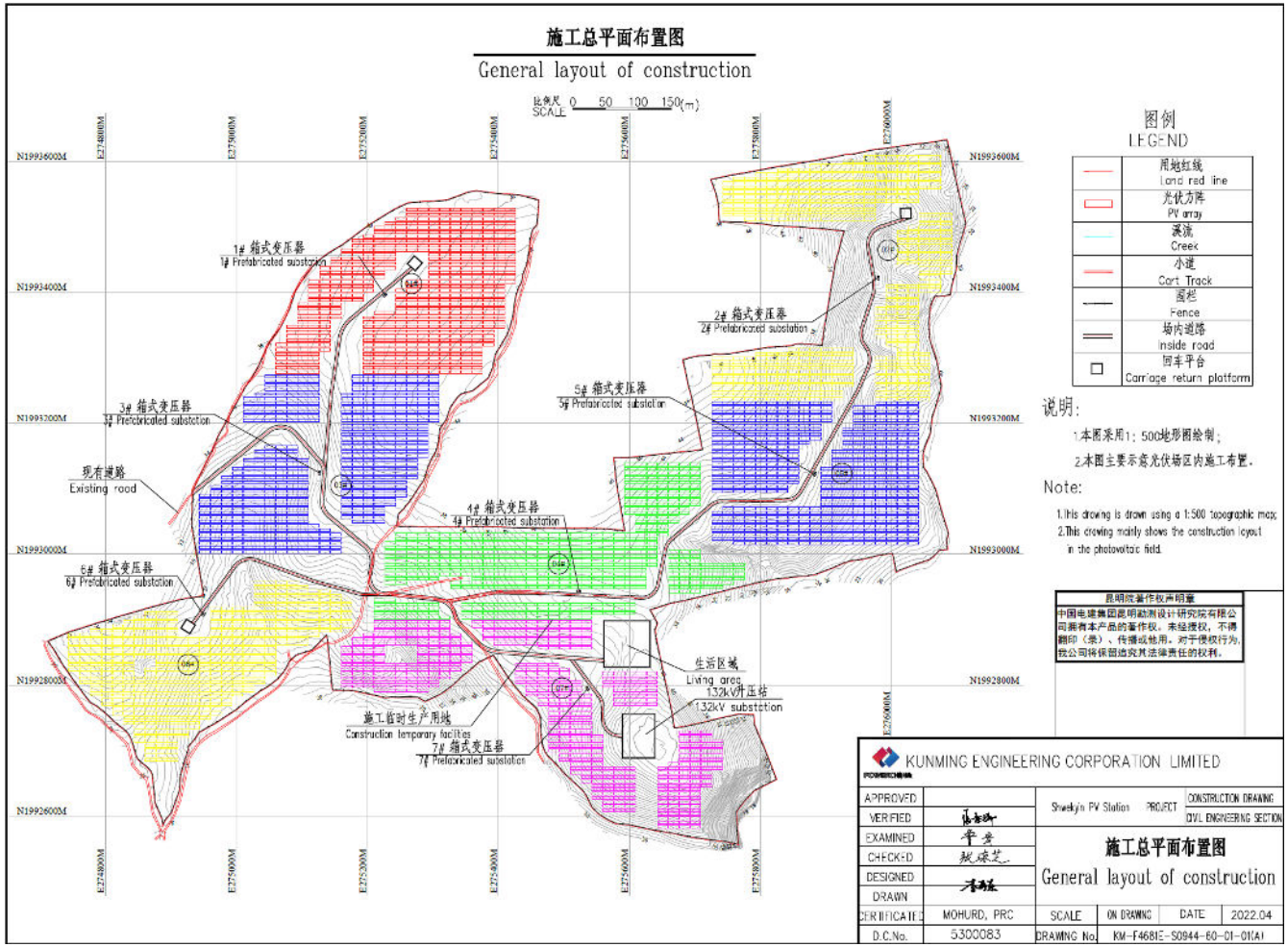


Figure 2.3 – General Layout Plan of the Project

Shwekyin Township is situated between 17°55'N and 18°14'N, 96°44'E and 97°14'E. The total area is about 945 square miles which 22.9 mile east to west and 42.6 miles north to south.

2.2 History of Land

The project proponent has acquired the land slot to construct the 40MW ground mounted solar power plant and total land requirement for the project is 164acres (66hectares). The required land slot was leased by project proponent for the proposed project and the former land is used as Farm Land.

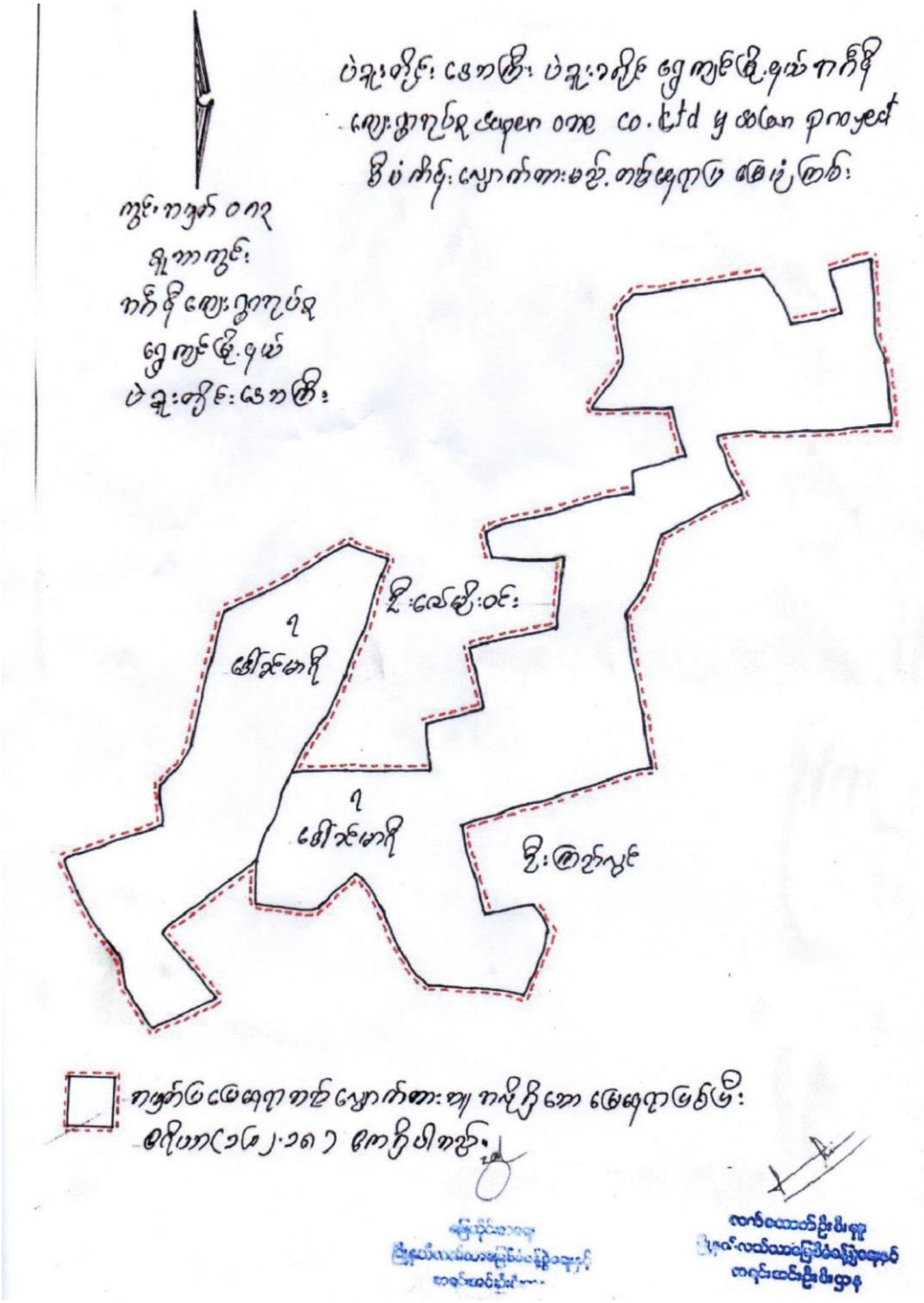


Figure 2.4 – Land Slot Information

2.3 Scope of the Project

The scope of the study for EMP will vary on the scale and type of the development project. In this EMP, a study was made to cover construction of solar power plant and overhead

transmission line as well as operation of solar power plant to generate electricity from solar energy and distribute to the Shwekyin Substation with 230kV overhead transmission line. This EMP is based on consideration of terrestrial and aquatic resources conservation, pollutant abatement on air quality, water quality, soil quality, noise level reduction, safe working environment ensuring for the workers. The site survey and baseline environmental quality measurement were carried out by a study team from E Guard Environmental Services, which has experience in conducting assessment on environmental concerns for various kind of development projects in Myanmar.

Figure 2.5 - Scope of the Project

A study team from E Guard Environmental Services conducted site survey on 1st-3rd June, 2022 for all site-related issues and baseline environmental data were also collected from possible sources of pollution by using appropriate environmental measuring devices. Data interpretation and analysis were based on those collected data for the current and future conditions. In this report, recommended mitigation and monitoring measures were also included to mitigate environmental impacts due to the activities of the proposed project. It is estimated that there will be not much significant impacts on the environmental and socio-economic factors due to implementation of the proposed project during construction, operation and decommissioning phases because the proposed project will utilize renewable energy to generate electricity and distribute to Shwekyin Substation. Therefore, the scope of the study area for the proposed project is not limited to be defined beyond the project area. Within the project area, available secondary information and primary information collected from site survey were used for the consideration of cumulative impacts.

2.4 Project Description

2.4.1 Solar Resource Condition on Site

Myanmar is a country with great potential to develop solar energy by virtue of its superior geographical position and abundant light resources. Myanmar is located in the sub-equatorial region, with abundant solar energy resources and its spatial distribution is mainly large in the middle and low in the periphery.

The annual average total solar radiation in Bago Region is 6,300 MJ/m^2 ~ 6,700 MJ/m^2 and the annual average sunshine hours are over 2300h. The distribution of solar energy resources in Bago Region and its surrounding area is shown in figure.

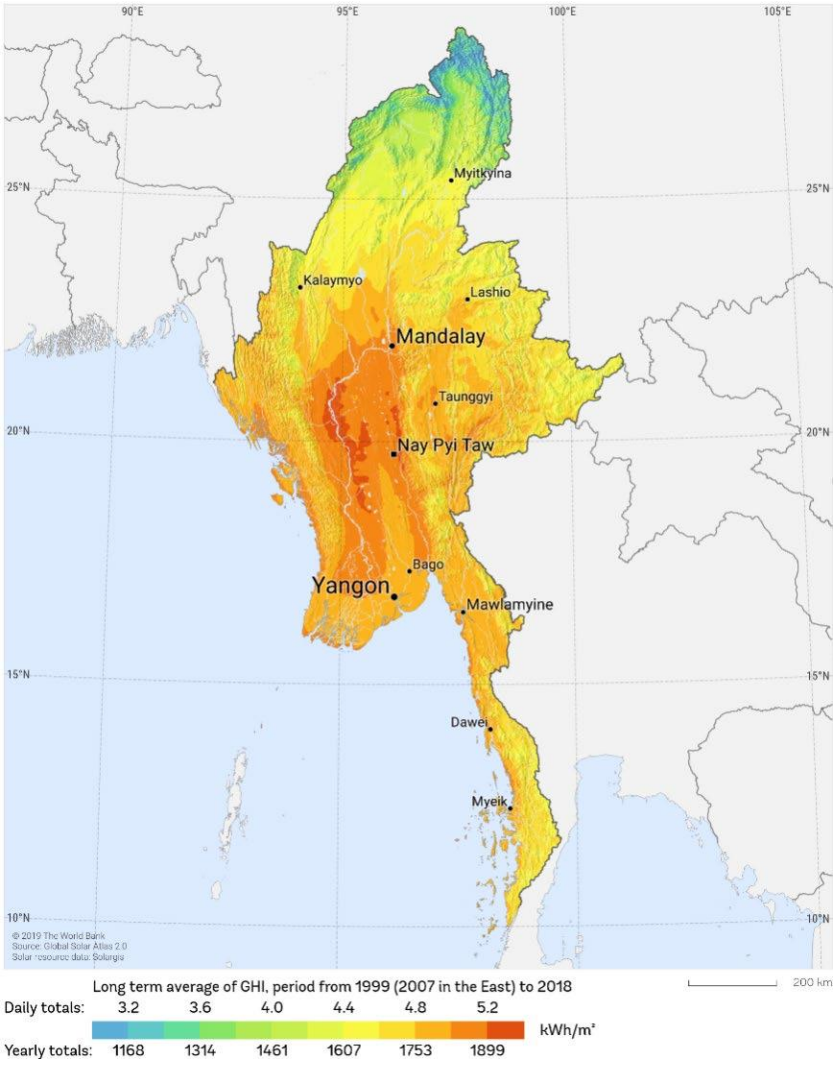


Figure 2.6 - Distribution of solar energy resources in Myanmar

Solar energy resources of Shwekyin PV power station are simulated and analyzed by SolarGIS. The total solar radiation in the horizontal plane of the site is 6,603MJ/m^2, the inclination angle of the fixed bracket is 24 and the corresponding total solar radiation in the inclined plane is 7,090MJ/m^2. Total horizontal solar radiation is shown in figure.

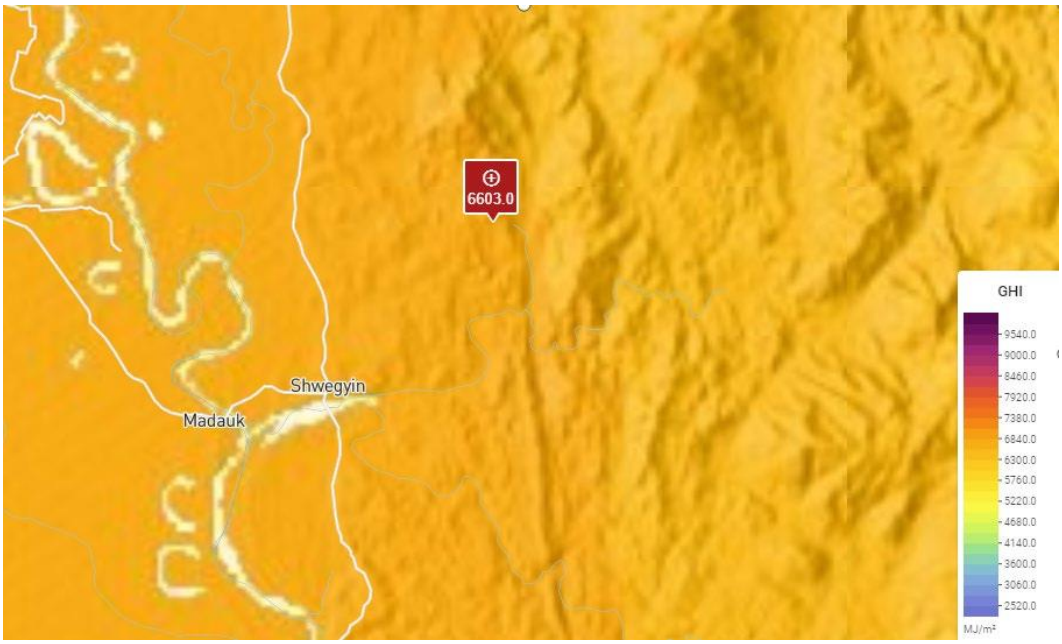


Figure 2.7 - Total solar radiation in the horizontal plane of the site

2.4.2 PV Power Generation System Solutions

2.4.2.1 Design Scheme of PV Power Generation System

The PV power generation of this project adopts monocrystalline silicon PV module for development. It selects 540Wp monocrystalline silicon double-sided PV module. The PV module adopts fixed inclination angle installation mode and the inclination angle of the PV array is 24. The PV sub-array is designed according to the capacity of 6.048MWp. A 5000kVA box transformer and 20 sets of 250kW series inverters are adopted, each inverter is connected with 20 PV strings and each PV strings is connected with 28 PV modules. The output electric energy is boosted to 33kV by the box transformer and then sent to booster station. The box transformer is arranged in the middle of the array near the road. In this project, eight PV sub-arrays of 6.048MWp are arranged and a total of 89,600 monocrystalline silicon double-sided PV modules with a capacity of 540Wp are adopted. The installed capacity of PV power generation project is 48.384MWp and the installed capacity of AC side is 40MWac.

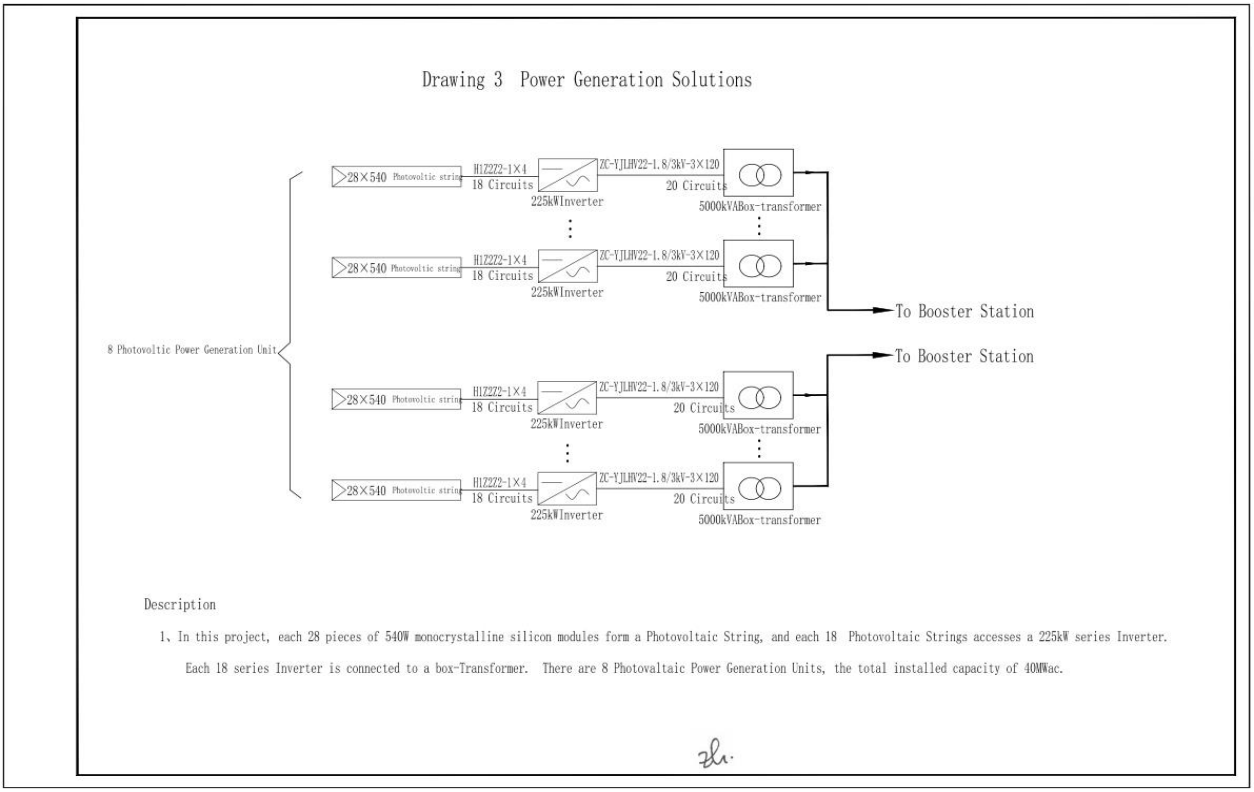


Figure 2.8 – Power Generation Solution

The system efficiency of this PV power generation project is considered as 81.5%. The power generation gain of the back of the double-sided module is 4.5% and the double-sided module attenuates by 2% in the first year and then by 0.45% every year. The annual total solar radiation of the project site is 6,603.0MJ/m^2. After calculation, the average on-grid power of this project in the 20-year operation period is 76,064MW-h and the average annual equivalent utilization hours are 1,572h.

2.5 Electrical Design

2.5.1 Access System Scheme

The scale of this project is 40MWac and a 230kV booster station will be built in the middle of the PV field. After the booster station collects the power of PV power generation project, the booster station will be connected to the 230kV side of the Shwekyin Substation about 8km from the site with a 240mm^2 conductor cross section. The final access system design shall prevail.

2.5.2 Electrical Main Wiring

(1) Main Electrical Wiring of PV field

The scale of this project is 40MWac and the installed capacity is 48.384MWp. It is planned to adopt 540Wp monocrystalline silicon module and 5000kW box-type transformer with 5MWac as a sub-array with total of 8 sub-arrays.

In this grid-connected PV power station project, 400 parallel PV strings are connected to 20 sets of 230KW string inverters per 5MWac PV sub-array. Each inverter is connected to a maximum of 20 PV strings and the EC connected side capacity is 302.4kWp. The inverter is connected to the bus bar on the low voltage side of the box transformer, which has a small voltage drop. The average voltage drop of DC cable between PV group and inverter and AC cable between inverter and AC bus box is less than 2% and the total efficiency of the system is high.

The output voltage of every 5MWac PV sub-array of the PV power station is 33kV after inversion and boost. In the PV field area, the electric energy collected by the box transformer through the 33kV cable tap box is transmitted to the 230kV booster station through the power collection line. In this project, two circuits of power collection lines are used to collect electric energy and send it to the booster station and each power collection line collects about 20MWac PV power respectively.

(2) Main Wiring of 230kV Booster Station

230 kV outgoing line side: a circuit of 230kV outgoing line will be built in this project so Shwekyin Substation.

33kV distribution equipment: single-bus configuration type, with one bus PT interval, two PC incoming intervals, one outgoing interval, one dynamic reactive power compensation interval and one station grounding transformer interval.

Substation transformer: 33kV bus is equipped with a 1250kVA substation grounding transformer, and another 11kVA transformer with a capacity of 315kVA is connected to the external power supply as the main substation transformer.

Reactive power compensation: 1 set of dynamic reactive power compensation device with capacity of ±10Mvar is provided for 33kV bus which shall the subject to the requirements approved by the access system.

2.5.3 Selection of Main Electrical Equipment

(1) Equipment selection of PV power generation system

1) Selection of Inverter

Because PV modules are easily affected by sunlight shading, the optimal operating point of each PV cluster is not matched with the inverter, which will affect the efficiency of the inverter

and the power generation of the whole system. In order to solve the above problems, inverters generally adopt the mode of input grouping and parallel connection.

2) Selection of 33kV box-type step-up transformer

In this project, each 5MWac PV power generation unit system adopts the unit connection mode of one 5000kW step-up transformer.

3) Selection of 33kV Cable Tap Box

In this project, in order to increase the operation flexibility of each PV array, some PV arrays are equipped with a 33kV cable tap box and then connected in parallel. The outlet of cable tap box is designed according to 4 groups of wiring loops at most and reasonable connections are formed according to different situation. Each power generation unit is independent of each other, so it is safer to operate, more convenient to overhaul and smaller in influence range.

Table 2.1 - Summary of Equipment Quantity in PV Field Area

Serial Number	Name	Quantity
1	5MWac PV sub-array	8 (pieces)
2	PV string assembly	2,880 (pieces)
3	5,000kW box-type step-up transformer	8 (sets)
4	Collector power line	2 (circuits)

(2) Selection of main electrical equipment of booster station

1) Configuration of 33kV high voltage switchgear

The 33kV distribution equipment is arranged indoors and KYN-40.5 removable armored metal-enclosed high-voltage switchgear is proposed. The booster station of this project is configured as follows: 1 cable outlet cabinet, 2 PV inlet cabinets, 1 bus voltage transformer cabinet, 1 dynamic reactive power compensation cabinet and 1 station transformer and grounding transformer cabinet with a total of 6 switchgear cabinets. Except SF6 circuit breaker used in reactive power compensation cabinet. Other cabinet are equipped with vacuum circuit breakers.

2) Selection of dynamic reactive power compensation device

According to the relevant regulations on reactive power compensation configuration and voltage regulation of PV power station in Technical Regulations for Access of PV Power Station to Power Systems, in order to make the PV power generation project basically not

exchange reactive power with the power grid during grid-connected operation and considering sufficient margin, a set of dynamic reactive power compensation device is installed in the 230kV booster station for local compensation. Outdoor dynamic reactive power compensation device is adopted for reactive power compensation and the capacity is temporarily selected as ±10MWac and the final configuration is subject to the approved access system.

3) Selection of Station Transformer

Considering enough margin and the best load rate of transformer and considering the size of standby capacity, the capacity of station transformer is 315kVA. The 400V AC power supply adopts automatic changeover switch to realize automatic switching function.

To reduce the system overvoltage level, the arc overvoltage of 33kV in this project is reduced by grounding with small resistance through grounding transformer. The station transformer capacity is 315kVA, and the station transformer on the 33kV is considered as the grounding transformer. The model of the station grounding transformer is DKSC-1250/33-315kVA/0.4 three-phase grounding transformer.

The booster station uses dual power supply, single-bus configuration. The main power supply is from the bus of 33kV distribution equipment in booster station, and the standby power supply is from the nearby 11kV power grid. S11-315/11 is selected as the model of the transformer for the external power station. The 33kV transformer adopts the form of station transformer and grounding transformer.

The booster station is equipped with six GCS low-voltage extraction distribution panels as AC power supply panels of the whole station.

2.5.4 Cable and Channel Design

(1) Cable Selection

1) PV1-F 1800V 1x4mm^2 PV cable is selected as the cable from PV panel to DC bus box.
2) The maximum input DC voltage of inverter is 1500V, which is connected by 3kV flame retardant cross-linked polyethylene insulated jacket power cable. According to the distance between the series inverter and the box-type step-up transformer, the voltage drop of the farthest PV module is controlled at about 2% so that the model and specification of AC cable from each inverter to the box-type step-up transformer can be determined, and the specification of Zr-YJLHV$_{22}$-1.8/3kVx120mm^2 is preliminarily adopted.
3) Zr-YJV$_{22}$-26/35-3x70mm^2, Zr-YJV$_{22}$-26/35-3x120mm^2, Zr-YJV$_{22}$-26/35-3x185mm^2, Zr-YJV$_{22}$-26/35-3x240mm^2 are adopted for the 33kV collective line based on the wiring of each group of box transformer.

4) The model of 33kV reactive power compensation incoming high voltage power cable is Zr-YJV_{22}-26/35-3x95mm^2.
The model of high voltage power cable for 33kV station and grounding transformer connection is Zr-YJV_{22}-26/35-3x70mm^2.
The model of high voltage power cable for incoming line of 11kV standby transformer is Zr-YJV_{22}-8.7/11-3x70mm^2.
The model of low-voltage power cable for 33kV station and 11kV standby transformer is Zr-YJV_{22}-0.6/1-3x300+1x150mm^2.

(2) Channel Design

1) All power cables with flame retardant crosslinked polyethylene insulation sheath are used in PV plant area and cables in PV plant area are laid in trough box or directly buried way, while cables passing through roads are laid in buried pipes.
2) There are two laying modes of DC output cables of PV array. The cables in the east-west direction directly enter the series inverter along the mounting bracket of PV module, and the cables in the north-south direction are laid into the series inverter by means of cable box. The AC output cable of group series inverter is laid in cable trough box mode and enters the low voltage side of box transformer. Cable tray box can be supported by the bracket and ground foundation of PV array string nearby.
3) The electric energy of each PV sub-array is connected to the power collection line along the cable trench through the cable tap box through the 1 circuit of 33kV cable and the 2 circuits of power collection lines of this project respectively enter the 33kV distribution room of the booster station along the directly buried trench.
4) The 33kV cable trench of the whole station is set along the road in the whole project area. After the main trench penetrates into the fence of the booster station at an appropriate position, it is connected to the cable trench in the station and enters the 33kV distribution cabinet of the booster staion.
5) Anti-static floor is set in control room, protection room communication room and cable bracket is set in the static floor.
In addition, cable channels can be laid flexibly according to the layout position and spacing distance of PV square array and small cable trough boxes, cable bridge branches or main cable bridges can also be set. Cable trough boxes and cable bridges can be supported by brackets and ground foundations assembled by PV square arrays nearby, and cables that need to cross roads can be laid by buried pipes or overhead bridges.

2.5.5 Electrical Equipment Layout

(1) Layout of electrical equipment in PV area

1) The series inverter is arranged in the PV sub-arrays, fixed on the bracket locally and installed outdoors.

2) The 33kV box-type substation and the 33kV cable tap box are centrally arranged locally and the cables are directly buried.

(2) Booster Station layout

The booster station is arranged in a rectangular shape with a length of about 50m and a width of about 50m. The booster station is equipped with a production complex building, which is arranged in the middle of the booster station and the 33kV distribution room is arranged in the north of the booster station. The complex building includes a main control room, a protection screen room, a communication room, an office and a living room.

An independent lightning rod with a height of 35m is set in the booster station, which is arranged beside the 33kV reactive compensation device.

One set of 33kV reactive power compensation device is set up in the booster station, which is arranged outdoors in the north side of the booster station, and one set of 33kV substation and grounding transformer is arranged in the 33kV distribution room of the booster station.

The 33kV distribution equipment adopts KYN-40.5kV armored removable metal enclosed switchgear, which is arranged in single row in the 33kV distribution room.

The electrical secondary equipment of booster station is arranged in the protection room and the communication equipment is arranged in the communication room.

The booster station is provided with a circular road as a channel for equipment transportation, patrol and firefighting.

(3) Layout of cables and cable trench

The cable and cable trench in the station shall be arranged according to the principle of connecting electrical equipment nearby, short path and beautiful appearance and shall be planned as whole, coordinated with each other in the plane and vertical direction, combined with far and near, so as to reduce bending and crossing.

Outdoor, cable trench shall be arranged in parallel along roads and buildings and structures according to the position of electrical equipment. Cable trenches and branch trenches shall be set in areas where cables are concentrated, such as indoor 33kV high-voltage switchgear and 0.4kV low-voltage panel, which are communicated with outdoor cable trenches.

In places where the number of cables is small and the location is relatively close, the cable burying scheme is adopted.

2.5.6 Measurement

The metering gateway is set at the 230kV incoming line interval on the opposite side of the 230kV booster station of the system and the 230kV outgoing line end of the PV power station is configured with the same meter as the gateway, so the 230kV outgoing line current transformer is equipped with a special metering coil with an accuracy of 0.2S level for bidirectional measurement and a pressure loss timer. The pressure loss timer reflects the fault condition, record the time of voltage loss and disconnection by phase separation. The 230kV incoming current transformers are equipped with special metering coils with an accuracy of 0.2S, and each is equipped with an intelligent multifunctional watt-hour meter of 0.5S, which can measure in both directions. All electric energy meters are sent to the electric energy acquisition device through the device, and simultaneously transmitted to the dispatching end through special channels. And remote meter reader is attached.

2.5.7 DC and UPS Power Supply

(1) DC System

To supply DC power for breaker opening/closing, microcomputer integrated automation system, communication and emergency lighting in booster station, a set of 220V intelligent microcomputer high-frequency switching power supply DC complete set device is set in booster station, which contains two sets of 200Ah lead-acid maintenance-free batteries and two sets of high-frequency switching power supply charging templates. The battery capacity can meet the discharge capacity of the whole station after 2 hours of power failure.

(2) AC uninterruptible power supply

The booster station is equipped with AC uninterruptible power supply to meet the requirements of automation equipment such as monitoring system, automatic fire alarm system and remote viewing system. The AC uninterruptible power supply system is not equipped with a separate battery and one set is set in the whole station, with redundant configuration and capacity of 2x8kVA. Two UPS modules are adopted, which are manually connected as standby, and each UPS module is connected with a bus. Two sections of bus run independently. When any UPS module fails, the other UPS module is manually switched to this section of bus. AC uninterruptible power supply system uses RS485 interface to communicate with substation computer monitoring system.

2.5.8 Power Quality Monitoring Equipment

The booster station is equipped with set of power quality monitoring device, which is used for real-time monitoring of voltage deviation, frequency deviation, three-phase unbalanced current, negative sequence current, harmonics, flicker, voltage fluctuation and continuous recording of other power quality indicators, so as to accurately evaluate the impact of grid-

connected PV power station project on power quality of the power grid. According to the measured results, it is determined whether the filter device needs to be installed.

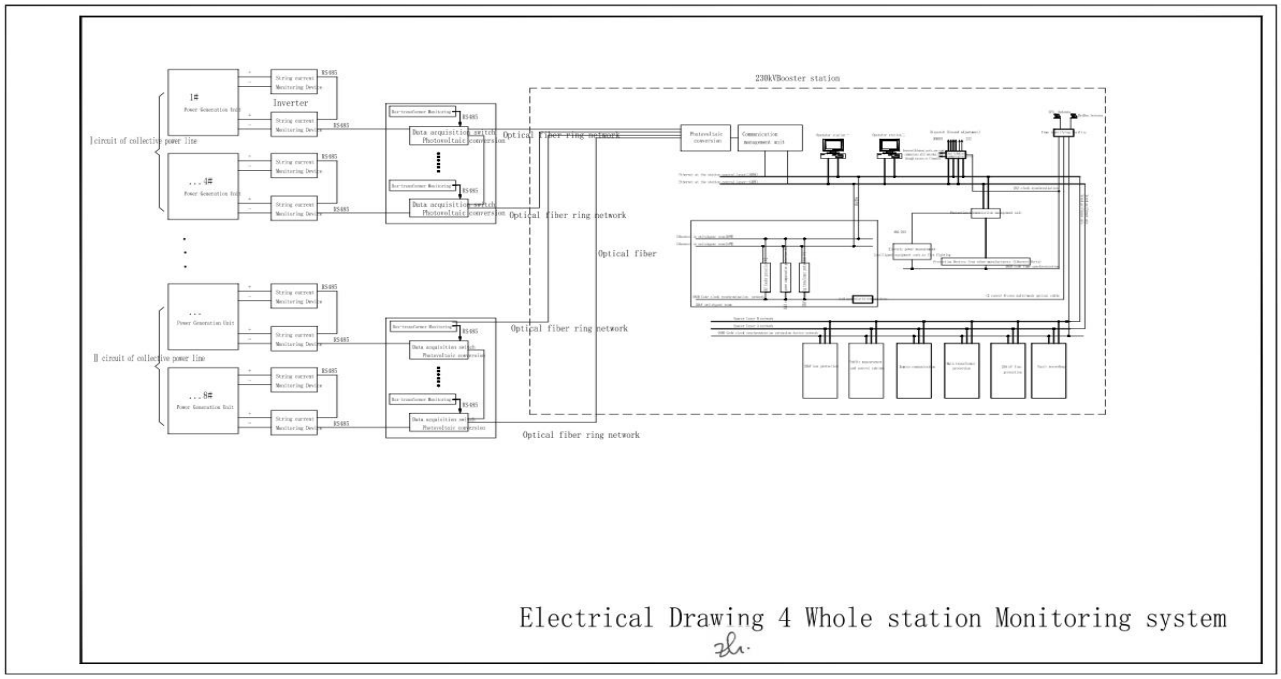


Figure 2.9 – Station Monitoring System

2.5.9 Microcomputer-Five Prevention System

The booster station of PV power station is equipped with microcomputer five-prevention installation system, which is in communication connection with the monitoring system of booster station. The five-prevention system obtains the status information of electrical equipment from the monitoring system through the communication interface and locks the operation of the monitoring system.

The microcomputer five-prevention system mainly includes: five-prevention workstation, computer key, electric code lock, line electroscope, grounding pile, intelligent grounding line manager, intelligent unlocking key manager, high-voltage bus live display locking device, etc.

2.5.10 GPS Time Synchronization System

The booster station is equipped with a unified time synchronization system to receive the standard timing signals provided by the Global Positioning System and Beidou II satellite signals. The GPS master clock adopts dual clock redundancy configuration, and the corresponding expansion device is configured according to the scale in the station.

The time synchronization system provides the time synchronization function of all secondary equipment such as station control layer equipment, protection equipment, measurement and

control equipment, fault recording, automatic devices and other intelligent equipment in the booster station.

2.5.11 Fire Alarm System

A set of fire alarm system is set up in the booster station area, including detection device (point or cable detector, manual alarm), centralized alarm device, power supply device and linkage signal device, etc. The centralized alarm device is arranged in the main control room of the booster station, and the detection points are directly connected to the centralized alarm device. In case of fire in equipment and rooms in booster station area, sound and light signals shall be sent out immediately on the centralized alarm device, and the address and time of fire alarm shall be recorded. After confirmation, the corresponding firefighting facilities can be manually started to organize firefighting. The linkage control mode is adopted to control ventilator and air conditioner in the main control room and distribution room in the area, and monitor the feedback signals.

2.5.12 Image Monitoring and Public Alarm System

Closed-circuit television monitoring points shall be set at important parts such as booster station, PV square array, inverter site and fences, fixed focus or zoom monitoring lenses shall be selected according to the scope or characteristics of different monitoring objects, and the fence of the station area shall be provided with an opposite infrared alarm fence security system. The video signal is processed, distributed and transmitted to the monitor terminal in the main control room, and networked to form a unified closed-circuit television monitoring system covering the scope of this project.

2.5.13 Optical Power Prediction System

According to the project management principles and needs of PV power generation project, the booster station is equipped with a set of optical power prediction system.

2.5.14 Secondary Equipment Layout

The secondary equipment layout of booster station is designed according to the centralized layout of relay protection and monitoring, and the background display is placed in the central control room. Equipment such as network switch cabinet, fault recording screen, meter panel, main transformer protection cabinet, 230kV line protection, power quality monitoring cabinet, DC screen and UPS power supply are all centrally arranged in the protection room. Communication equipment is placed in communication room.

2.6 Civil Engineering Design

2.6.1 Design of Support Bracket System

In this project, 540Wp monocrystalline silicon PV modules are used. The PV bracket support consists of 28 monocrystalline silicon PV modules arranged in 2 (rows) x 14 (columns) to form a support unit. The inclination angle of the support is 24, and the lowest point of the support is 0.5m above the ground. (A fixed bracket is adopted in the bidding document, and it can be adjusted to a tracking bracket in the later stage as an alternative to the technical solution). In this project, there are 3,200 brackets with installed capacity of 48.384MWp.

The PV bracket support is supported by Q355 steel diagonal beams and crossbeams. Each support unit consists of five frames and four crossbeams. The front column, the rear column, the diagonal beams and the diagonal braces form one frame. The inclined beam span is 2.8m (vertical projection) and the crossbeam span is 3.6m. C80x40x15x2.5mm hot-dip galvanized cold-formed thin-walled rolled channel steel is used for inclined beams, and C90x45x15x2.0mm hot-dip galvanized cold-formed thin-walled hammed channel steel is used for crossbeams. U50x35x2.0mm hot-dip galvanized cold-formed thin-walled hemmed channel steel is adopted for diagonal braces, and φø60x2.5mm hot-dip galvanized steel pipe is adopted for columns. The PV module is connected with the beam by bolts, and each PV panel is fixed on the beam by 4 bolts. The cross beam is connected with the inclined beam through the purlin. The upper end of the upright column is connected with the inclined beam through a rotary connector, and the lower end is inserted into the foundation steel pipe for socket fastening.

2.6.2 Design of Bracket Foundation

Based on the site geology and bracket layout, each bracket is provided with 10 bored steel pipe cast-in-place pile foundations (arranged in front and back double rows). According to calculation, the steel pipe cast-in-place pile is proposed to have a pile length of 1.75m, a pile top with a height of 0.25m above the ground, a pile foundation drilling diameter of 200mm and a drilling depth of 1.5m. The steel pipe pile is formed by welding three 1.2m long φ 14 ribbed steel bars with 0.6m long, ø76x4mm specifications. After drilling pile foundation, insert steel pipe pile, straighten steel pipe pile and pour C25 fine stone concrete in drilling gap.

2.6.3 Design of Site Structures

One 33kV box-type transformer is installed near the road in every two array centers, and the foundation is box-type brick-concrete foundation. According to the need of electrical layout, a cable tap box is installed beside some 33kV box inverter integrated machines, and the foundation is box-type brick foundation. In this project, the box transformer to booster station adopts the form of directly buried cable, and the excavation size is 1.6m in top width, 1m in bottom width and 1m in depth. Place cables after laying sand cushion. Then spread a layer of

fine sand and cover it with red bricks, and then back fill it. For the convenience of management, a wire mesh fence with a height of 1.8m is set along the outside of the PV farm array.

2.6.4 Design of Booster Station

2.6.4.1 General Layout

A 230kV booster station is built within the site, with a length of 85m, a width of 74m and an area of 6,290m^2 (excluding slope). The entrance of the booster station is arranged on the east side of the station area, and a living area is arranged near the entrance. A comprehensive building and an auxiliary building are arranged in the living area. The west side of the booster station is a production area, and the distribution building, main transformer, outdoor GIS and reactive power compensation are arranged in the production area in turn. There is cable trench connection between each of electrical equipment and the comprehensive control building. The entrance road of booster station is connected by on-site construction road. The minimum width of the roads in the station is 4m, all of which are concrete pavement with a turning radius of 9m. The roads surround the power distribution building to form a circular lane, and the clear height of the roads is not less than 4m, which meets the fire protection requirements. Greening is appropriate around the complex buildings, and 2.2m high brick walls are set around the booster station.

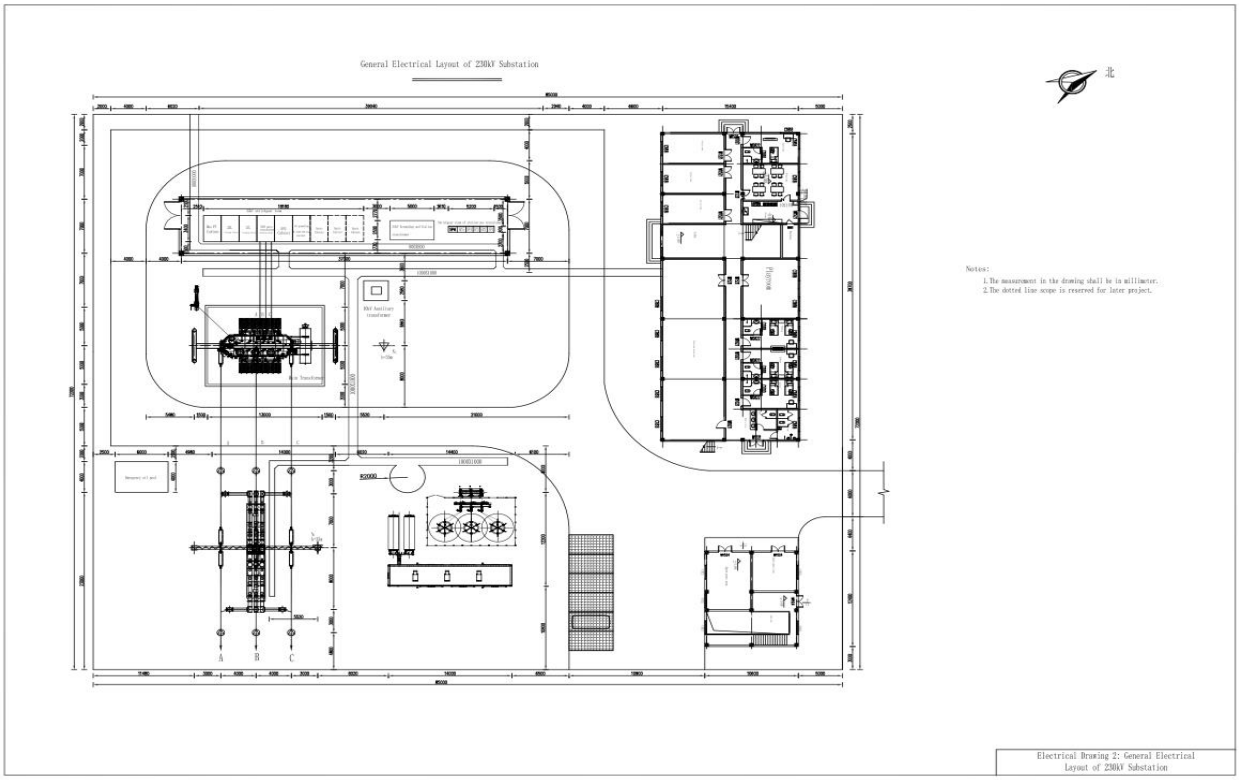


Figure 2.10 - General Electrical Layout of 230kV Substation

2.6.4.2 Building Design

Comprehensive building is area of 350m^2, with office and living function, including battery room, protective screen room, entrance hall, public toilet, guard room, dining room, kitchen, bedrooms, master control room, conference room, archives room, safety instrument room, laundry room, comprehensive offices and offices.

Auxiliary room is a building area of 80.30m^2. The first floor above ground adopts frame structure with a floor height of 3.9m, and two spare parts rooms are arranged. The underground floor is reinforced concrete box structure with a height of 4.9m, and is arranged as a fire pool and a water pump room. Indoor distribution building is 200m^2.

2.6.4.3 Structure Design

According to the electrical requirements, frameworks are arranged in the booster station, which are main transformer framework and 230kV outdoor GIS framework. The frame is in the form of herringbone cement ring bar and angle steel welded truss, and the buried depth of the foundation is 3.5m, which meets the requirements of anti-overturning checking calculation. The equipment support in the station is mainly used for 230kV outdoor GIS reactive power compensation devices. According to the height requirement installation, select 3m or 4.5m cement ring rod. The upper end is welded with steel plates for easy connection with requirement, and the lower end is buried in the cup mouth of reinforced concrete independent foundation.

The main transformer foundation is set in the production area of booster station. The foundation of the main transformer is cast with reinforced concrete as a whole, with C30 concrete strength and C15 concrete cushion. The foundation of the main transformer has low requirements on the foundation, and the residual gravel soil after field excavation can meet the bearing capacity requirements. Embedded steel plates on the surface of main transformer foundation are convenient for installation of main transformer equipment. The upper layer of main transformer is provided with steel mesh. Spread pebbles with thickness of 250mm. The main transformer is provided with an oil collecting pit on the side near the accident oil pool, which is internally connected with a steel pipe with a diameter of 200mm and leads to the accident oil pool, and the oil discharged slope is not less than 2%. The accident oil pool adopts reinforced concrete structure, and its effective volume is not less than 35m^3, which can meet the requirement of oil storage after single main transformer accident.

The cable trench in the station is made of brick, and clear width is generally 0.6m-1.0m. In order to bear the vehicle load, the cable trench passing through the road locally adopts the cast-in-place reinforced concrete type. Precast ditch cover plate shall be laid on cable trench, and angle steel shall be used around cover plate.

2.6.4.4 Heating and Ventilation

It is comfortable temperature all year round in Myanmar. There is no central heating equipment in the booster station, and air conditioners and other equipment are arranged in each room of the comprehensive building to cool down as required. Cabinet air conditioners are set in the power distribution room and protection room to adjust indoor humidity and temperature according to the working requirement of electrical equipment.

Emergency smoke exhaust and mechanical ventilation equipment shall be set in the power distribution room, and the smoke exhaust amount shall be 18,225m^3 based on the calculation of air changes not less than 10 times per hour. Three axial fans shall be set close to the bottom of the beam, and the flow rate of single fan is q=7,500m^3/h. The public toilet adopts natural air intake and mechanical air exhaust ventilation, and the ventilation frequency is 7 times/hour. The side wall of the toilet is equipped with an exhaust fan to exhaust the air outdoors. The dormitory toilet adopts natural air intake and mechanical air exhaust ventilation, and the ventilation frequency is 7 times/hour. The toilet is equipped with ventilator and air duct inside the toilet to exhaust the air outdoors. Other buildings can be ventilated naturally.

2.6.4.5 Water Supply and Drainage

In this project, a new well is built, which is initially planned to be arranged in the booster station. Deep well pumps are used to pump water to the 150m^3 firefighting pool in the booster station as the water source for firefighting, greening and PV module cleaning.

The water consumption of booster station is 200L/person, and daily water consumption is 3.2m^3/d for 16 people. The domestic water quality must meet the drinking water quality standard, and a purification treatment system is set for treatment. After treatment, it is stored in a 4m^3 water tank. Domestic water is pressurized by variable frequency pump and supplied to each water point of booster station by branch pipe network.

Regular cleaning of PV modules can improve the power generation efficiency of modules to certain extent. There are few pollution sources in this project, so cleaning once every six months can be considered. The water consumption for cleaning PV modules is estimated as 1.6L/m^2, and the total water consumption for each cleaning is about 330m^3. The cleaning water is taken from the pool by tanker and transported to each water point area, and pressurized by small diesel pump to clean PV panels.

The booster station adopts rain and sewage diversion drainage mode. Sewage will flow into septic tank after collection, and will be discharged into sewage treatment equipment after clarification and filtration in septic tank. After treatment, it will be used for greening irrigation or discharge, and the discharge requirement will meet the first-class standard. Setting

intercepting ditch along the slope opening line in booster station can prevent foreign exchange water from entering booster station.

Sprinkler and drainage ditch are set around the building in booster station, which are combined with site drainage ditch. Rainwater is collected by site drainage ditch and then discharge in to road drainage ditch outside the station.

2.6.4.6 Fire Protection Design

The fire protection design of this PV power plant implements the fire protection policy of "Prevention first and combining prevention with Elimination". The design ensures that the firefighting, fire prevention spacing, safety exit, accident smoke exhaust and lighting meet the requirement of relevant specification. The main electromechanical equipment adopts ammonium phosphate dry powder fire extinguishing method. Ammonium phosphate dry powder fire extinguishers are used for main building firefighting.

The volume of the complex building is 4,751.85m^3, which is the largest building in the station. The fire resistance rating is Grade II, and the fire risk is classified as Class E. The water consumption of the outdoor fire hydrant is 15L/s, the fire duration is 2h, and the maximum fire water consumption for one fire extinguishing is 108m^3. 150m^3 is set in the booster station, and the fire pool meets the fire water consumption. Outdoor fire hydrant system adopts annular pipe network to supply water. Outdoor fire hydrants are set up in the site, and the distance between fire hydrants is less than 120m.

The fire risk category of main transformer yard and reactive power compensation device is Class C, and the fire resistance rating is Grade II. The capacity of a single main transformer is 40MVA and two MFT50 trolley dry powder fire extinguishers, one 1m^3 fire sand box and three fire shovels are arranged beside the main transformer.

The power supply of fire-fighting electrical equipment shall be supplied according to secondary load. The fire power supply of booster station is taken from the double-circuit 0.4kV station, and the double-circuit power supplies are standby for each other. Separate power supply circuit is adopted for firefighting electrical equipment. All power supply circuits of firefighting equipment adopt flame retardant cables, so as to ensure firefighting power consumption in case of fire.

Safety exit indicator lights and evacuation indicator lights shall be set all evacuation passages, stairwells and safety exits, and the distance between them shall be no more than 15. The minimum illuminate of indicator lamp and evacuation lamp is higher than 0.5Lx. the indicator lamp and evacuation lamp are of self-contained battery type, and the continuous power supply time shall not be less than 30mins when AC power is lost.

According to the specification requirement, the booster station of the PV power plant should be provided with an automatic fire alarm system, and fire duty room should be shared with the central control room of the booster station of the PV power plant. The fire alarm system is designed according to the specification requirements. The system includes temperature cable detector, intelligent photoelectric smoke detector and temperature detector, control module, audible and visual alarm, indicator light, manual alarm button, etc. The fire detection and alarm area include the central control room and communication room in the booster station of PC power station. In case of fire, the fire alarm control box can send out audible and visual alarm signals in time. Display the location of fire alarm and feedback the signal to the linkage control box.

2.7 Construction Organization Design

Shwekyin PV project is located in Shwekyin Township, Bago Region, and the geographical coordinates of site are located at 17°58’07.8”N and 96°56’04.2”E. Road traffic conditions are good, and there is a road near the site. There is also a village service road between the road and the site, with a distance of about 1.5km. according to the field survey results, the site is located in the hilly area, with uneven ground, little relief in the range, and more vegetation on the surface, mainly bushes. The site has good geological stability and meets the topographic and geological conditions of PV power station construction.

The main materials required for this project are masonry materials, sandstone aggregates, cement, concrete, steel, timber and oil, which are mainly purchased from Bago Region. The construction water is taken from the river near the site and supplied by water truck with a transportation distance of about 4km. When necessary, water can also be obtained by drilling in the site. Electricity for construction can be connected by 11kV line near the site as power supply. Diesel generator is used for construction and emergency standby power supply at a long distance.

The newly-built road in this project has a width of 3.5m, a subgrade width of 4.5m and a gravel pavement. The entrance road of booster station is 5m wide, the subgrade is 5.5m wide and the pavement is gravel. The newly-built road is about 9.5km long, and the entrance road is about 1.5km long.

The construction scope of civil engineering and PV array bracket installation of this project includes: site leveling, on-site road construction, bored steel pipe filling pile installation, bracket installation, cable trench excavation and lining, house foundation excavation, treatment, masonry and decoration, booster station requirement foundation excavation and masonry, HVAC and water supply and drainage, water conservation and environmental protection measures and flood control and drainage facilities construction, etc. Main equipment installation construction scope includes: installation of PV modules, installation and debugging of current collection lines, installation and debugging of electrical equipment of booster station,

etc. Combined with the actual situation of this project, the total construction period from construction preparation to project completion is proposed to be 6 months, of which the construction period is 5 months.

2.8 Installed Capacity

A total of 89,600 pieces of 540Wp monocrystalline silicon PV modules are used in Shwekyin PV power station, and 28 PV modules are connected in strings to form a string unit. Each PV array includes 400 PV string units, and a total of 8 PV sub-arrays are built. The total installed capacity of this project is 48.384MWp.

2.9 Capacity of Project

20 sets of 250kW series inverters and one 5000kVA box transformer are used in each PV square array of Shwekyin PV power station, total of 8 set, and the project scale is 40MWac.

2.10 Selection of PV Modules and Inverters

2.10.1 Selection for PV Modules

According to the mainstream product model, application performance and capacity analysis of PV module market, this project plans to adopt 540Wp double-sided monocrystalline silicon.

2.10.2 Efficiency and Degradation of PV Modules

The efficiency of 540Wp monocrystalline silicon double-sided PV modules to be selected in this project is 21% and the power attenuation of double-sided monocrystalline silicon PV module is less than 2% in the first year and 0.45% every year from the second year.

2.10.3 Selection of Inverters

250kW series inverters are proposed as inverters in this project.

2.10.4 Technical Specification of Major Equipment

1. Box transformer
   The rated capacity: 5,000kVA
   The rated voltage: 33kV (8x1.25%/0.8kV)
   Number of Phases: 3 Phases
   Frequency: 50Hz
   Voltage regulation mode: no excitation tap-changer is set on the high voltage side
   Coil connection group: D,yn11
   Cooling method: ONAN
   Neutral grounding mode: the neutral point on the 33kV side is not grounded.
2. Cable

(1) PV1-F 1800V 1x4mm^2 special PV cable shall be selected as the cable from PV panel to DC bus box.
(2) The maximum input DC voltage of the inverter is 1500V, which is connected by 3kV flame retardant crosslinked polyethylene insulated jacket power cable. According to the distance between the series inverter and the box-type step-up transformer, the voltage drop of the farthest PV module is controlled about 2% so that the model and specification of AC cable from each inverter to the box-type step-up transformer can be determined, and the specification of Zr-YJLHV$_{22}$-1.8kV-3x120mm^2 is preliminarily adopted.
(3) 33kV collector line will adopt Zr-YJV$_{22}$-26/35-3x70mm^2, Zr-YJV$_{22}$-26/35-3x120mm^2, Zr-YJV$_{22}$-26/35-3x185mm^2, Zr-YJV$_{22}$-26/35-3x240mm^2 based on the wiring situation of each group of box transformer.
(4) The model of 33kV reactive power compensation incoming high voltage power cable is Zr-YJV$_{22}$-26/35-3x95mm^2.
(5) The model of high voltage power cable for 33kV station and grounding transformer connection is Zr-YJV$_{22}$-26/35-3x70mm^2.
(6) The type of high voltage power cable for incoming line of 11kV standby transformer is Zr-YJV$_{22}$-8.7/11-3x70mm^2.
(7) The low voltage power cable of 33kV station and grounding transformer and 11kV standby transformer is selected as Zr-YJV$_{22}$-0.6/1-3x 300+1 x150mm^2.
(8) Selection of control cables in booster station: ZR-KVVP2-22 with various cross-sectional models.

2.10.5 Technical Specification

2.10.5.1 Relays

This project adopts microcomputer integrated protection system, in which relays are integrated.

2.10.5.2 Protection

1. Protection of 230kV outgoing line

The 230kV outgoing line is equipped with a set of optical fiber current differential protection as the main protection, with phase-to-phase distance protection, grounding distance protection and three-phase primary reclosing.

2. 33kV section

The 33kV line adopts microcomputer-based protection device integrating protection, measurement and control, and is equipped with three-stage directional current quick-break and overcurrent protection, which has the functions of automatic reclosing, low-frequency load shedding, wave recording, etc.

The 33k substation transformer is a microcomputer-based protection device integrating protection and measurement and control of grounding transformer, which is provided with time-limited current quick-break and overcurrent protection, overvoltage and under-voltage protection, overload protection and zero-sequence voltage protection.

The measurement and control devices of 33kV line protection and station transformer protection are put down in the distribution room and placed on the corresponding switch cabinets. Operation buttons and signal lights are required on the screen, and the electric quantity value is directly displayed on the microcomputer-based protective device.

3. 33kV bus protection

The booster station of this project is provided with a set of 33kV bus differential protection device, which can quickly remove the 33kV bus fault.

4. Fault wave record cabinet

The booster station is provided with a fault recorder cabinet to record the fault process of 33kV bus and 230kV outgoing line and the action of protection.

2.10.6 Communication

1. PV field communication

In this project, each PV array is equipped with a data acquisition and processing device. According to the device, the operating parameters, fault states and power generation parameters of the inverter and the box transformer of the unit and the current quantity signals of each access circuit in each inverter are obtained and stored through the RS485 bus. At the same time, the data acquisition and processing device uploads the data to the computer monitoring system of PV power generation project through optical fiber transmission. In addition, mobile phones and walkie-talkies are provided for patrol and maintenance contact communication of PV power generation project operators.

2. Communication of booster station

The 230kV booster station is designed according to the principle of “nobody on duty or few people on duty”, and the communication between the booster station and the dispatching terminal is optical fiber communication. The booster station shall reserve the communication interface with Myanmar centralized control center and be equipped with corresponding equipment.

2.11 Proposed Yearly Generation

Total solar radiation value of Shwekyin PV power station site 6,603.0MJ/m^2 on the horizontal plane and 7,090.1MJ/m^2 on inclined plane. The calculation of power generation in this project is based on the above solar radiation data.

2.11.1 Total Efficiency of Power Generation System

The energy conversion of grid-connected PV power generation system mainly includes: energy source link, energy conversion link, energy output link and so on. There are different energy losses in all above links. The main losses in the energy source link are the unavailable solar radiation loss (including the loss caused by shading in the morning and evening, and the reflection and refraction loss of light passing through glass), dust shading loss and so on. The main losses in energy conversion are losses caused by the quality defects or mismatches of battery components, and the losses caused by temperature influence, etc. The main losses in the energy output link are ohmic losses (DC and AC lines, protection diodes, cable joints, etc.), inverter efficiency losses, transformer efficiency losses, field power losses (including box inverter power consumption, main transformer, booster station lighting, etc.), system failures and maintenance losses, etc.

For grid-connected PV power generation systems in different regions, different climatic environments and different construction schemes, the above losses are different. For the evaluation of the above losses in this project in combination with local climatic conditions and the proposed construction scheme are shown in following Table.

Table 2.2 - System Efficiency Evaluation

Serial No.	Loss Factor	Generation Loss
1.	Unavailable light loss	2.00%
2.	Component mismatch loss	1.50%
3.	Temperature influence loss	9.50%
4.	Dust shielding loss	2.00%
5.	Low voltage cable confluence loss	0.45%
6.	Inversion loss	0.75%
7.	Loss of collecting line	0.98%
8.	Field power loss	1.20%
9.	System failure and maintenance loss	1.00%
10.	Power grid dispatching loss	0.50%
11.	**Comprehensive efficiency of system**	**81.50%**

2.11.2 Calculation of annual on-grid power generation

The power generation capacity of double-sided monocrystalline silicon PV cell module will be attenuated to some extent due to the aging of the cell module after working for a period of time. The operation period of this project is calculated as 20 years. The power generation gain of double-sided module is 4.5% ant the power attenuation of PV module in the first year is 2% and then the power attenuation of PV module is 0.45% every year since 2 year.

Based on the above calculation principle, the annual average power generation of Shwekyin PV power station is 76,064MW-h and annual power generation is shown in following table.

Table 2.3 - Annual Power Generation of Shwekyin PV Power Station

Running Period	Attenuation Coefficient	Annual Attenuation	Annual Generation (MW-h)
Year 1	0.98	2.00%	79,534
Year 2	0.9755	0.45%	79.169
Year 3	0.971	0.45%	78,803
Year 4	0.9665	0.45%	78,438
Year 5	0.962	0.45%	78,073
Year 6	0.9757	0.45%	77.708
Year 7	0.953	0.45%	77,343
Year 8	0.9485	0.45%	76,977
Year 9	0.944	0.45%	76,612
Year 10	0.9395	0.45%	76,247
Year 11	0.935	0.45%	75,882
Year 12	0.9305	0.45%	75,517
Year 13	0.926	0.45%	75,151
Year 14	0.9215	0.45%	74,786
Year 15	0.917	0.45%	74,421
Year 16	0.9125	0.45%	74,056
Year 17	0.908	0.45%	73,690
Year 18	0.9035	0.45%	73,325
Year 19	0.899	0.45%	72,960
Year 20	0.8945	0.45%	72,595
Annual Average			**76,064**

2.12 Proposed Layout Plan

Shwekyin PV power station project has a scale of 40MWac, which was completed and put into operation at one time, with a total area of 0.75km^2. According to the land use situation, topography and geomorphology conditions of the site and the initial access system scheme, a 230kV booster station is initially planned to be built in the middle of the site, eight 5MWac PV power generation sub-arrays are arranged on the gentle slope.

There is a road in the southwest of the site, with a width of about 4m-4.5m, which meets the transportation requirement of PV power plant equipment. It is proposed to enter the site for reconstruction and expansion of the part of the access road that does not meet the requirements. The roads in the site should avoid hillsides with large gullies as much as possible, so as to reduce digging and filling and avoid destroying natural gullies, and approach or pass through more PV arrays as much as possible along the route. The total length of the construction road is about 4km, the road surface width is 3.5m, and the roadbed width is 4.5m. Clay-bound macadam is adopted, and a shunting platform is set at the end of the road.

The PV array should be arranged according to the land use range and terrain condition, so as to avoid the great difference between the length and width of the sub-square, so as to achieve the best layout scheme with better land use, saving connecting cables and shorter routine inspection lines.

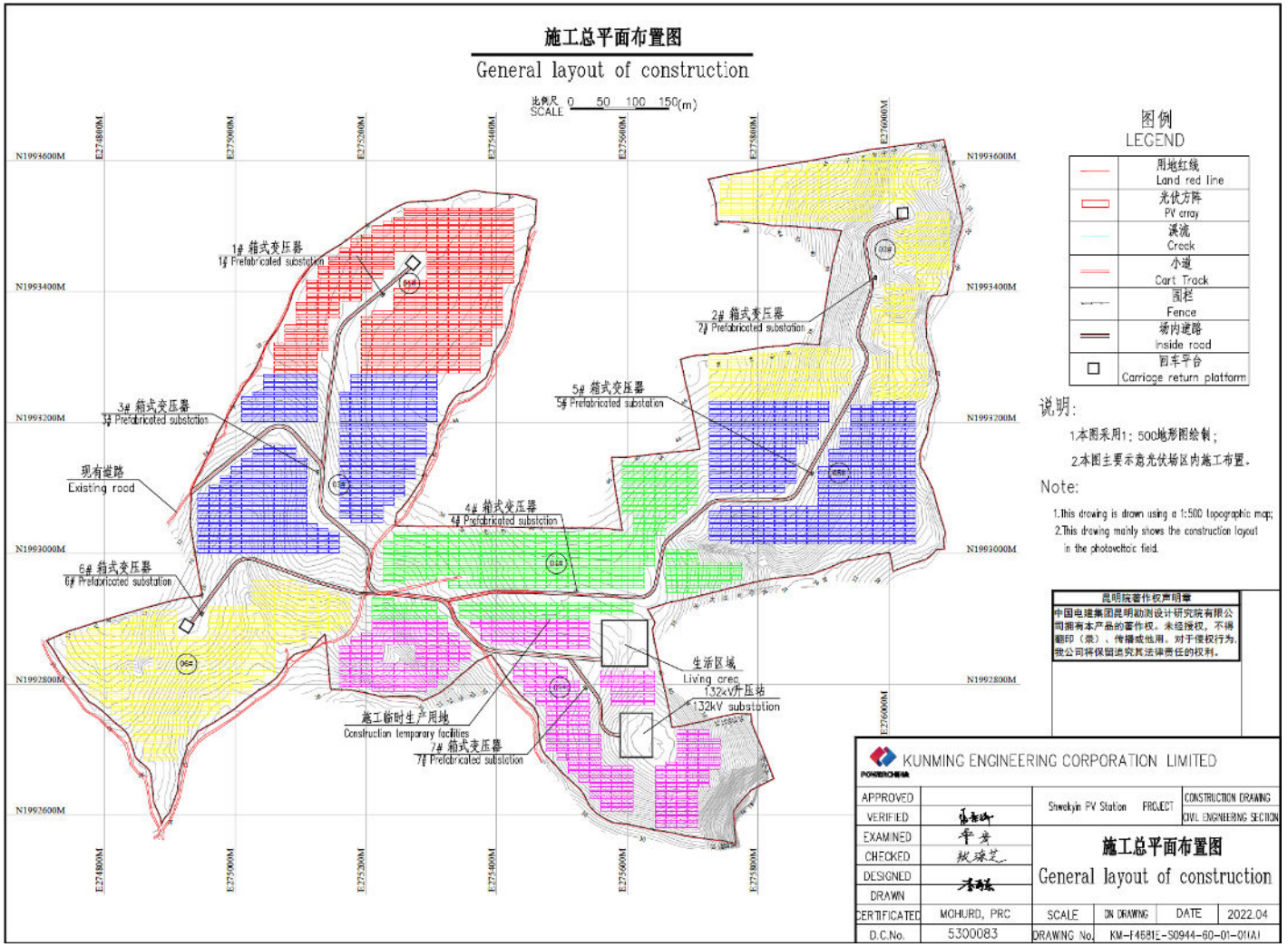


Figure 2.11 - General Layout of the Project

2.13 Single Line Diagram of Power Plant

The main electrical wiring of the 230kV booster station is shown in the Figure "Electrical attached figure", which is specifically described as follows

230kV outgoing line side: this project completed one circuit of 230kV outgoing line to Shwekyin Substation.

33kV distribution equipment: single-bus configuration type, with one bus PT interval, two PV incoming intervals, one outgoing interval, one dynamic reactive power compensation interval and one station grounding transformer interval.

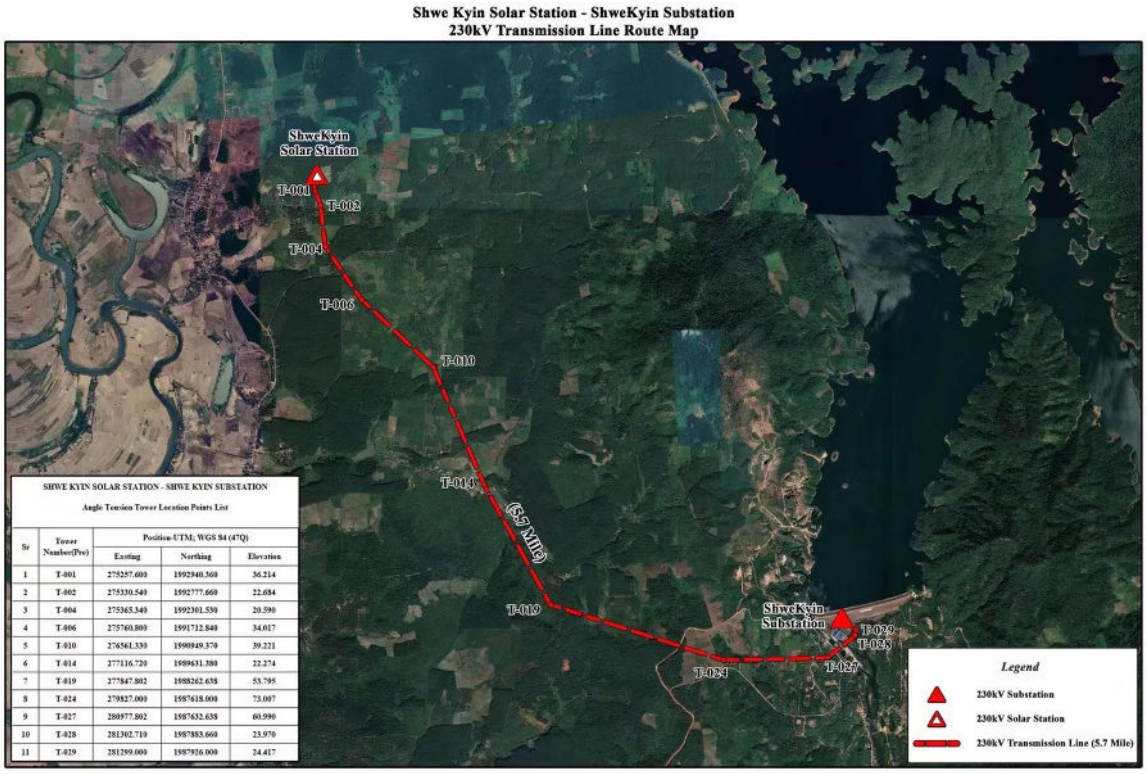
Substation transformer: 33kV bus is equipped with a 1,250kVA substation grounding transformer, and another 11kV transformer with a capacity of 315kVA is connected to the external power supply as the main substation transformer.

Reactive power compensation: 1 set of dynamic reactive power compensation device with capacity of ±10Mvar is provided for 33kV bus, which shall be subject to the requirements.

2.14 Transmission Line Design

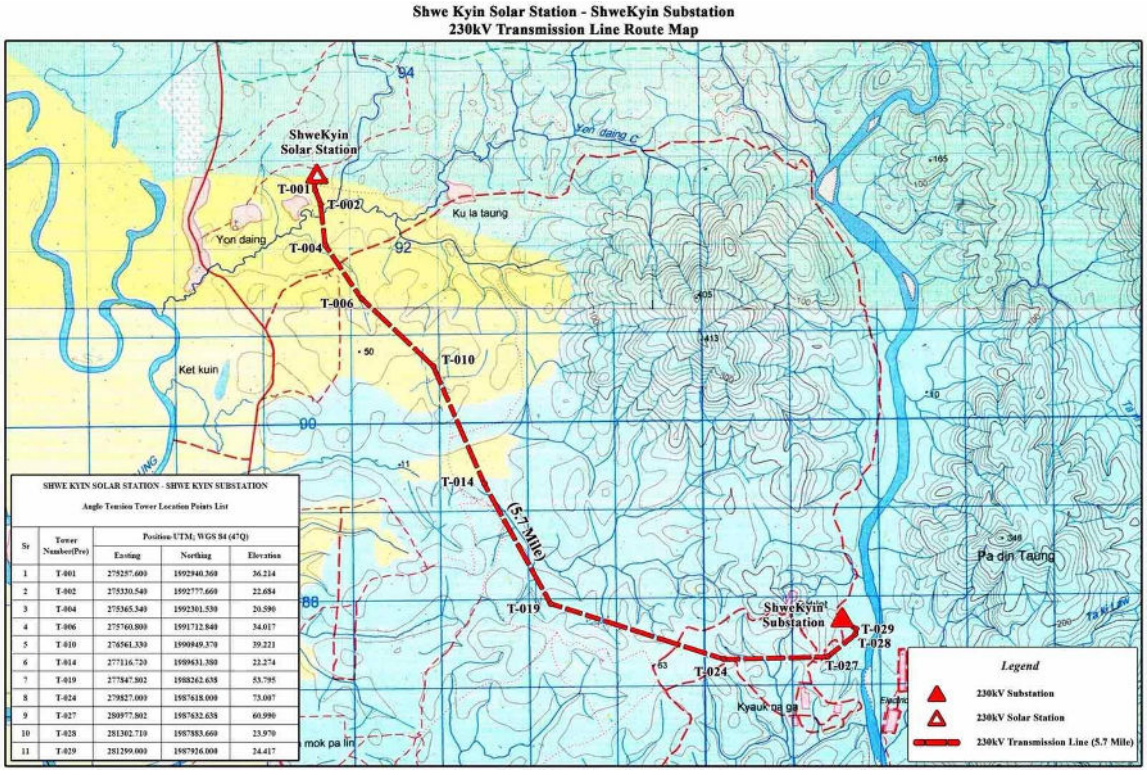
Main Technical Characteristics of the Line

(1) Line Name = Shwekyin Transformer 230kV Line
(2) Line Origin and Destination = Start from PV power station and end at Shwekyin Substation with a length of about 8km. Single circuit erect.
(3) Design meteorological conditions = design according to the basic wind speed of 30m/s and the ice thickness of 0mm
(4) Type of conductor and ground wire = the conductor adopts JL/GIA-240,30 steel-cored aluminum stranded wire; OPGW-50 communication cable is used as ground wire
(5) Insulation level = 2*4 pieces of suspension strings, 2*5 pieces of tension strings and 2*4 pieces of jumper strings
(6) Insulator and hardware string type = 70kN U70B double insulator string is used for suspension insulator string, 70kN U70B double insulator string for tension string and 70kN U70B double insulator string for jumper string
(7) Arrangement mode of iron tower conductors = triangular arrangement is adopted
(8) Iron towers = all are self-supporting iron towers
(9) Foundation type = Cast-in-place vertical reinforced concrete foundation is adopted for the entire iron tower.



Sr	Tower Number(Pre)	Position UTM; WGS 84 (47Q)		
		Easting	Northing	Elevation
1	T-001	275257.600	1592940.360	36.214
2	T-002	275330.540	1592777.660	22.684
3	T-004	275365.340	1592301.530	20.590
4	T-006	275760.800	1591712.840	34.017
5	T-010	276561.330	1590949.370	39.221
6	T-014	277116.720	1589631.380	22.274
7	T-019	277847.502	1588262.638	53.795
8	T-024	279827.000	1587618.000	73.007
9	T-027	280977.802	1587632.638	60.990
10	T-028	281302.710	1587883.660	23.970
11	T-029	281299.000	1587926.000	24.417

Figure 2.12 – Route of Transmission Line



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		Easting	Northing	Elevation
1	T-001	275257.600	1592940.360	36.214
2	T-002	275330.540	1592777.660	22.684
3	T-004	275365.340	1592301.530	20.590
4	T-006	275760.800	1591712.840	34.017
5	T-010	276561.330	1590949.370	39.221
6	T-014	277116.720	1589631.380	22.274
7	T-019	277847.502	1588262.638	53.795
8	T-024	279827.000	1587618.000	73.007
9	T-027	280977.802	1587632.638	60.990
10	T-028	281302.710	1587883.660	23.970
11	T-029	281299.000	1587926.000	24.417

Figure 2.13 – Route of Transmission Line

Table 2.4 - Main Economic Indicators of Lines

Serial Number	Projects	Indicators
1	Line length (km)	8
2	Number of tower (base)	37
3	Average span (m)	217
4	Tensile ratio (%)	45.6
5	Wire (kg/km)	1132
6	Insulator (piece/km)	245

2.15 System Overview

2.15.1 Outgoing Line Scale

The installed capacity of this PV power station is 40MWac. The outgoing line is connected to nearby Shwekyin Substation with a circuit of 230kV line, with a total length of 8km.

2.15.2 Wire Cross Section

According to the system demonstration, the 240mm^2, cross-section conductor is adopted in this line project.

2.15.3 Access Scheme

Recommended access system scheme for this project: The 230kV single circuit line of the outgoing line of this project is connected to nearby Shwekyin Substation and the cross-section of a conductor is 240mm^2, and the maximum load is considered as 30MVA.

2.16 Line Path Scheme Selection

2.16.1 Description of Outgoing Line

The outgoing line direction of this project is located in the north of the project site, about 8km away from Shwekyin Substation. The outgoing line will be directed to north.

2.16.2 Electromechanical Parts

2.16.2.1 Selection of Wire Model

According to the system planning and demonstration, the conductor cross section of this project is 1x240mm^2 (the maximum load is considered as 30MVA. The requirements to be considered are icing and wind load on mechanical strength. JL/GIA-240/30 steel-cored aluminum stranded wire is adopted as the conductor in this project.

2.16.2.2 Selection of Ground Wire

The line of this project is a conventional line and the optical cable of the outgoing line adopts OPGW as the communication line and the lightning conductor is erected.

Table 2.5 - OPGW technical parameter values

Projects			Unit	Guaranteed value
Optical fiber	Type		--	G.652
	Quantity		Core	24B1
	Attenuation	1310nm	dB/km	0.35
		1550nm	dB/km	0.21
Sectional area	Bearing cross-sectional area:		mm^2	92.4
	AS area		mm^2	92.4
	AA area		mm^2	0.0
	Stainless steel pipe area:		mm^2	2.7
	Total cross-sectional area:		mm^2	95.1
Outer layer stranding			--	Right direction
External diameter			mm	13.05
Unit weight			kg/km	605.4
Rated breaking force (RTS)			kN	103.6
20℃ DC resistance			Ω/km	0.765
Short-circuit current capacity (40℃~200℃,0.25s)			$kA^2 \cdot s$	52.8
Short circuit current			kA	14.5

2.16.2.3 Hardware Fittings

According to the regulations, the safety factors of the hardware of this project is not less than 2.5 under the maximum service load, and the conditions of disconnection, disconnection and checking calculation are not less than 1.5. The main hardware configuration is shown in following table.

Table 2.6 - Main Hardware Model Table

Wire type / Hardware name	**JL/G1A-240/30**
Suspension clamp	XGF-5C

tension clamp,strain clamp,dead end	NY-240/30
Connecting hardware	JYD-240/30
Repair hardware	JX-240/30
Antivibration hammer	FYH-240/30

2.16.2.4 Insulation Coordination

2.16.2.4.1 Insulator Type Selection

Glass insulators have the characteristics of large climbing distance, corrosion resistance, zero value self-explosion, and have better cost performance, which is favored by operating units. Therefore, glass insulator design is recommended for the whole line, and its characteristics and insulator string number are shown in following tables.

Table 2.7 - Insulator Characteristic Table

No.	Item	Quantity
1.	Model	U70B
2.	Height (mm)	146
3.	Disk diameter (mm)	255
4.	Climbing distance (mm)	320
5.	Connection type (marking)	16
6.	Lightning full-wave impulse withstand voltage (kV)	100
7.	Power frequency wet flash (kV)	40
8.	Power frequency breakdown (kV)	130
9.	Rated electromechanical failure load (kN)	70
10.	Reference weight (kg)	4

Table 2.8 - Insulator string sheet table for 230kV line

Elevation (m)	Number of Jumper String and Suspended String (Double)	Tensile strand number (duplex)
0-1000	Eight Tablets	10 Tablets

2.16.2.5 Grounding

Grounding wires are grounded base by base through towers, and horizontal radiation grounding bodies are used as grounding devices in general areas, closed ring grounding devices are used in paddy fields and residential areas. The grounding downlead adopts φ12 round steel, and the

grounding body is 0.8m for cultivated land and 0.6m for non-cultivated land. The measures of adding grounding modules are taken in areas with high soil resistivity.

According to the regulations, the power frequency grounding resistance value of tower grounding device shall not exceed the values listed in following table.

Table 2.9 - Grounding Resistance Value Table

Soil resistivity (ω. m) / Grounding resistance requirements (ω)	≤100	100~500	500~1000	1000~2000	≥2000
Power frequency grounding resistance value (ω)	10	15	20	25	30

2.16.2.6 Wire Distance to Ground and Crossing Requirements

According to the regulations of relevant codes and specifications, the minimum vertical distance between the ground and crossing objects when the conductor is in maximum calculation sag, or the minimum clearance distance between the conductor and crossing objects and parallel objects when the conductor is in maximum calculation wind deviation, shall meet the requirements.

Table 2.10 - Wire-to-ground Distance and Cross Crossing Requirements

Name of the object to be crossed		The minimum distance (m)	Remarks
Residential area		7.0m	
Non-residential area		6.0	
Difficult transport area		5.0	
A hillside within walking distance		5.0	Wind deflection clearance distance
Hillside, cliffs and rocks that cannot be reach by foot		3.0	
Grade highway to pavement		7.0	
Weak current line, power line		3.0	
Building	Vertical distance	5.0	
	Wind deflection clearance distance	4.0	
	Vertical distance	4.0	

Natural growth height of trees	Wind deflection clearance distance	3.5	
	Fruit trees and cash crops	3.0	

2.16.2.7 Iron Tower

The installed capacity of this project is 40MWac. The outgoing line is connected to nearby Shwekyin Substation with a primary 230kV line, with a total length of 8km, and the whole line is erected in a single circuit with JL/GIA240/30 steel core aluminum stranded wire. The whole line is designed according to the ice thickness of 0mm and the basic wind speed of 30m/s.

The module is a single-loop tower with an altitude of less than 1000m, a design wind speed of 35m/s, a conductor model of JL/GIA-240/30 and a ground wire of GJ-50, which is designed according to the mountain planning. The straight tower and tension tower in the form of tower adopt “up” shaped iron tower.

2.17 Construction Schedule

2.17.1 Progress of Preparation Period

The main work during construction preparation period includes: the construction of temporary production and living houses, the leveling of temporary sites, the construction of some roads in the site and other temporary facilities, etc.

2.17.2 Total Construction Progress

The construction of this project can be roughly divided into the following parts: construction preparation, on-site road construction, PV arrays foundation and support construction, PV module installation, installation of box inverter equipment and related power distribution devices, cable laying, commissioning and finishing work, and completion acceptance.

Constrains on the construction progress of this project mainly include on-site traffic, civil engineering construction of switchyard and installation and commissioning of electrical equipment of switchyard.

According to the requirements of MoEE, it is initially planned to start construction on March 15th, 2022 and finished the project on November 15th, 2022 with a total construction period of 8 months. The scale of this project is 40MWac, and the preparatory work for construction has to begin in March. However, the current status of the project area is starting some preliminary activities such as to ensure that such preliminary activities do not cause Environmental Impacts.

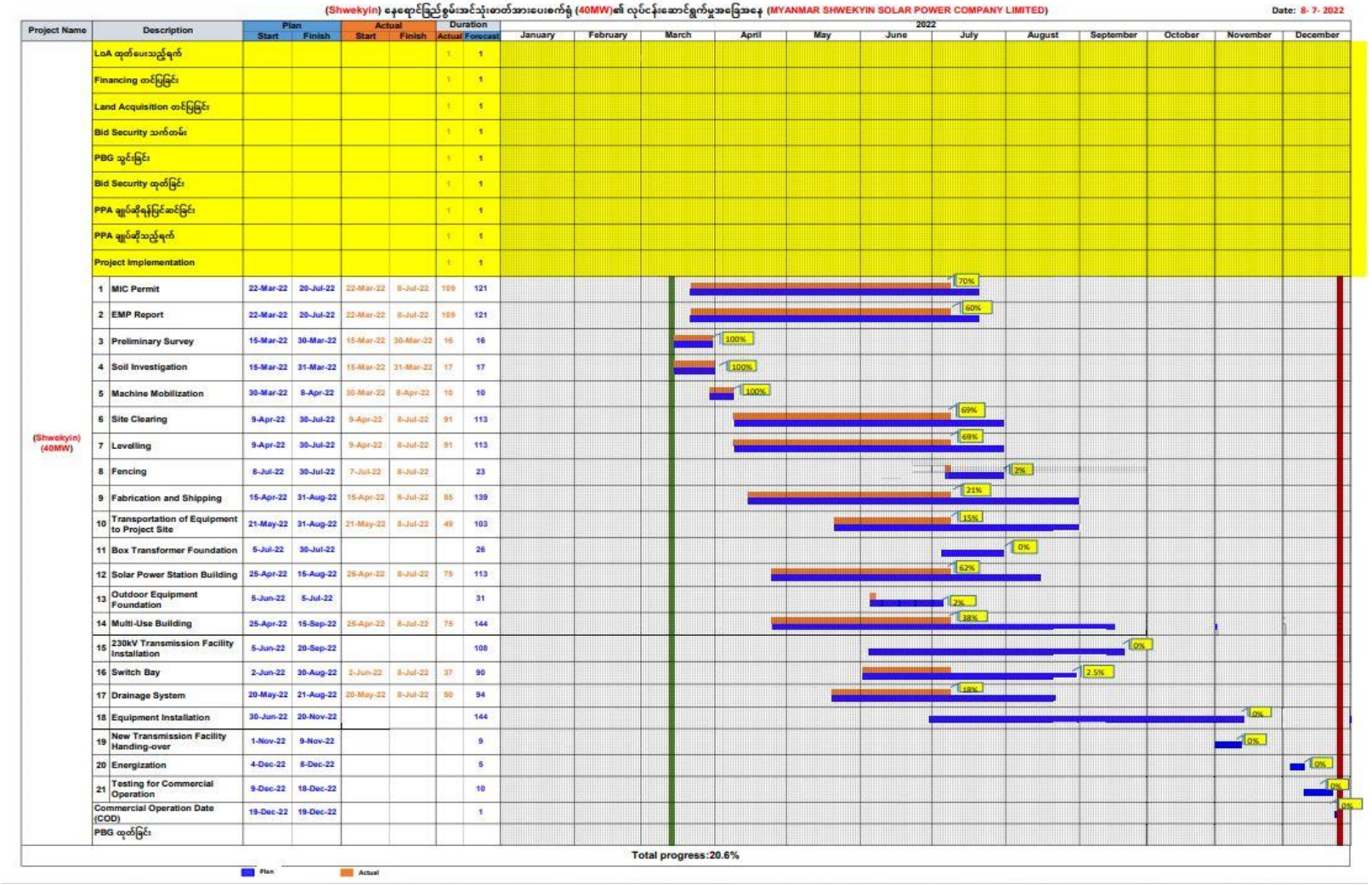

Figure 2.14 - Construction Schedule

2.17.3 Current Conditions of the Project

The following figures show the current site condition of the proposed project.

	
Construction of PV Station	Construction of Living Area
	
Ground clearing for project site	Construction for Solar Panel

Figure 2.15 - Current site condition of the proposed project

2.18 SCADA System Information

All equipment of this PV power station projects are monitored by computer monitoring system. The PV power station project is divided into three levels of monitoring: the inverter boost unit monitors each PV array on the spot of each PV array, in the central control room of the 230kV booster station, the main equipment of the PV array and the electrical equipment of the booster station are centrally monitored. It can be dispatched remotely as required. Monitor the whole PV power plant engineering equipment. The monitoring system of booster station and PV plant area is designed with a unified platform.

The PV arrays of this project are distributed locally and the operation parameters of each PV arrays (including DC input voltage and current, AC output voltage and current, power, grid frequency, fault code and information and solar PV battery series current, etc.) are monitored by the inverter control unit and passed though the inverter communication controller. Upload it to the computer monitoring system of 230kV booster station by optical fiber transmission, and realize the monitoring, alarm and historical data storage of the above operating parameters

in the central control room of booster station through the operator station of computer monitoring system.

In the operator station of the main control room of the 230kV booster station, the parameters of each inverter can be set separately and the startup and shutdown sequence of the inverter system can be set according to the actual weather conditions, so that the operation of the whole PV power station project can be achieve the optimal performance and maximum power generation capacity.

2.19 Permissible Lower Limit of Annual Generation

The allowable lower limit of annual power generation of Shwekyin Solar Power Station is considered as 80% and the annual on-grid power corresponding to the allowable lower limit is shown in following table.

Table 2.11 - Annual power Generation (80% lower allowable limit)

Running Period	Considering the annual power generation (MW-h) corresponding to 80% of the allowable lower limit
Year 1	63,627
Year 2	63,335
Year 3	63,043
Year 4	62,751
Year 5	62,458
Year 6	62,166
Year 7	61,874
Year 8	61,582
Year 9	61,290
Year 10	60,998
Year 11	60,705
Year 12	60,413
Year 13	60,121
Year 14	59,829
Year 15	59,537
Year 16	59,245
Year 17	58,952
Year 18	58,660
Year 19	58,368
Year 20	58,076
Annual Average Value	60,851

2.20 Utilities

2.20.1 Construction Materials and Machines Requirement

Construction materials such as cement, gravel, sand and steel will be exported as well as purchased from local providers for the proposed project. The required sand will get from Shwekyin and gravel from Motepalin. Estimated construction materials requirement are 1,400 tons (cement), 5,500 tons (gravel), 370 tons (steel) and 22,000 cubic feet (chain link) for construction phase.

The construction machines and vehicles such as wheel loader, backhoe, bulldozer, compactor, dump truck and general transportation vehicle will be used for construction of this project.

The following table describes detail constructions machines and vehicles used for this project.

Table 2.12 - Constructions machines and vehicles used for this project

No.	Types	Number
1.	Wheel Loader	2
2.	Backhoe	5
3.	Bulldozer	1
4.	Compactor	1
5.	Dump Truck	10
6.	General Transportation Vehicle	1
Total		20

The following figures show construction machines and vehicles used for proposed project.

Wheel Loader

Backhoe

	
Bulldozer	Compactor
	
Dump Truck	General Transportation Vehicle

Figure 2.16 - Construction machines and vehicles used for proposed project

2.20.2 Water Requirement

Water requirement for construction work is approximately 225,000 gallons per month and domestic water is approximately 15,000 gallons per month. The required water will gets mainly from tube well in the project site and also rain water was stored in a pond to use for construction phase.

The water consumption of booster station is 200L/person, and daily water consumption is 3.2m^3/d for 16 people. The domestic water quality must meet the drinking water quality standard, and a purification treatment system is set for treatment. After treatment, it is stored in a 4m^3 water tank. Domestic water is pressurized by variable frequency pump and supplied to each water point of booster station by branch pipe network.

Regular cleaning of PV modules can improve the power generation efficiency of modules to certain extent. There are few pollution sources in this project, so cleaning once every six months can be considered. The water consumption for cleaning PV modules is estimated as 1.6L/m^2, and the total water consumption for each cleaning is about 330m^3. The cleaning water is taken from the pool by tanker and transported to each water point area, and pressurized by small diesel pump to clean PV panels.

2.20.3 Electricity and Fuel Requirement

Electricity for construction can be connected by 11kV line near the site as power supply. Diesel generator is used for construction as power supply which has capacity of 65KV.

The main type of fuel for construction phase is premium diesel. The required diesel and petrol will get from nearby petrol stations. The estimated amount of diesel is 12,000 gallons and these will store with barrels in storage area.

For operation phase, the estimated amount of diesel is 100 gallons per month and will be stored with fuel storage.

2.20.4 Human Resources Requirement

There are 76 workers for construction work in this project, include about 70 locals and 6 foreigners. In this project working hours is 8 hours per day and work 30 days a month. In construction phase works start at 9:00AM to 5:00PM and one shift per day. In this project, worker camp is provided in project site and rent a house to use as camp in nearby village for migrate workers.

2.21 Waste Generation

2.21.1 Solid Waste Generation\

Wastes will be generated at various stages of project development. The primary forms of solid waste will be cements paper bags, broken bricks, concrete residual waste, scrap metals, glass, woods from construction activities and cutting trees. Improper solid waste management may lead to impact on visual environment and soil because those wastes may contain hazardous substance such as cement and other chemical substances, in additional to health and safety of workers. Construction soil waste will be generated by site clearance, earth working and leveling activities as well as vegetable debris will be generated at the time of land clearance for PV modules, switchyard, multiple-use building and right of way for overhead transmission line. Domestic solid wastes such as garbage and organic waste, communal waste from construction workers camp are other sources of solid waste generation. Additionally, night soil may be generated from the construction base camp.

The primary forms of solid waste will be cement paper bags, broken bricks, concrete residual waste, scrap metals, woods and cutting trees from construction of transmission poles along right of way.

During the operation phase, there is no operation solid waste which is disposed of from the proposed project's operation processes. However, domestic solid waste such as garbage, rejected office materials and organic waste from multiple-use building are common solid

wastes generation. Waste can be generated in case of inappropriate behavior by personnel like careless littering.

2.21.2 Liquid Waste Generation

During the construction phase, cleaning construction machines and construction vehicles, concrete mixing plant within the project site will generate liquid waste. Sanitary wastewater will be discharged of from toilet depending on the number of workers involved. Domestic liquid waste from construction workers camp will be also discharged.

Concrete mixing plant for foundation of transmission poles will generate liquid waste.

During the operation phase, main source of operation liquid waste is cleaning activities for PV modules to promote their efficiency for electricity generation. Domestic liquid waste such as black water from toilets and grey water from basins and bathrooms within the project site will be discharged.

2.21.3 Hazardous Waste Generation

During the construction phase, damaged PV modules due to improper installation are common, hazardous waste generation of the proposed project because PV modules contain toxic chemicals such as Lead and Cadium. Spillage or leakage of diesel and engine oil from vehicles and machine may release as hazardous waste.

During the operation phase, damaged PV modules due to improper handling during cleaning activities and maintenance activities are common hazardous wastes generation. Uninstalled lifespan-expired PV modules due to exchanging new PV modules at the time of extending operation period of the project are also common hazardous wastes. Hazardous waste like waste oil and lubricants and oil containing jutes and rags will be generated during maintenance activities.

For generation of batteries waste, this project does not used batteries to store electricity from PV modules and will distribute directly to Shwekyin Substation via overhead transmission line. If there will be electricity outage in Ground Mounted Solar Power Plant, this project will use electricity from national grid near the project.

CHAPTER 3 - IDENTIFICATION OF THE PROJECT PROPONENT

The proposed 40 MW ground mounted solar power plant project is proposed by Myanmar Shwekyin Solar Power Company Limited, formed by China ITS (Holdings) Co., Ltd., which is a China-based company and a successful bidder for EPGE solar Tender PV (Bid No. EPGE PV 02/2021-2022). The project is located at Ingani Village Tract, Shwekyin Township, Bago District, Bago Region. The construction processes of the proposed project will take about 8 months and then operation processes to generate electricity from solar energy and distribute to the Shwekyin Substation for 20 years. During the construction period, Myanmar Shwekyin Solar Power Company Limited is responsible for the proposed project.

3.1 Information of the Project Proponent

Myanmar Shwekyin Solar Power Company Limited is in order to implement the proposed project. The following table describes the management responsible persons and the following figure shows the organization chart of Myanmar Shwekyin Solar Power Company Limited.

Table 3.1 – Mangement list of Myanmar Shwekyin Solar Power Company Limited

No.	Name	Position	National Registration Card Number/ Passport and Nationality	Company Address
1.	Mr. Jiang Xingcheng	Director	PE2174891	Corner of Malikha Street and Pathonemar 5th Street, A-031 Shwe Kyar Pin Quarter, Zabuthiri Township, Nay Pyi Taw, Myanmar

Table 3.2 – Mangement Employments list of Myanmar Shwekyin Solar Power Company Limited

No.	**Rank**	**Number**		**Total**
		Local	**Foreign**	
1.	Senior Management (Manager/Senior Official)	1	1	2
2.	Professionals	2	1	3
3.	Technicians	2	1	3
4	Skilled Labors	1	1	2
5	Workers	7	2	9
Total		**13**	**6**	**19**

3.2 Bidder Information

China Intelligent Transportation System (Holdings) Co., Ltd. is a company based in China and is doing railway business, civil aviation business, sustainable business, and overseas business and investor relations. The following table describes the shareholders of Myanmar Shwekyin Solar Power Company Limited.

Table 3.3 – Shareholders of Myanmar Shwekyin Solar Power Company Limited

No.	Name	Country	Registration Number	Percentage	Address
1.	Hytrust Energy (Singapore) Investment Pte. Ltd.	Singapore	20220979	100%	250, North Bridge Road, #36-01 A, Raffles City Tower, Singapore (179101)

Table 3.4 - Bidder of Proposed Project

Name of Bidder	China ITS (Holdings) Co., Ltd.	
Head office address	Building 204, Jia 10 Courtyard, Jiuxianqiao North Road, Chaoyang District, Beijing, China.	
Telephone/Contact	+959770437886	Zhang Zhitao
E-mail/Alternative E-mail	Zhitao1024@hotmail.com	Phyu.kiec@gmail.com
Place and Year of incorporation/registration	Cayman Islands	2008

The following figure shows the organization chart of China (ITS) Holding Co., Ltd.

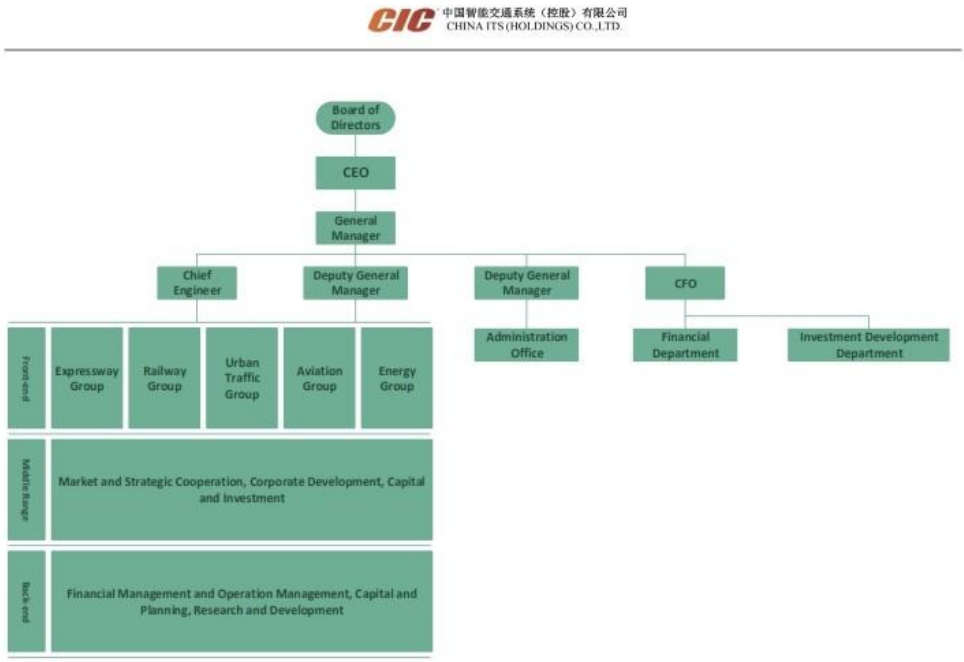

Figure 3.1 - Organizational Chart of China (ITS) Holding Co., Ltd.

3.3 Organizational Structure of 40 MW Ground Mounted Solar Power Plant

The following figure shows the organization chart of Myanmar Shwekyin Solar Power Company Limited.

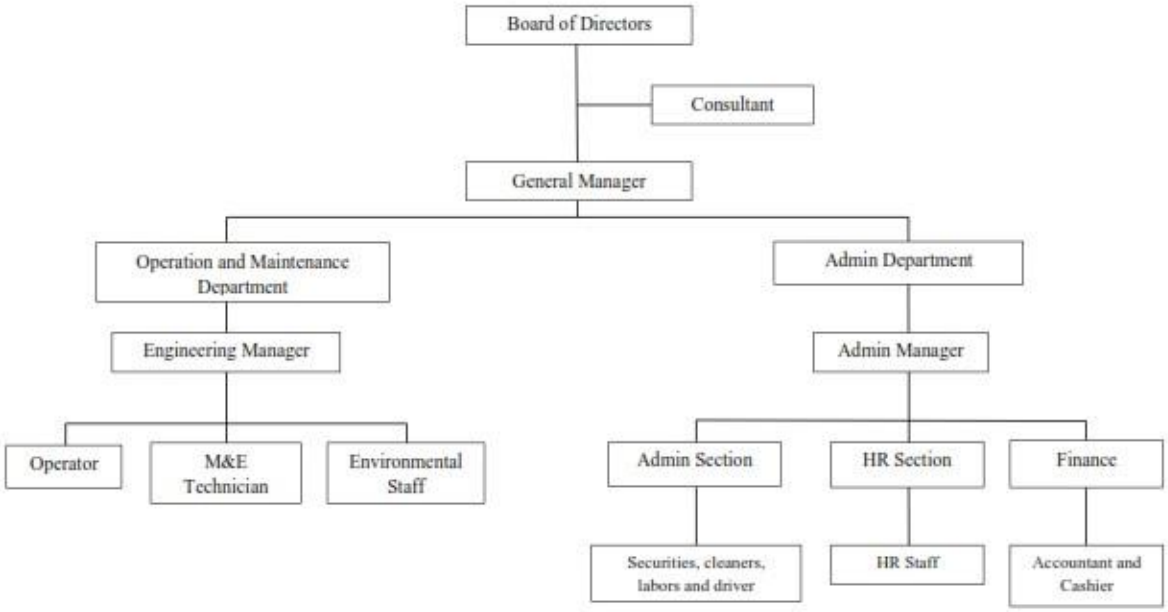

Figure 3.2 - Organizational Chart of Myanmar Shwekyin Solar Power Company Limited

3.4 Investment Plan

The total investment amount for the proposed project is 38.5 million USD and it includes investment for financing, materials, equipment, infrastructure and land lease cost. The following table describes detail investment plan for the proposed project.

Table 3.5 – Investment Plan of the Proposed Project

No.	Category	Investment Amount (Million USD)
1.	Materials and Equipment	36.77
2.	Infrastructure and Land lease cost	0.55
3.	Investment for financing	1.18
Total		**38.5**

CHAPTER 4 - IDNETIFICATION OF THE EMP EXPERTS

The Environmental Management Plan (EMP) for the proposed 40 MW Ground Mounted Solar Power Plant Project connected to Shwekyin Substation is prepared by E Guard Environmental Services Co., Ltd. The environmental study was carried out by the study team and the following is a summary of team member's responsibilities.

U Soe Min (Lead Consultant)

U Soe Min is team leader of the consultant team responsible for successful implementation of the project in all aspects. He is a civil, water resources and environmental engineer. He holds Bachelor of Civil Engineering (Rangoon Institute of Technology, 1984) and Master of Environmental Engineering (Asian Institute of Technology, 2001). He had involved with Water Resources Development Projects in Myanmar and trained in Japan for Irrigation and Drainage Engineering by JICA when he was working for Irrigation Department of Myanmar for 8 Yrs. He had work experiences in Thailand (5 Yrs) and in Singapore (10 Yrs) as civil water resources-environmental engineer at institute and private companies. He had involved in water resources development projects from investigation and feasibility studies to planning, design and construction, and environmental impact assessments. He has experiences of local and international practices on construction management, contractual documentations, and establishment of environmental data acquisition systems. Taking the role of a local environmental consultant, he is leading the local consultant team, E Guard Environmental Services Co., Ltd., and collaborating with international consultant firms in doing EIA reporting in Myanmar. He had involved as a local consultant to ADB and World Bank supporting capacity-building projects in strengthening environmental safeguard systems in Myanmar.

Dr. Myint Oo (Advisor)

Dr. Myint Oo, Rector (Retired) of University of Forestry and Environmental Science, Yezin, Ministry of Natural Resources and Environmental Conservation, worked for the Ministry for 35 years from 1984 to 2019. He obtained M. Sc. and Ph. D. Degrees from Göttingen University, Germany with special reference to tropical forest resources assessment using remotely sensed data and geographic information system. As a government employee he was involved in forest management planning and implementation, organizing and conducting forestry research studies, training, international relation, administration and teaching of forestry and environment-related subjects at the University. After retirement in 2019 he joined E Guard Environmental Services Co. Ltd. as an advisor, attended the training course on 'Principles of Environmental Impact Assessment Review' organized by AIT Center in Vietnam, and has been involved in internal review process of EIA studies implemented by project teams of the company, as well as providing advices to project team members.

U Htet Aung (Assistant Consultant/ Team Leader)

U Htet Aung is an Assistant Consultant, received Master Degree with Petroleum Geology from Yangon University in 2015. He has three years experiences in data collections and report writing. He is currently preparing environmental reports, conducting public consultation and information gathering processes. He was participated in the preparation of Environmental Impacts Assessment (EIA) Report of Yangon Outer Ring Road (YORR) Construction Project and Nyaungdon Bank Protection and Rehabilitation Project. He was leading for Data Analysis and Impact Assessment, Stakeholder engagement and Public Consultation Meeting and Technical Report Writing of this EMP report.

Daw Thein Mwe Khin (Consultant/ Social Expert)

Daw Thein Mwe Khin is an Associate Consultant, who received her Master Degree in Regional and Rural Development Planning from Asian Institute of Technology in 2019 and Bachelor Degree in Forestry from the University of Forestry in 2013. She is currently working as a social expert in Yangon Outer Ring Road Construction Project, Hanthawaddy New international Airport Development Project and Wataya bridge Construction project. She had experience in working as a survey team leader for YCRL Updating Project and Dryzone Water Supply Project in 2014, 2015 and 2016 respectively. She had her expereinces in working as a core team member of the social team who did the prearation of RAP for Construction of Kyarkalay Bypass and 2 Bridges and RAP for Construction of Thaton Bypass and 2 Bridges in 2014. In addition, she has a project leader role in the preparation of four IEE reports for various types of projects, tender preparation, many social surveys, FGDS for various EIA/IEE/EMP projects during around five years of working life in EIA field. She also studied the socioeconomic impact of rural electrification on the well-being of rural households in central dry zone, Myanmar as her master thesis in 2018.

U Aung Si Thu Thein (Consultant)

U Aung Si Thu Thein is an Assistant Consultant, who received his Bachelor Degree in Forestry from the University of Forestry in September, 2015. He also received Post Graduate Diploma in Geographic Information Systems from the Dagon University in February, 2018. Moreover, he pursued his Master of Science Degree in Natural Resources Management from the Asian Institute of Technology, Thailand in May, 2020. He has almost four years-experience in preparation of Environmental Management Plan and Initial Environmental Examination Reports for various development projects as a Lead Consultant and in participation many Environmental Impact Assessment and Resettlement Action Plan projects for development projects in Myanmar. On the other hand, he has two years-experience in research conducting with regards to impacts assessment of natural resources management systems on livelihood of local people. Moreover, he has many experiences in communication with clients, government authorities and local people, stakeholder engagements and public consultation meetings conduction and socio-economic survey.

Daw Htet Shwe Sin Aung (Assistant Consultant)

Daw Htet Shwe Sin Aung is an environmental specialist at E Guard Environmental Services Co., Ltd. She graduated since 2017 with the Master of Science specialized in Zoology from Yangon University. She has three years experiences in surveying the fauna, writing report and good experience in lab works. Now she is responsible for surveying fauna data and report writing, gathering information for the environmental reports, conducting socioeconomic surveys, cooperating with clients including NGOs, Local and Governmental agencies for the projects, assisting and cooperating in writing of environmental reports. Her responsibilities are surveying fauna data analyzing and writing report.

Daw Shwe Ya Min Bo (Assistant Consultant)

Daw Shwe Ya Min Bo is an Environmental Specialist, who received her Bachelor Degree in Forestry from the University of Forestry and Environmental Sciences in November, 2016. She also received Post Graduate Diploma in Geographic Information System and Remote Sensing and Post Graduate Diploma in Environmental Studies from University of Yangon in December, 2019. She has almost five years-experiences in preparation of Environmental Management Plan and Initial Environmental Examination reports for various development projects and in participation many Environmental Impact Assessment and Resettlement Action Plan projects including Japan's ODA loan projects. She also participates in the activities of socio-economic survey, biodiversity survey, and reviewing the reports. She was responsible for Planning and Identifying, Coordinating, Data Analysis and Impact Assessment, Stakeholder engagement and Public consultation meeting and Technical Report Writing.

U Kyaw Soe Moe (Environmental Specialist)

U Kyaw Soe Moe is an Environmental Specialist who received Bachelor of Civil Engineering from Taunggyi Technological University in 2016 and Post Graduate in GIS from Dagon University, Yangon in 2019. He has more than five years of experiences in conduction stakeholder engagement, public consultation, social survey and site visit. His contributions on preparation of EIA for this project are site visiting, primary and secondary data supervision, environmental quality data analysis and assisting on environmental and social impacts assessment consideration and writing environmental management plans and mitigation measures.

Daw Thet Shwe Yee Aung (Project Associate)

Daw Thet Shwe Yee Aung is working as Project Associate in E Guard Environmental Services. She completed her Bachelor Degree in Geology from University of Yangon in 2018. She has more than three years-experience in conduction stakeholder engagement and public consultation, social survey and site visit. She is currently assisting in preparing environmental

reports, drawing maps, public consultation and information gathering processes. Contact: 09-797005173; thetshweyeeaung@eguardservices.com

Daw May Thu Win (Legal Analyst)

Daw May Thu Win is working as a Project Assistant in E Guard Environmental Services Co., Ltd. She obtained her Bachelor Degree in Law from East Yangon University (Tarwa) in 2018. In this project, her responsibilities are legal aspect conformity analysis laws, rules, regulations, policies, agreements, international conventions, protocols, derivatives, announcements and notifications used for environmental reports, cooperating in public consultations and information gathering process.

Daw Nang Aye Thida (Project Associate)

Daw Nang Aye Thida is working as a project assistant in E-Guard Environmental Services Co., Ltd. She obtained her Bachelor degree in Civil Engineering from Technological University (Taunggyi). She has over three years experiences working in Environmental and Social Fields. She has her experience in preparing Environmental Management Plan (EMP) report for New Donthami Bridge Construction Project and experience in working as one of the core team member of social team who did the preparation of RAP for Yangon Outer Ring Road (Eastern Section) Construction Project, Hanthawaddy New International Airport Development Project. Additionally, she has experience in collecting information, conducting socioeconomic surveys, data entry and analyzing, involved in engagement with stakeholders as well as the project owners, governmental organizations and public consultation meeting, site visit, impact assessment and reporting for the other relevant projects.

Daw Shar Thae Hoy (Project Assistant Internship)

Daw Shar Thae Hoy, graduated with a qualified bachelor's degree in Plant Biology from the University of Yangon. She put a strong emphasis on environmental science in her final year research studies term paper, analyzing the quality of the water from the MyitNge River and how it affects local public health issues. In these research studies, she has seen the critical situation of water pollution and the uttermost importance of water sanitation. Academically, she also has a keen enthusiasm for plants, ecosystems, and community ecology and possesses 4 years of lab and fieldwork experience, working hand in hand on projects in the field of ecological sciences, monitoring and identifying plant species. Furthermore, excellent written communication, technical and report writing, field assessment, and data analysis are other particular skills of her working attributes. She is devoted to environmental protection because she has participated in numerous trainings such as the "World Green Organization Youth Leadership Training Program", the "Air Quality Measurement and Monitoring Training Program" organized by the University of Toronto as well as being an "Ambassador of Sustainability International Training Program". She is applying all of her academic knowledge by working as a project assistant internship role at E-Guard Environmental Service, in which

responsibilities include assisting senior project associates in researching and gathering information, especially for the physical and biological environmental impacts and mitigation for environmental reports.

U Wunna Zaw (Surveyor)

U Wunna Zaw is a surveyor who specializes in instrumentation and field data collection of environmental condition of the site and measuring of environmental baseline data. He has experiences at onsite data collection of many project, since 2018 to present. He attended and finished "Occupational Safety and Health Supervisor Course" sponsored by WIN OSHE Co., Ltd.

The full address of the company conducting this EMP report is as followed.

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URL: www.eguardservices.com

CHAPTER 5 - POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

We, Myanmar Shwekyin Solar Power Company Limited, had made commitment that this report is strongly prepared by following the related existing Laws and Rules including EIA Procedure and mitigation measures already stated in this Environmental Management Plan (EMP) report for the proposed 40 MW Ground Mounted Solar Power Plant Project Connected to Shwekyin Substation. Moreover, we also committed to operate the proposed project by following the plans and mitigation measures stated in this EMP report.

We, E Guard Environmental Services Co., Ltd. had also made commitment to follow and compliance with the related existing Laws, Environmental Conservation Law, Rules, Environmental Impact Assessment Procedure, National Environmental (Quality) Emission Guidelines, Standards and Mitigation Measures stated in this Environmental Management Plan (EMP) report for the proposed 40 MW Ground Mounted Solar Power Plant Project Connected to Shwekyin Substation operated by Myanmar Shwekyin Solar Power Company Limited.

The National Laws and Regulations for the Environmental Protection applicable to the proposed project are described as followings.

1. The Environmental Conservation Law (2012)
2. The Environmental Conservation Rule (2014)
3. Environmental Impact Assessment Procedure (2015)
4. National Environmental Quality (Emission) Guidelines (2015)
5. Myanmar National Environmental Policy (2019)
6. Myanmar Climate Change Policy (2019)
7. National Land Use Policy (2016)
8. Myanmar Investment Law (2016)
9. Foreign Investment Rules (2013)
10. The Law Amending The Prevention and Control of Communicable Disease Law (2011)
11. Prevention of Hazards from Chemical and Related Substances Law (2013)
12. The Control of Smoking and Consumption of Tobacco Product Law (2006)
13. Myanmar Fire Brigade Law (2015)
14. Motor Vehicles Safety and Management Law (2020)
15. The Myanmar Insurance Law (1993)
16. The Public Health Law (1972)
17. Labour Organization Law (2011)
18. Settlement of Labour Dispute Law (2012)
19. The Development of Employment and Skill Law (2013)
20. The Minimum Wages Law (2013)

21. The Payment of Wages Law (2016)
22. Workmen's Compensation Act (1923)
23. The Leaves and Holiday Act (1951)
24. Social Security Law (2012)
25. Occupational Safety and Health Law (2019)
26. The Rights of National Races Law (2015)
27. The Petrol and Petroleum Product Law (2017)
28. Forest Law (2018)
29. Freshwater Fisheries Law (1991)
30. The Underground Water Act (1930)
31. The Electricity Law (2014)
32. The Farm Land Law (2012)
33. Natural Disaster Management Law (2013)

1) The Environmental Conservation Law (2012)

Purpose: To construct a healthy and clean environment and to conserve natural and cultural heritage for the benefit of present and future generations; to maintain the sustainable development through effective management of natural resources and to enable to promote international, regional and bilateral cooperation in the matters of environmental conservation.

- The project proponent has to pay the compensation for damages if the project will causes injuries to environment, under the sub-section (o) of section 7 of said law.

- The project proponent has to purify, emit, dispose and keep the polluted materials in line with the stipulated standards, under section 14 of said law

- The project proponent has to install or use the apparatus, which can control or help to reduce, manage, control or monitor the impacts on the environment, under section 15 of said law.

- The project proponent has to allow relevant governmental organization or department to inspect whether performing is conformity with the terms and condition included in prior permission, issued by the ministry, or not, under section 24 of said law.

- The project proponent has to comply with the terms and conditions included in prior permission, under section25 of said law.

- The project proponent has to abide by the stipulations included in the rules, regulation, by-law, order, notification and procedure issued by said law, under section 29.

2) The Environmental Conservation Rule (2014)

- The project proponent has to avoid emit, discharge, or dispose, direct to discharge or dispose the materials which can pollute to environment, or hazardous waste or hazardous material prescribed by notification in the place where directly or indirectly injure to public, under sub- rule (a) of rule 69.

- The project proponent has to avoid performing to damage to ecosystem and the environment generated by said ecosystem, under sub-rule (b) of rule 69.

3) Environmental Impact Assessment Procedure (2015)

- The project proponent has to be liable for all adverse impacts caused by doing or omitting of project owner or contractor, sub-contractor, officer, employee, representative or consultant who is appointed or hired to perform on behalf of project owner, under sub-paragraph (a) of paragraph 102.

- The project proponent has to support, after consultation with effected persons by project, relevant governmental organization, governmental department and other related persons to resettlement and rehabilitation for livelihood until the effected persons by the project receiving the stable socio-economy, which is not lower than the status in pre-project, under sub-paragraph (b) of paragraph 102.

- The project proponent has to implement fully all commitments of project and conditions included in EMP. Moreover the project proponent has to be liable for contractor and sub-contractor who perform on behalf of him/her have to fully abide by the relevant laws, rules, this procedure, EMP and all conditions, under paragraph 103.

- The project proponent has to be liable and fully & effectively implement all requirements included in ECC, relevant laws and rules, this procedure and standards under rule 104.

- The project proponent has to inform the completed information, after specifying the adverse impacts caused by the project, from time to time, under paragraph 105.

- The project proponent has to continuously monitor all adverse impacts in the pre-construction phrase, construction phrase, operation phrase, suspension phrase,

closure phrase and post-closure phrase, moreover has to implement the EMP with abiding the all conditions included in ECC, relevant laws & rules and this procedure, under paragraph 106.

- The project proponent has to submit, as soon as possible, the failures of his or her responsibility, other implementation, ECC or EMP. If dangerous impact caused by this failure or failure should be known by the Ministry the project proponent has to submit within 24 hours and other than this situation has to submit within 7 days from knowing it, under paragraph 107.

- The project proponent has to submit the monitoring report semiannually prescribed time by Ministry in line with the schedule of EMP, under paragraph 108.

- The project proponent has to prepare the monitoring report in accord with the rule 109.

- The project proponent has to show this monitoring report in public place such as library, hall and website and office of project for the purpose to know this report by public within 10 days from the date, which the report is submitted to the Ministry. Moreover has to give the copy of this report, by email or other way which way agreed with the asked person, to any asked person or organization, under paragraph 110.

- The project proponent has to allow inspector to enter and inspect in working time and if it is needed by Ministry has to allow inspector to enter and inspect in the office and work place of project and other work place related to this project in any time, under paragraph 113.

- The project proponent has to allow inspector to immediately enter and inspect in any time if it is emergency or failure to implement the requirements related to social or environment or caused to it, under paragraph 115.

- The project proponent has to allow inspector to inspect the contractor and sub-contractor who implements on behalf of project, under paragraph 117.

4) Nation Environmental Quality (Emission) Guidelines (2015)

- The project proponent has to emit, discharge (or) dispose anything in line with the standards stipulated in said guideline.

5) Myanmar National Environmental Policy (2019)

Mission: To achieve a clean environment, with healthy and functioning ecosystems, that ensures inclusive development and wellbeing for all people in Myanmar.

Vision: To establish national environmental policy principles for guiding environmental protection and sustainable development and for mainstreaming environmental considerations into all policies, laws, regulations, plans, strategies, programs and projects in Myanmar.

6) Myanmar Climate Change Policy (2019)

Vision: To be a climate-resilient, low carbon society that is sustainable, prosperous and inclusive, for the wellbeing of present and future generations.

Purpose: To create and maximize opportunities for sustainable, low carbon, climate resilient development, ensuring benefits for all.

7) National Land Use Policy (2016)

Objectives:

- To promote sustainable land use management and protection of cultural heritage areas, environment, and natural resources in the interest of all people in the country;
- To strengthen land tenure security for the livelihoods improvement and food security of all people in both urban and rural areas of the country;
- To recognize and protect customary land tenure rights and procedures of the ethnic nationalities;
- To develop transparent, fair, affordable and independent dispute resolution mechanisms in accordance with the rule of law;
- To promote people centered development in land resources and accountable land use administration in order to support the equitable economic development of the country;
- To develop a National Land Law in order to implement the above objectives of the National Land Use Policy.

8) Myanmar Investment Law (2016)

Purpose: To ensure the appointing of employees, fulfilling the rights of employees, avoiding any injury to environment, social and cultural heritage, insure the prescribed insurance in line with the above law. This law focuses as follows,

- The project proponent has to register the land lease contract at the specific registration office, under sub-section (d) of section 51 of said law. (if the land lease contract is needed)

- The project proponent has to appoint the nationalities in the various levels of administrative, technical and expert work by the arrangement to develop their expertise, in line with the sub-section (b) of section51of said law.

- The project proponent has to appoint the nationalities only in normal work without expertise, in line with the sub-section (c) of section51of said law.

- The project proponent has to appoint either foreigner or nationality with the appointment agreement in accord with the law, in line with the sub-section (d) of section51of said law.

- The project proponent has to comply with the international best practices, existing laws, rules and procedures to not damage, pollute, and injure to environment, cultural heritage and social, in line with the sub-section (g) of section65of said law.

- The project proponent has to close the project after paying the compensation to the employees in accord with the existing laws if violates the appointment agreement or terminate, transfer or suspend the investment or reduce the number of employees , in line with the sub-section (i) of section65of said law.

- The project proponent has to pay the wages or salary to the employees in accord with the laws, rules, order and procedures in the suspension period, in line with the sub-section (j) of section65of said law.

- The project proponent has to pay the compensation or injured fees to the respected employees or their inheritors if injury in or loss of part of body or death caused by work, in line with the sub-section (k) of section 65of said law.

- The project proponent has to stipulate the foreign employees to respect the culture and custom and abide by the existing laws, rules, orders, directives, in line with the sub-section (l) of section65of said law.

- The project proponent has to abide by labor laws, in line with the sub-section (m) of section65of said law.

- The project proponent has to pay the compensation to the injured person for damages if damages of environment or socio-economy are occurred by misuse of project, in line with the sub-section (o) of section 65of said law.

- The project proponent has to allow to inspect in anywhere of project if Myanmar Investment Commission inform to inspect the project, in line with the sub-section (p) of section 65 of said law.

- The project proponent has to obtain the permission of MIC before EIA process and report this process to MIC, in line with the sub-section (q) of section 65 of said law.

- The project proponent has to insure the prescribed insurance by rules, under section 73 of said law.

9) Foreign Investment Rules (2013)

The promoter or investor shall:

- comply with Environmental Protection Law in dealing with environmental protection matters related to the business;
- shall carry out socially responsible investment in the interest of the Union and its people;
- shall co-operate with authorities for occasional or mandatory inspection;
- shall exercise due diligence to be in conformity and harmony with norms and standards prescribed by relevant Union Ministry in conducting construction of factories, workshops, buildings, and other activities;
- shall enforce Safety and Health under rule 54 of said rule.

10) The Law Amending the Prevention and Control of Communicable Diseases Law (2011)

Purpose: To ensure the healthy work environment and prevention the communicable diseases by the cooperation with the relevant health department.

- The project proponent has to build the housing in line with the health standards, distribute the healthful drinking water & using water and arrange to systematically discharge the garbage and sewage, under clause (9) of sub-section (a) of section 3 of said law.

- The project proponent has to abide by any instruction or stipulation by Department of health and Ministry of Health, under section 4 of said law.

- The project proponent has to inform promptly to the nearest health department or hospital if the following are occurred; (under section 9)

- Mass death of animals included in birds or chicken;

- Mass death of mouse;

- Suspense of occurring of communicable disease or occurring of communicable disease;

- Occurring of communicable disease, this must be informed.

- The project proponent has to allow any inspection, anytime, anywhere if it is need to inspect by health officer, under section 11 of said law.

11) Prevention of Hazards from Chemical and Related Substances Law (2013)

Purpose: To ensure to use the hazardous chemical and related substances safely and safety for the employees. Moreover, safety in carrying the hazardous chemical and related substances and storage place of it. If it is needed to train how to use the safety dresses, which provided to the employees with free of charges. Insure to compensate for injury to person or damage to environment. The project has to be inspected for safety use of hazardous chemical and related substances before starting the project.

- The project owner will be inspected for the safety and resistance of the machinery and equipment by the respective Supervisory Board and Board of Inspection before starting the business under sub-section (a) of section 15 of said law.

- The project owner will assign the employees, who will serve with the hazardous chemical and substances, to attend the trainings on prevention of hazardous chemical and substances in local or abroad under sub-section (b) of section 15 of said law.

- The project owner will abide by the conditions included in the license under sub-section (a) of section 16 of said law.

- The project owner will abide by and assign to the employees who serve in this work to abide by the instructions for safety in using the hazardous chemical and related substances under sub-section (b) of section 16 of said law.

- The project owner will arrange the enough safety equipment in the work place and provide the safety dresses to the employees who serve in this work with free of charge under sub-section (c) of section 16 of said law.

- The project owner will train, in work place my arrangement, the know how to use the occupational safety equipment, personal protection equipment and safety dresses systemically in the work place under sub-section (d) of section 16 of said law.

- The project owner will allow the receptive Supervisory Board and Board of Inspection to inspect whether the hazard may be injured to health of human, animal, or damaged to environment under sub-section (e) of section 16 of said law.

- The project owner will assign the healthy employees who have obtained the recommendation that is fit for this work after taken medical check- up and keep systematically the medical records of employees under sub-section (f) of section 16 of said law.

- The project owner will inform the copy of storage permission for hazardous chemical and related substances to the relevant township administrative office under sub-section (g) of section 16 of said law.

- The project owner will obtain the approval with instructions of relevant fire force before starting the work if the project will use the fire hazard substances or explosive substances under sub-section (h) of section 16 of said law.

- The project owner will transport only the limited amount of the chemical and related substance in accord with the prescribed stipulations in local transportation under sub-section (i) of section 16 of said law.

- The project owner will insure, in accord with the stipulations, to pay the compensation if the project cause injury to person or animals or damage to environment under section 17 of said law.

- The project owner will abide by the conditions included in the registration certificate. Moreover will abide by the orders and directives issued by the Central Supervisory Board from time to time under section 22 of said law.

- The project owner will classify the level of hazard to protect it in advance according to the properties of chemical and related substances under sub-section (a) of section 27 of said law.

- The project owner will provide the safety equipment, personal protection equipment to protect and reduce the accident and assign to attend the training to use the equipment systematically under sub-section (c) of section 27 of said law.

- The project proponent has to abide any regulation contained in license and any regulation contained in license and any regulation contained in certificate under section 30 of said law.

12) The Control of Smoking and Consumption of Tobacco Product Law (2006)

Purpose: To ensure the creation of smoking area and non-smoking area in the power plant area for health and control of smoking.

- The project proponent has to keep the caption and mark referring that is non-smoking area in the project area under sub-section (a) of section 9 of said law.

- The project proponent has to arrange the specific place for smoking in the project area, keep the caption and mark in accordance with the stipulations under sub-section (b) of section 9 of said law.

- The project proponent has to supervise and carry out the measures so that no one shall smoke at the non-smoking area under sub-section (c) of section 9 of said law.

- The project proponent has to allow the inspection of supervisory body in the power plant area, under sub-section (d) of section 9 of said law.

13) Myanmar Fire Brigade Law (2015)

Purpose: To ensure to prevent the fire, to provide the precautionary material and apparatuses, if the fire caused in the project area to be defeated because the project is business in which electricity and any inflammable materials such as petroleum are used. Therefore, the project owner has to institute the specific fire service in line with the above law. This law focuses the following

- The project proponent has to institute the specific fire services if it is needed, under sub-section (a) of section 25.

- The project owner has to provide materials and apparatuses for fire precaution and prevention, Sub-section (b) of section 25.

14) Motor Vehicles Safety and Management Law (2020)

Purpose: When the construction period and if it is needed in operation and production period for the all vehicles.

- The project proponent has to comply with the restrictions and restrictions on the use of domestic vehicles by the Ministry of Transport and Communications with the approval of the Union Government under sub-section (a) of section 9 of said law.

- The project proponent has to comply with safety, environmental regulation, standards and regulations regarding the initial registration of vehicles issued by the Ministry under sub-section (c) of section 12 of said law.

- The project proponent has to drive at the speed limit set by the Road Transport Directorate to ensure the safe movement of vehicles on public roads under sub-section under sub-section (r) of section 14 of said law.

- The project proponent has to maintain the vehicles in accordance with the standards set by the Department so that it can be driven safely under sub-section (a) of section 18 of said law.

- The project proponent has not to carry or transport hazardous materials in public places in accordance with the regulations under sub-section (g) of section 81 of said law.

15) The Myanmar Insurance Law (1993)

Purpose: The project can cause the damages to the environment and injuries to public so to ensure the needed insurances are insured at Myanma Insurance. This law focuses the following matters;

- If the project proponent uses the owned vehicles, the project owner has to insure the insurance for injured person under section 15 of said law.

- The project proponent has to insure the insurance to compensate for general damages because the project may cause the damages to the environment and injury to public under section 16 of said law.

16) The Public Health Law (1972)

Purpose: To ensure the public health include not only employees but also resident people and cooperation with the authorized person or organization of health department. The project owner will cooperate with the authorized person or organization in line with the section 3 and 5 of said law.

Section 3 - The project proponent has to abide by any instruction or stipulation for public health.

Section 5 - The project proponent has to allow any inspection, anytime, anywhere if it is needed.

17) Labour Organization Law (2011)

Purpose: To ensure protection the rights of the employees, having the good relationships between the employees and employer and enabling to form and carry out the labour organizations systematically and independently.

- The project owner promises to allow the labour organization, to negotiate and to settle with the employer if the workers are unable to obtain and enjoy the rights of the workers contained in the labour laws and to summit demands to the employer and claim in accord with the relevant law if the agreement cannot be reached under section 17 of said law.

- The project proponent promises to demand the re-appointment of worker who is dismissed by the employer, without the conformity with the labour laws under section 18 of said law.

- The project proponent promises to send the representatives to the Conciliation Body in settling a dispute between the employer and the worker under section 19 of said law.

- The project proponent promises the labour organization to participate and discuss in discussing with the government, the employer and the complaining employees in respect of employee's rights or interest contained in the labour laws under section 20 of said law.

- The project proponent promises the labour organization to participate in solving the collective bargains of the employees in accord with the labour laws under section 21 of said law.

- The project proponent promises the labour organization to carry out the holding the meetings, going on strike and other collective activities in line with the procedure, regulation ,by-law and directive of relevant Chief Labour Organization under section 22 of said law.

18) Settlement of Labour Dispute Law (2012)

Purpose: To ensure negotiation and discussion between employees and project proponent, abiding the decision of Tribunal. This law focuses as follows;

- The project proponent has to not absent to negotiation within the stipulated time for complaint, under section 38 of said law.
- The project proponent has not to change the existing stipulations for employees within conducting period before Tribunal, under section 39 of said law.
- The project proponent has not to close the work without negotiation, discussion on dispute in accord with this law, decision by Tribunal, under section 40 of said law.
- The project proponent has to pay the compensation decided by Tribunal if violates any act or any omission to damage the interest of labour by reducing of product without efficient cause, under section 51 of said Law.

19) The Development of Employment and Skill Law (2013)

Purpose: To ensure the job security and to develop the employee's skill with the fund of project owner:

- The project proponent has to appoint employees with the contract in line with the provision of section 5 of said law.
- The project proponent has to carry out the training programs with the policy of Skill Development Body to develop the employment skill of employees who is appointed or will be appointed, under section 14 of said law.
- The project proponent has to monthly pay to the fund, which is fund for development of skill of employees, not less below 0.5 percentage of the total payment to the level of worker supervisor and the workers below such level, under sub-section (a) of section 30 of said law.

- The project proponent has to promise not to deduct from the payment of employees for above-mentioned fund, under sub-section (b) of section 30 of said law.

20) The Minimum Wages Law (2013)

Purpose: To ensure the project owner pay the wages not less than prescribed wages and notify obviously this wages in work place, moreover to be inspected.

- The project proponent has to pay the wages in line with section 12 of said law.
- The project proponent has to notify the prescribed wages obviously in work place under sub-section (a) of section 13 of said law.
- The project proponent has to record correctly the lists, schedules, documents, and wages, report these to the relevant department, and give if these are asked while inspecting, in accord with the stipulations under sub-section (b) (c) (d) of section13 of said law.
- The project proponent has to allow to be inspected by the inspector, under sub-section (d) and (e) of section 13 and section 18 of said law.
- The project proponent has to allow holiday for medical treatment if the employee' health is not fit to work, under sub-section (f) of section 13 of said law.
- The project proponent has to allow holidays without deducting from the wages if one of parents or one of family dies, under sub-section (g) of section 13 of said law.

21) The Payment of Wages Law (2016)

Purpose: To ensure the way of payment and avoiding delay payment to the employees. This law focuses as follows;

- The project proponent has to pay the wages in accord with the section 3 and 4 of said law under section 3 and 4 of said law.
- The project proponent has to submit with the agreements of employees & reasonable ground to department if it is difficult to pay because of force majeure included in natural disaster, under section 5 of said law.

- The project proponent has to abide by the provisions of section 7 to 13 in chapter (3) in respect of deduction from wages.

- The project proponent has to pay the overtime fees, prescribed by law, to the employees who work over working hours, under section 14 of said law.

22) Workmen's Compensation Act (1923)

Purpose: To ensure the compensations to injured employee while implementing in line with the above law and pay the prescribed compensations in various kinds of injury. This law focuses as follow;

Section 13 -The project proponent has to pay the compensation in line with the provisions of said law base on kind of injury and case-by-case.

23) The Leaves and Holiday Act (1951)

Purpose: The employees can take the leaves and get the holidays legally and to ensure the right to get the holidays and leaves. This law focuses the following matters;

- The project proponent has to allow the leaves and holidays in line with the law.

24) Social Security Law (2012)

Purpose: The project proponent has to create the social security for the employees because the project is the business under the Myanmar Citizen Investment Law. To ensure the social security for employees of the project, the project owner has to register to the social security offices and to pay the prescribed fund.

- The project proponent has to register to the respected social security office, under sub-section (a) of section 11 of said law

- The project proponent has to pay the social security fund for at least four types of social security included in sub-section (a) of section 15, under section 15 of said law.

- The project proponent has to pay the fund, which has to be paid myself, and together with the fund which has to be paid from their salary by the employees. Moreover, the project owner will pay the cost for paying the

above-mentioned fund only myself under sub-section (b) of section 18 of said law.

- The project proponent has to pay the fund for accidence, under sub-section (b) of section 48 of said law. (but this fund is not related to workmen compensation so if it is needed compensation must be separately paid by the Workmen compensation Act)

- The project proponent has to make correctly and submit the list and record provided in section 75 to respected social security office, under section 75 of said law.

25) Occupational Safety and Health Law (2019)

Purpose: To effectively implement measures related to safety and health in every industry and to set occupational safety and health standards.

- The project proponent has to provide adequate and relevant personal protective equipment to workers free of charge and make them wear it during work so as not to expose workers to any serious occupational diseases or hazards under sub-section (e) of section 26 of said law.

- The project proponent has to arrange and display occupational safety and health instructions, warning signs, notices, posters, and signboards under sub-section (l) of section 26 of said law.

- The worker shall wear or use at all times any protective clothes, equipment and tools provided by the employer for the purpose of safety and health under sub-section (a) of section 30 of said law.

- The worker shall proper and systematic use any equipment and tools, machines, any parts of the machines, vehicles, electricity and other substances being used at the workplace under sub-section (d) of section 30 of said law.

- The worker shall take reasonable care for the safety and health of himself/ herself and of other persons who may be affected by his/ her acts or omissions at work under sub-section (e) of section 30 of said law.

26) The Rights of National Races Law (2015)

Purpose: To ensure that project proponent has to disclose to residents ethnic nationalities about the project fully, moreover to ensure to cooperate with them. This law focuses the following matters;

Section 5 - The project proponent has to disclose all about the project fully to the residents who are national races.

- The project proponent has to cooperate with the residents who are national races.

27) The Petroleum and Product of Petroleum Law (2017)

Purpose: The project will transport and store the fuel in any phrase. To ensure to take the license for importation and storage and abide by the stipulations in the license

- The project proponent has to transport the fuel by the vehicle or vessel, which is licensed by the Ministry of Transportation and Communication under sub-section (a) of section 9 of said law.
- The project proponent has to abide by the procedures and conditions specified by the Ministry of Transportation and Communication under sub-section (e) of section 9 of said law.
- The project proponent has to transport after obtaining the transportation license issued by the Ministry of Natural Resource and Environmental Conservation under sub-section (b) of section 10 of said law.
- The project proponent has to allow inspection by the Ministry of Natural Resource and Environmental Conservation under sub-section (d) of section 10 of said law.
- The project proponent has to store the fuel in the tank, which is licensed by the Ministry of Natural Resource and Environmental Conservation under sub-section (a) of section 10 of said law.
- The project proponent has to show the notice of danger on the tank or container of fuel under section 11 of said law.

28) Forest Law (2018)

Purpose: To ensure in carrying out the project with the permission of Ministry of Natural Resources and Environmental Conservation if the project land is forestland or forest covered land. This law focuses as follow;

- The project proponent has to obtain the permission of Ministry of Natural Resources and Environmental Conservation before starting the work if the project land is forest land or forest covered under sub- section (a) of section 12.

29) Freshwater Fisheries Law (1991)

Purpose: According to the sub-section (e) of section 2 of said law, the freshwater area includes any river, creek, pond and water area so the project will be near by the river or creek which is freshwater area the safety of freshwater and aquatics. This law focuses as follow;

- The project proponent has to avoid any water pollution and disturbing to fish and other aquatic lives in any fresh-water such as river, creek under section 40 of said law.

30) The Underground Water Act (1930)

Purpose: To ensure to obtain the licence before sinking the underground water and to abide by the conditions in license. This law focuses as follow;

- The project owner will obtain the licence granted by the water officer for sinking the underground water before sinking water, under section 3 of said law.
- The project proponent has to abide by the conditions prescribed by rules, under sub-section (a) of section 6 of said law.

31) The Electricity Law (2014)

Purpose: of this law is to ensure the compliance with the conditions of permission for productions of electricity, abiding by any stipulation, implementing with the best practices and paying compensation in line with above law. It stipulated the following obligations of the project proponent:

- To implement the project with the best practices to reduce the damages on the environment, health and socio-economy, also will pay compensation for the damages and will pay the fund for environmental conservation, under sub-section (b) of section 10;
- To take the certificate of electric safety, issued by the chief-inspector, before the commencement of power generation, under section 18;

- To be liable for damages to any person or enterprise by failure to abide by the quality standards or rules, regulation, by-law, order and directive issued under said law according to sub-section (a) of section 21;
- To be liable for damages to any person or enterprise by negligence of project owner according to sub-section (a) of section 22;
- To comply with the permission for electric searching and generation, under sub-section (a) and (b) of section 26;
- To inform promptly to chief-inspector and head officer of related office while occurring of accident in electricity generation, under section 27;
- To comply with the standards, rules and procedure. Moreover will allow the inspection by respected governmental department and organization if it is necessary, under section 40; and
- To pay the compensation to anyone who is injured or caused to death in electric shock or fire caused by the negligence or omitting of the project owner or representative of project owner, under section 68..

32) The Farm Land Law (2012)

Purpose: To ensure the right to use the farm land and sufficient compensation for acquisition of the farm land. This law focuses the following matters;

- The project owner has to abide by the decision of relevant Ministry with the coordination with the Central Administrative Body of the Farmland for paying the compensation if it is needed acquisition farm land under section 26 of said law.
- The project proponent has to obtain the permission of the Central Administrative Body of Farmland for the land use change from paddy field land to other land use under sub section (a) of section 30 of said law.
- The project proponent has to obtain the permission of the Yangon Region Government with the recommendation of Yangon Region Administrative Body of Farmland for the land use change from farm land other than paddy field land to other land use under sub section (b) of section 30 of said law.

33) Natural Disaster Management Law (2013)

Purpose: to implement natural disaster management programs and to coordinate with national and international organizations in carrying out natural disaster management activities; to conserve and restore the environment affected by natural disaster and to provide health, education, social and livelihood programmes in order to bring about better living conditions for victims.

- The project proponent has to perform preparatory and preventive measures for natural disaster risks reduction before the natural disaster strikes under sub section (a)(i) of section 13 of said law.
- The project proponent has to undertake rehabilitation and reconstruction activities for improving better living standard after the natural disaster strikes and conservation of the environment that has been affected by natural disaster under sub section (a)(iii) of section 13 of said law.
- The project proponent has to carry out better improvement on early warning system of natural disaster under sub section (b) of section 14 of said law.
- The project proponent has to carry out together with the measures of natural disaster risk reduction in development plans of the State under sub section (d) of section 14 of said law.
- Whoever if the natural disaster causes or is likely to be caused by any negligent act without examination or by willful action which is known that a disaster is likely to strike, shall be punished with imprisonment for a term not exceeding three years and may also be liable to fine under section 25 of said law.
- Whoever interferes, prevents, prohibits, assaults or coerces the department, organization or person assigned by this law to perform any natural disaster management shall, on conviction, be punished with imprisonment for a term not exceeding two years or with fine or with both under section 26 of said law.
- Whoever violates any prohibition contained in rules, notifications and orders issued under this law shall, on conviction, be punished with imprisonment for a term not exceeding one year or with fine or with both under section 29 of said law.
- Whoever willful failure to comply with any of the directives of the department, organization or person assigned by this law to perform any natural disaster management shall, on conviction, be punished with imprisonment for a term not exceeding one year or with fine or with both under sub section (a) of section 30 of said law.

5.1 Commitment to followed by Project Proponent

MYANMAR SHWEKYIN SOLAR POWER COMPANY LIMITED

To follow Commitments and Mitigation Measures stated in the Environmental Management Plans (EMP) of Environmental Management Plan (EMP) Report

With regards to the above matter, we, MYANMAR SHWEKYIN SOLAR POWER COMPANY LIMITED, strongly commit that this EMP report, prepared by E Guard Environmental Services Co., Ltd. is strong and complete. We also commit that we will operate our proposed project according to our commitments and implement Environmental Management Plan (EMP) and mitigation measures that are mentioned in this EMP report. Moreover, we commit to work out our best not to cause any impacts on social and environment during the construction and operation phases of the project by implementing the appropriate mitigation measures described in this EMP report and if any impacts that are not anticipated in the report occur, appropriate mitigation measures must be implemented accordingly.

Your Sincerely,

Mr. JIANG Xingcheng

Director of

MYANMAR SHWEKYIN SOLAR POWER COMPANY LIMITED

CHAPTER 6 - DESCRIPTION OF THE SURROUNDING ENVIRONMENT

The objective of baseline data collection is to establish the meaningful and relevant information of the environmental as primary data collection. The methodology had been designed to know the nature and degree of pollution from various sources in the environment. Baseline environmental parameters were defined according to the guideline which applies to projects. All necessary criteria such as site selections for sampling and analysis of ambient air quality, water quality and noise and vibration level of the project site were identified by environmental specialists of E Guard.

i) **Onsite Measurement and Analysis** – Baseline environmental parameters such as wind speed, wind direction, air quality, water quality and noise level of the project were measured by using the appropriate environmental quality measuring equipment.

ii) **Secondary Data Collection and Analysis** – Some data such as socio-economic condition, physical/biological environment and weather data were collected from official township data from the General Administrative Department and analyzed by the study team.

Onsite measurements are conducted by using the following environmental quality measuring equipment.

Table 6.1 - Environmental Quality Measuring Equipment

No.	Name and Model of Instrument	Parameters	Measuring Instrument
1.	**Haz-Scanner EPAS**	- PM_{10}, PM $_{2.5}$, NO_2, Temperature, and Relative Humidity	
2.	**Digital Sound Level Meter**	- Noise	
3.	**Soil Sampler (One Piece Auger)**	- Soil	

6.1 Physical Environment

6.1.1 Climate

The climate of Myanmar can be described as tropical monsoon climate. It is characterized by strong monsoon influences, has a considerable amount of sun, a high rate of rainfall and high humidity. The annual average temperature ranges from highest of 43°C and lowest of 5°C.

6.1.1.1 Temperature and Rainfall

The proposed project site is located at Ingani Village Tract, Shwekyin Township, Bago District, Bago Region. The highest temperature is 43°C and the lowest of 5°C at Shwekyin Township. Rainfall and temperature of Shwekyin Township from 2015 to 2019 are described as followed,

Table 6.2 – Temperature and Rainfall of Shwekyin Township

No.	Year	Rainfall		Temperature	
		Rainy Days	Total Rainfall (inches)	Summer (°C) Highest	Winter(°C) Lowest
1.	2015	125	143.25	40.9	11.7
2.	2016	121	133.51	42.8	11.4
3.	2017	137	149.88	40.8	10.0
4.	2018	19	20.24	40.6	9.7
5.	2019	104	145	42.4	12.9
6.	2020	102	104.68	42.3	10.1

Source: Shwekyin Township Data (GAD, 2020)

6.1.2 Wind Speed and Wind Direction

The following figures describe the wind speed, wind direction and wind class frequency distribution of the proposed project site on 01st to 02nd June 2022. According to the observed data, the wind blow from South with the highest speed of 10.4 m/s in the project site.

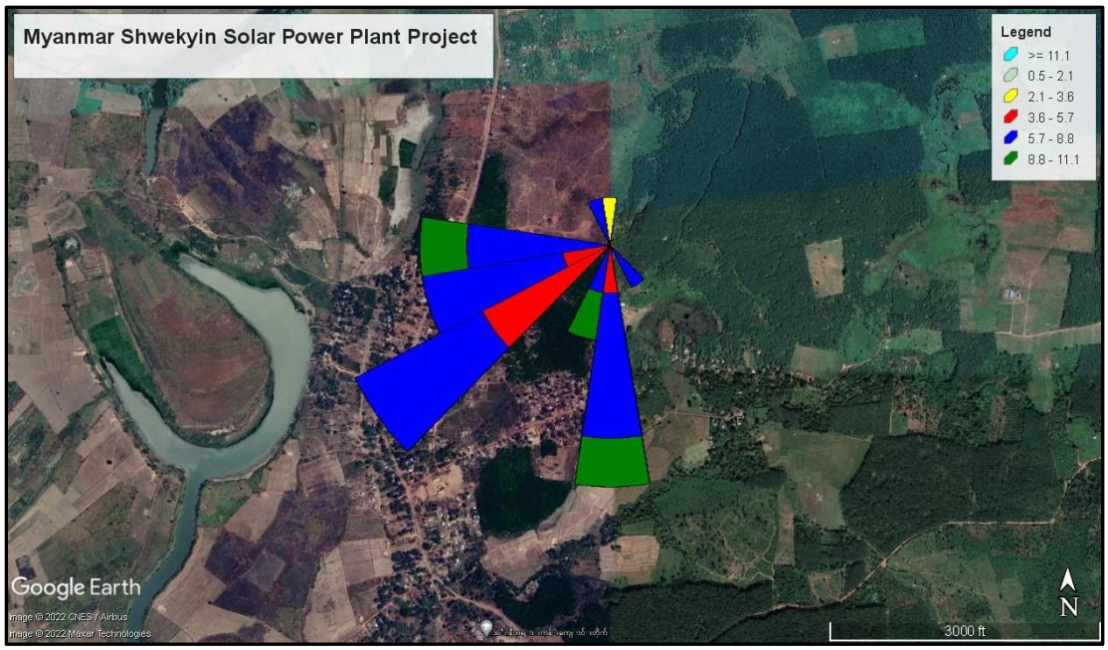


Figure 6.1 - Wind Speed and Wind Direction at Air Monitoring Point in the project site

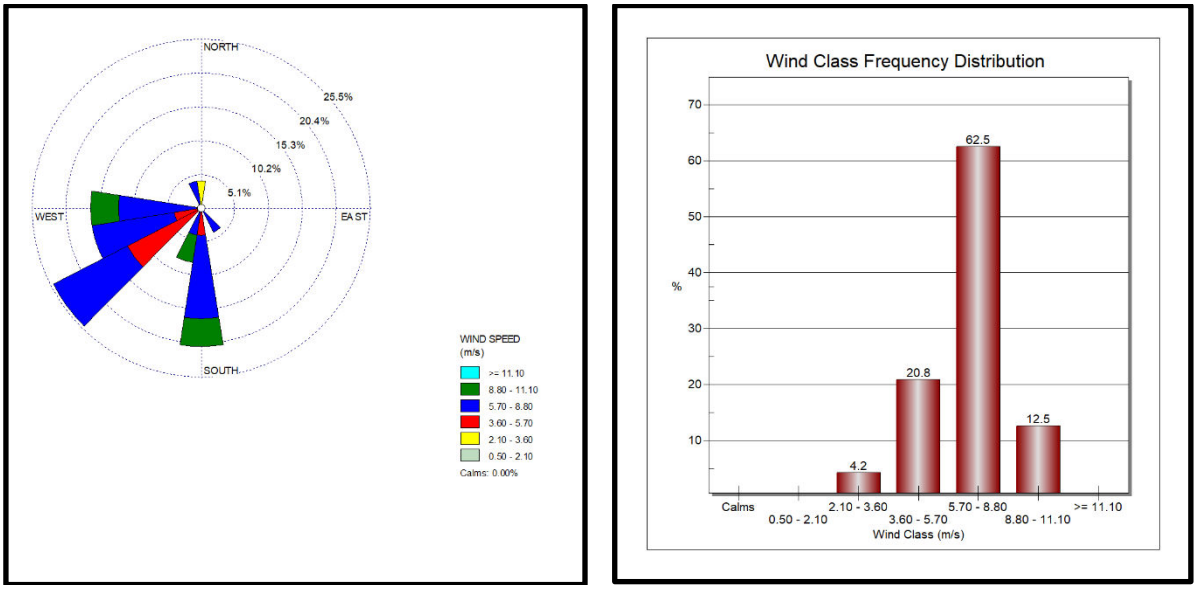


Figure 6.2 - Wind Speed Data and Wind Class Frequency Distribution at Air Monitoring Point in the project site

6.1.3 Natural Disaster

6.1.3.1 Earthquake Intensity

Myanmar is exposed to multiple natural hazards including cyclones, earthquakes, floods and fire and it has been periodically exposed by natural disasters. Shwekyin Township is located closed to Sagaing Fault, which is a major tectonic structure that cuts through the center of Myanmar. The Sagaing Fault broadly divides the country into a western half moving north with the Indian Plate and an eastern half attached to the Eurasian Plate. Earthquake intensity map of Myanmar can be seen in the following figure.

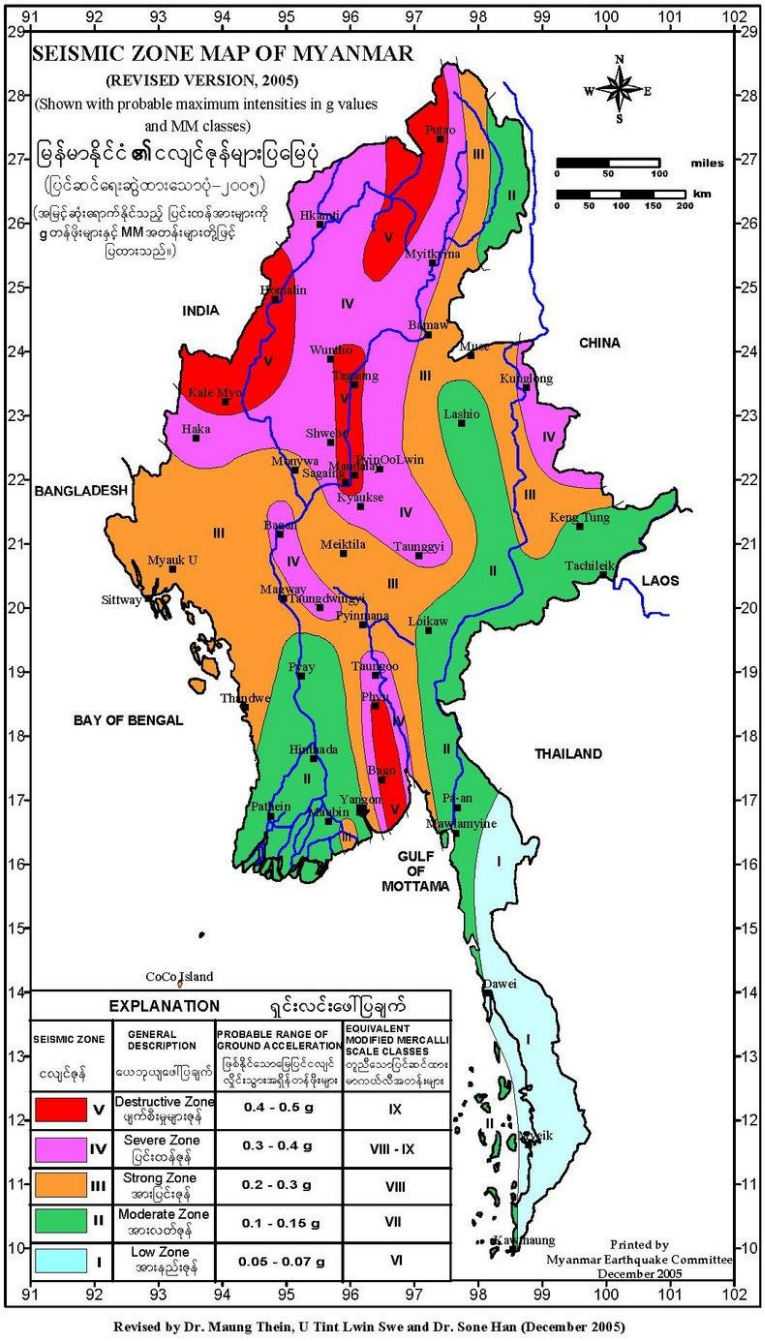


Figure 6.3 - Seismic Zone Map of Myanmar.

The approach is mainly empirical and historical in the sense that it makes use of past seismic events and history to make educated predictions about region wide intensities in the future. It is hoped that a probabilistic seismic risk (or earthquake hazard map) on horizontal ground acceleration should be taken into account in the design. As shown in the map, five seismic zones are demarcated and named (from low to high) Zone I (Low Intensity Zone), Zone II (Moderate Intensity Zone),

Zone III (Strong Intensity Zone), Zone IV (Severe Intensity Zone) and Zone V (Destructive Intensity Zone), mainly following the nomenclature of the European Macro Seismic Scale 1992.

As per map, the proposed project is located within the **Zone IV (Severe Intensity Zone)**. Therefore, the project proponent shall consider all structural designs of the switchyard, building and electrical equipment installation such as PV modules, inverters, box-type transformers and overhead transmission line in order to prevent earthquake risks.

6.1.4 Topography

The Shwekyin Township is located on Eastern Yoma Mountainous Region and mountains, hills, valleys and plains are at East and North, for West and South there are low land area and river valleys. Shwekyin Township is situated 96ft above sea level.

6.1.5 Hydrology

Shwekyin Township has large number of rivers and most of the rivers are flow from North to South. Most significant rivers are Sittaung River and Shwekyin Creek, both are flow from North to South near Shwekyin. Local water resources are mostly freshwater and saltwater and used for agriculture and drinking water. Sittaung River has a depth of 15ft in Dry Season and can be used for transportation. Sittaung River is flowing in meandering as big ship cannot travel.

6.1.6 Soil Condition

Soil sample from the project site are collected to know the quality and condition of the soil in the site. Soil samples were collected using appropriate sampling equipment and procedures.

The location where the soil sample was collected had already been cleared for project site. The site was used to plant rubbers before. Collected soils sample are visually verified with soil classification map of Bago Division which shown in the figure below. Soil types mostly found in Shwekyin Township are red brown forest soil. The color of top soil sample is dark red brown and sub soil is light brown color. The texture of the soils is medium to heavy loamy and the top soil contain moderate amount of plant available nutrients.

The red brown forest soils are the typical soils of tropical ever green forest of Myanmar. They occur in the hilly region and on the well-drained hill slopes at the elevation from 1000-4000ft above sea level.

The soils are formed under the influence of tropical evergreen forest with the annual rainfall of about 80-200inches. They are well structured and have a good drainage. The porosity is good which is 52-65% and the water holding capacity is less, 20-30%. The soil is slightly acid with the

pH value ranging from 5-6.5. the soil is regarded as forest land of good productivity. Suitable crops for this type of soil are rubber, mango, pineapple and orchard.

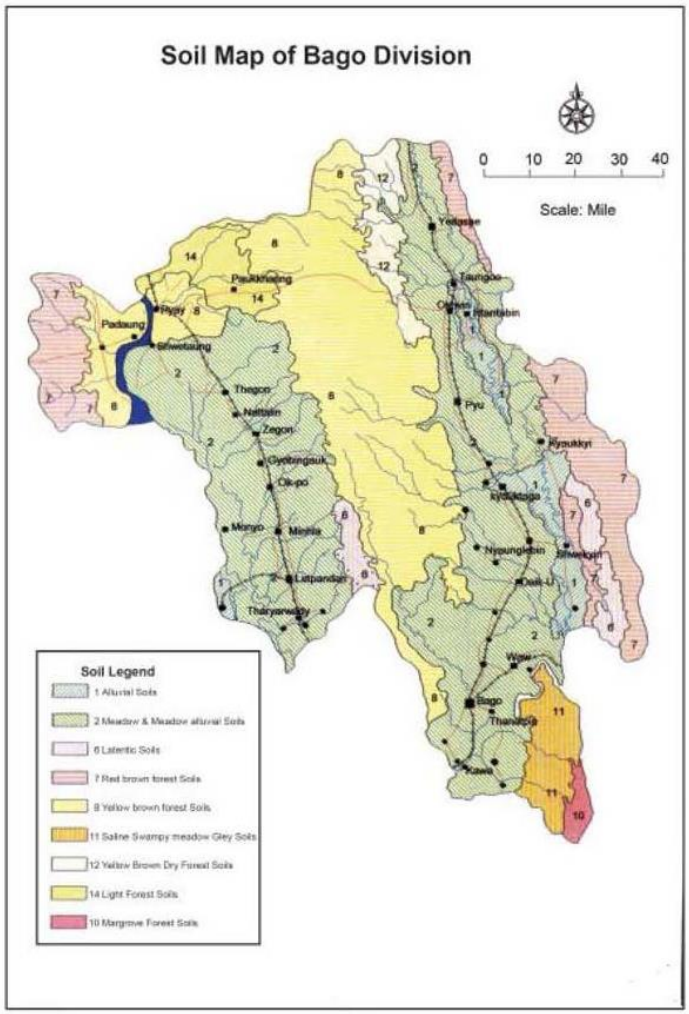


Figure 6.4 – Soil Map of Bago Region

6.1.7 Ambient Air Quality

The emissions of dust particles and gases were measured for 24hrs continuously at the selected sites using the Portable Haz Scanner Environmental Parameter Air Station (EPAS). The EPAS provides direct readings in real time with data logging capabilities.

Table 6.3 - Location of Air Quality Point

Date	Item	GPS Coordinates	Locations	Parameters
01.06.2022 – 02.06.2022	**Air Monitoring Point**	Lat: 18° 00' 56.89" N Long: 96° 52' 15.35" E	In the project site	**Gas Emission:** CO, CO_2, SO2, NO_2

				Dust Emission: PM_{10} , $PM_{2.5}$

Figure 6.5 - Air Quality Monitoring in the project site

Air quality monitoring was done in the project site on 01st to 02nd June 2022. The observed values of parameters are compared with National Environmental Quality (Emission) Guideline, National Ambient Air Quality Standards and American Conference of Govermental Industrial Hygienists. According to the comparison results, the observed values of the parameters are under the guideline value.

Figure 6.6 - Location of Air Quality Monitoring Point

Table 6.4 - Observed Values of Air Monitoring in the project site

Parameter	Observed Value	Guideline Value	Guideline	Unit	Averaging Period
SO_2	0.031	20	NEQG	µg/m^3	24 hours
NO_2	26.40	200	NEQG	µg/m^3	1 hour
CO	0.011	9	NAAQS	ppm	8 hours
CO_2	386.80	5000	ACGIH	ppm	8 hours
PM_{10}	17.97	50	NEQG	µg/m^3	24 hours
$PM_{2.5}$	6.63	25	NEQG	µg/m^3	24 hours

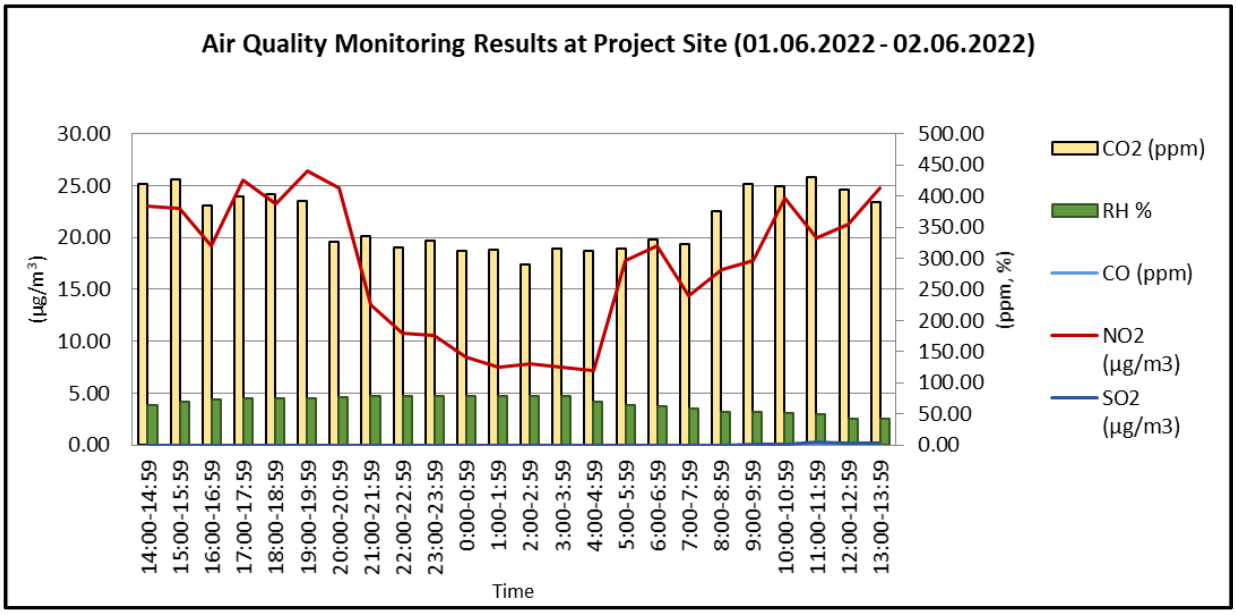


Figure 6.7 - Air Quality (NO_2, SO_2, CO_2 , CO and RH) Monitoring Result in the project site

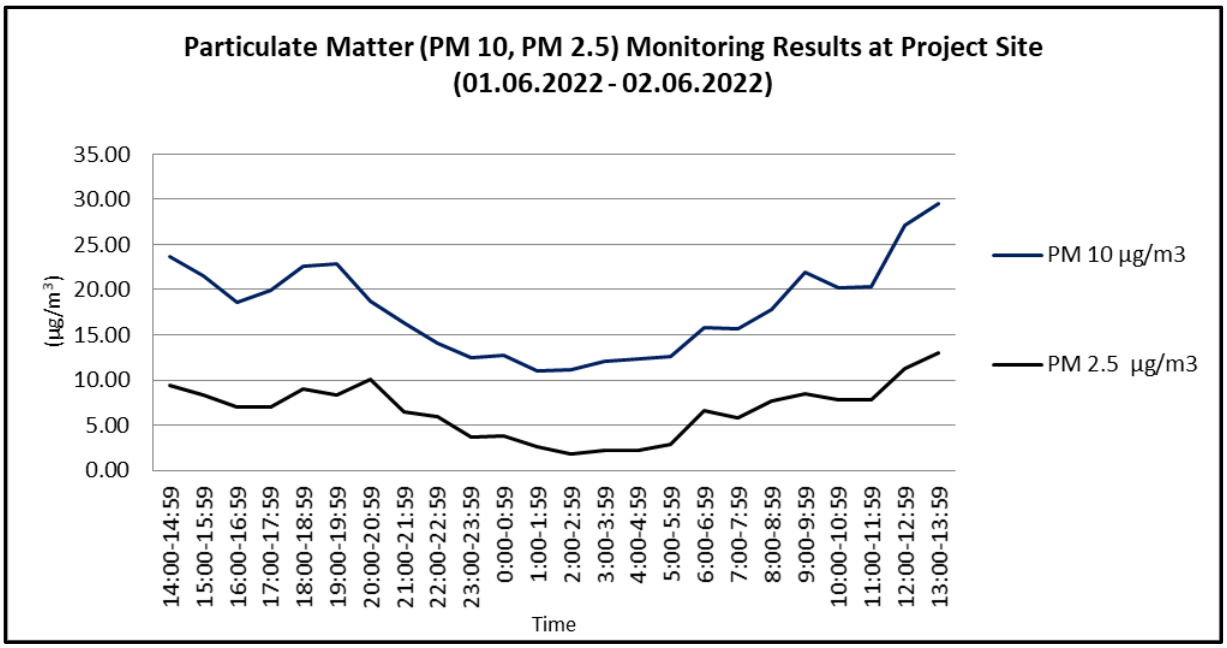


Figure 6.8 - Air Quality (PM) Monitoring Result in the project site

6.1.8 Noise

Noise level LAeq (dBA) was measured at the selected locations on 01st to 02nd June 2022. Duration and frequency were measured for 24 hrs continuously at the selected sites using the digital sound level meter.

Figure 6.9 - Locations of Noise Level Measuring Points

Table 6.5 - Locations of Noise and Vibration Points

Item	GPS Coordinates	Locations	Parameters
Noise Point 1	Lat: 18° 00' 56.85" N Long: 96° 52' 15.39" E	In the project site (Source)	Noise: (LAeq (dB (A)) 1hr interval for 24 hours) Vibration: (Lveq (dB) 1hr interval for 24 hours)
Noise Point 2	Lat: 18° 00' 57.38" N Long: 96° 51' 56.51" E	At Ingani Village (Receptor)	

Noise and vibration levels were measured at the same time with air quality measurement. Measurement range of noise level measuring meter is 20-130 dBA. The environmental noise quality was recorded at every 1 minute for 24 hours. Hourly averaged noise levels in energy weighted values of day and night time average are shown in Table below. The level results are compared with Environmental Quality Emission Guidelines (NEQG) Myanmar.

Table 6.6 - Comparison of the noise results and the standard guidelines

Location	Measured Values (dB (A))	
	Day Time (07:00-22:00)	Night Time (22:00-7:00)
Point 1	66.07	39.85
Point 2	63.63	45.51
Noise Level Standards from National Environmental Quality (Emission) Guideline		
Standard Value (NEQG) for industrial, commercial	70	70
Standard Value (NEQG) for residential	55	45

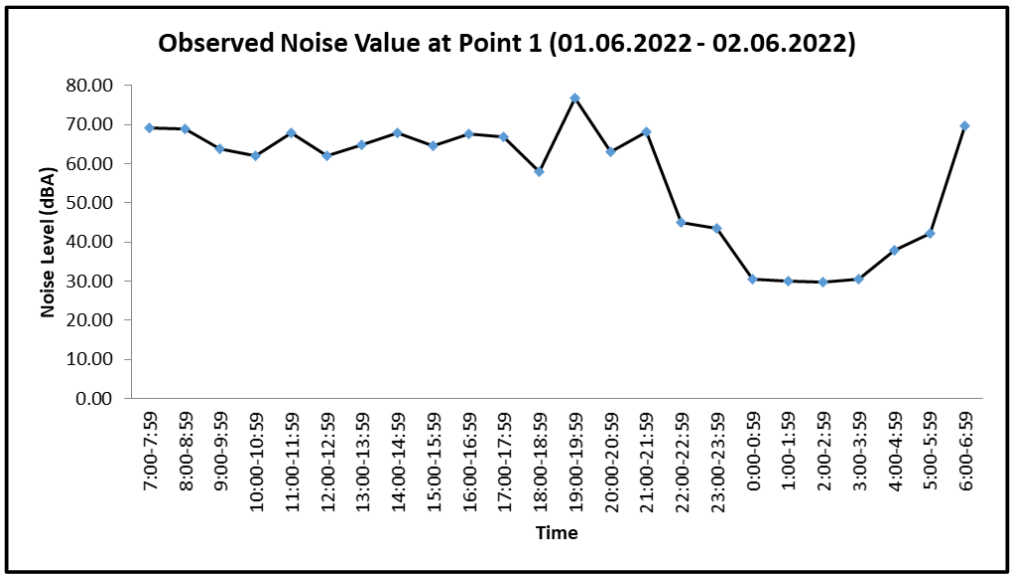


Figure 6.10 - Day Time and Night Time Noise Data at Point 1 (01.06.2022 - 02.06.2022)

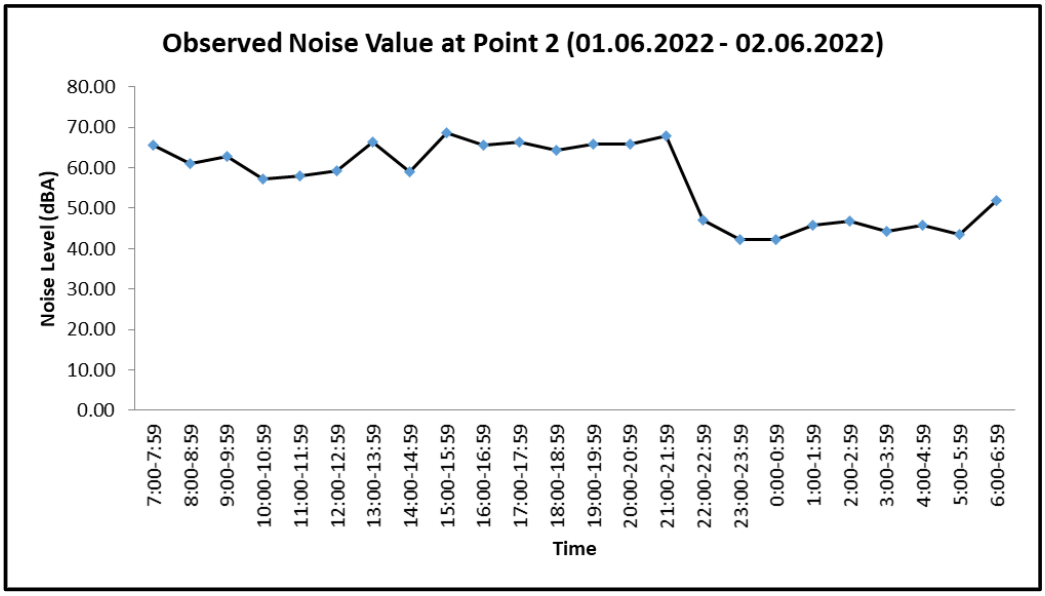


Figure 6.11 - Day Time and Night Time Noise Data at Point 2 (01.06.2022 - 02.06.2022)

6.1.9 Water Quality

Water samples were collected using appropriate sampling equipment and procedures. The sampling team has pre-arranged with the labs in Yangon for analysis and logistic arrangement made to reach the preserved samples with unique IDs to the designated labs within 48hrs.

The following laboratories were used for analysis of sampled water.

1. ISO Lab, No-18, Lanthit Road, Insein Township, Yangon. Tel; 01 540 955, 732251575
2. SGS (Myanmar) Limited, Mineral Services, 79/D, Bo Chein Street, 6 ½ Mile, Hlaing Township, Yangon, Myanmar. Tel; +95(1) 654 795

Table 6.7 - Locations of Surface Water Quality Sampling Points

Item	GPS Coordinates	Location	Parameters
Ground Water Quality Sampling Point	Lat: 18° 00' 58.07"N Long: 96° 52' 16.33"E	In the project site	Biochemical Oxygen Demand, Chemical Oxygen Demand, pH, EC, Total Dissolved Solid, Salinity, Dissolved Oxygen, Turbidity, Total Suspended Solid, Total Phosphorus, Total Nitrogen, Total Coliform Count, Oil & Grease, Chromium, Potassium

Figure 6.12 - Ground Water Sample Taking in the Project Site

Figure 6.13 - Location of Ground Water Quality Sample Taking Point

The results of the observed parameters are compared with National Environmental Quality (Emission) Guideline. The results of both ground water and surface water are under the guideline limit.

Table 6.8 - Comparison of Lab Results and National Emission Quality (Emission) Guideline

Item	Unit	Ground Water	National Environmental Quality (Emission) Guideline
pH	-	7.3	6 - 9
Total Dissolved Solid	mg/l	73	-
Salinity	ppt	0.1	-
Dissolved Oxygen	mg/l	5.6	-
Turbidity	NTU	14.2	-
Biological Oxygen Demand (BOD)	mg/l	4	30
Chemical Oxygen Demand (COD)	mg/l	32	125
Chromium	mg/l	<0.1	-
Total Nitrogen	mg/l	<1	10
Total Phosphorus	mg/l	0.028	2
Potassium	mg/l	1.3	-
Oil and Grease	mg/l	<5	10
Total suspended solid (TSS)	mg/l	20	50
Total coliform bacteria	CFU/100ml	8	400

6.1.10 Soil Quality

Table 6.9 - Location of Soil Sample Taking Point

Item	GPS Coordinates	Locations
Soil Sample Taking Point	Lat: 18° 00' 55.25" N Long: 96° 52' 10.84" E	In the project site

Figure 6.14 - Soil Sample Taking in the Project Site

Figure 6.15 - Location of Soil Sample Taking Point

6.2 Biological Component

6.2.1 Flora and Fauna

As the proposed project site is located on rubber plantation land, the existing of flora and fauna are rare and other than small bushes or small trees can only be found. There are no forests, protected areas and coastal resources within the project area and along the overhead transmission line.

Table 6.10 – Biological Resources and Existing Conditions of Shwekyin Township

Biological Resources	Existing Conditions
Fisheries and Aquatic biology	No fisheries and aquatic biology existing within the project area township.
Wildlife	Wild animals such as deer, bears, wildcat, monkey are found within the Protected Public Forest area.
Natural Vegetation	Large and commercial tree species are abundantly discovered within the township area, rare medicinal plant species and a variety

	of orchid species are also found in that region.
Rare or endangered species	No rare or endangered species existing within the project area township.
Protected areas	No protected areas existing within the project area township.
Coastal Resources	No coastal resources existing within the project area township.

Source: Shwekyin Township Data (GAD, 2020)

6.3 Socio-economic Environment

6.3.1 Demographic Profile

The population of Shwekyin Township is as followed,

Table 6.11 - Administrative Structure of Shwekyin Township

No.	Subject	Houses	Households	Quarters	Village Tracts	Villages
1.	Urban	4,440	4584	8	-	-
2.	Rural	17,401	17,679	-	31	82
	Total	21,841	22,263	8	31	82

Source: Shwekyin Township Data (GAD, 2020)

The detailed population status of Shwekyin Township is described in the following table.

Table 6.12 - Population status of Shwekyin Township

No.	Subject	Male	Female	Total
1.	Urban	11,300	12,009	23,309
2.	Rural	41,843	42,978	84,821
Total		53,143	54,987	108,130

Source: Shwekyin Township Data (GAD, 2020)

6.3.2 Major Ethnic Group

The detail number of ethnic people who lives in Shwekyin Township is described in the following table.

Table 6.13 – Ethnic Group of Shwekyin Township

No.	Ethnic Group	Population	Township Population	Percentage of Township Population
1.	Kachin	-	108,130	-
2.	Kayah	-	108,130	-
3.	Kayin	16,110	108,130	14.9
4.	Chin	9	108,130	0.008
5.	Mon	5	108,130	0.005
6.	Bamar	85,708	108,130	79.26
7.	Rakhine	44	108,130	0.04
8.	Shan	1649	108,130	1.52
9.	Pa-Oh	1	108,130	0.0009
10.	Danu	-	108,130	-
11.	Taungyoe	-	108,130	-
12.	Palaung	-	108,130	-
13.	Others	2,087	108,130	1.93
Total		105,614	108,130	97.6732

Source: Shwekyin Township Data (GAD, 2020)

The detail religious status of Shwekyin Township is described in the following table.

Table 6.14 – Religious Status of Shwekyin Township

No.	Religion	Number of People
1.	Buddhist	100,232
2.	Christian	3,528
3.	Hindu	444
4.	Islam	3,919
5.	Others	7
Total		108,130

Source: Shwekyin Township Data (GAD, 2020)

6.3.3 Socio-economic Profile

Socio-economic profile of Shwekyin Township is summarized as followed.

Table 6.15 - Socio-economic profile of Shwekyin Township

Population of workers	Workable Population = 69,475 Worker population = 66,803 Jobless population = 2,672 Jobless percentage = 4
Per capita GDP	1,183,773 (2017-2018) 1,293,115 (2018-2019) 1,348,956 (Estimated) (2019-2020)
Number of Industries	-

Number of Universities	-
Number of Schools	High Schools – 8 Middle Schools – 11 Primary Schools – 84 Pre-primary – 2 Monastery Schools - 4
Literacy percentage	97.23%
Public Health Facilities	General Hospitals – 4 Private Clinics – 13 Rural Health Department - 17
Transportation	The main transportation is by road and navigation by Sittaung River and Skwekyin Creek.

Source: Shwekyin Township Data (GAD, 2020)

6.4 Land Use Status

The following table describes the land use status of Shwekyin Township.

Table 6.16 - Land Use Status of Shwekyin Township

No.	Type of Land	Area (Acres)
1.	Agricultural Land	120,679
	(1) Paddy Land	37,496
	(2) Farm Land	680
	(3) Kaing/Kyun Land	20,964
	(4) Garden Land	59,990
	(5) Farm Land	1,549
2.	Reversed Forest/ Protected Public Forest	283,838
3.	Wild Land	119,629
4.	Virgin Land	13,290
5.	Other Type of Lands	67,648
	Total	605,084

Source: Shwekyin Township Data (GAD, 2020)

6.5 Historical and Well-Known Places

There are 5 pagodas in Shwekyin Township such as A Shae Mahar Pagoda, Shwe Taung Oo Pagoda, Wit Tat Pagoda, Kyauk Mhaw Pagoda and Kyite Htee Yoe Lay Pagoda.

The historical building as Independent Monument can be found in Shwekyin Township.

CHAPTER 7 - IDENTIFICATION, ASSESSMENT AND MITIGATION MEASURES OF POTENTIAL IMPACTS

7.1 Objectives of the Study

The objectives of the study are to identified the potential impacts on the natural environment and human beings due to the project activities, to highlight the significance of impacts with assessment parameters and its scales and to formulate mitigation measures to eliminate or reduce adverse potential impacts on the surrounding environment.

7.2 Phases of the Project

Potential impacts for the proposed projects are normally differentiated into three main categories, namely; Construction phase, Operation phase and Decommissioning phase:

Construction Phase: includes construction of switchyard and multiple-use building, staff quarter, briefing room, dining room and kitchen, installation of PV modules, tracking brackets, inverters, transformers, poles of overhead transmission line and stringing cables of overhead transmission line, which will connect to the existing Shwekyin Substation. The construction period of the proposed project is 6 months, which was started in March, 2022 and will be finished in November, 2022.

Operation Phase: includes electric power generation from solar energy and distributing to the Shwekyin Substation through 230kV overhead transmission line, which length is about 8km (about 5 miles). The operation period of the proposed project is 20 years.

Decommissioning Phase: after operation period, the project proponent will extend the operation periods with the approval of relevant departments to generate electricity from solar energy. The project proponent will have prior to submission of the decommissioning plan if they have a plan to close their project permanently. Therefore, impacts identification, impacts assessment and mitigation measures formulating for decommissioning phase of the project is excluded in this Environmental Management Plan Report.

7.3 Methodology for the Assessment

The assessment of each impact is based on consideration of the magnitude, duration, extent and frequency of activities, which are going to be carried out during three phases and characteristics of the project site. The significance of potential environmental impacts identified during the basic assessment by using a ranking scale. The significance of each impact is classified into five categories.

The following methodology was applied to assess the environmental impacts of the project mainly on air, water, soil, biodiversity including human beings and waste generation. Each source of impact was assessed by four parameters, magnitude, duration, extent and probability and each assess have five scales as mentioned below:

Table 7.1 - Impact Assessment Parameters and Its Scale

Assessment	Scale				
	1	2	3	4	5
Magnitude (M)	Insignificant	Small and will have no effect on working environment	Moderate and will result in minor changes on working environment	High and will result in significant changes on working environment	Very high and will result in parameter changes on working environment
Duration (D)	0-1 year	2-5 years	6-15 years	Life of operation	Post closure
Extent (E)	Limited to the site	Limited to the local area	Limited to the region	National	International
Probability (P)	Very improbable	Improbable	Probable	Highly probable	Definite

Then, the Significant Point (SP) is calculated by following formula.

Significant Point (SP) = (Magnitude + Duration + Extent) * Probability

Impact Significance: Based on calculated significant point, impact significance can be categorized as follows:

Table 7.2 - Impact Significance

Significant Point (SP)	Impact Significance
<15	Very Low
15-29	Low
30-44	Moderate
45-59	High

>59	Very High

7.4 Identification of Impacts

There may be some positive and negative impacts on surrounding environment of the proposed project due to the implementation of proposed project. The possible environmental impacts are identified based on the analysis of environmental baseline information and project activities. Most of the identified impacts were quantified to the extent based on the professional judgment. Each of the environmental issues was examined in terms of their current conditions, likely impacts during **Construction Phase** and **Operation Phase**. **Decommissioning Phase** is not included in this report but third party suggested that project proponent shall need to submit the decommissioning plan before project is termination.

7.5 Positive Impacts

7.5.1 Job Opportunities

Construction Phase: Several job opportunities will be created such as civil engineers, electrical engineers, surveyors, electricians, machine operators, drivers, bricklayers, carpenters and general labors. Security services, cleaning and waste collection are some of the services that will benefit indirectly. This project will create more job opportunities for general workers from local communities. The advance technology, skill knowledge and experience of local community will be improved by cooperating with experienced engineers and workers from the project. The net effect of job opportunities will improve livelihood, living standard to local community and poverty reduction.

Operation Phase: The operation processes of the project will create job opportunities for several local people as their levels of education such as electrical engineers, electricians and managers for power plant. For other local people such as cleaners, securities and drivers can have a chance to obtain job opportunities.

7.5.2 Business Opportunities

Construction Phase: The construction processes of the project require a huge quantity of construction materials such as sand, gravel, stones and cement. The need of fuels is also get from nearby village fuel stations. This will provide business opportunities to local business for their incomes. The construction of the project can also provide opportunities to small-scale business and vendors such as food stalls and shops near the project site.

Operation Phase: National and local government will earn payment of relevant taxes such as properties tax, income tax, and other taxes from the project throughout operation of the project.

7.6 Negative Impacts

The following table shows the potential negative impacts of the proposed project. There are four main types of impacts; impact on environmental resources, impact on ecological resources, impact on human and impact of waste generation.

Table 7.3 - Potential Negative Impacts of the Project

Potential Negative Impacts of the Project			
Impact on Environmental	Impact on Ecological	Impact of Human	Impact of Waste
Air Quality	Terrestrial Ecology	Occupational Health and Safety	Solid Waste Generation
Water Quality		Community Health and Safety	Liquid Waste Generation
Soil	Aquatic Ecology	Fire Hazard	Hazardous Waste Generation
Noise and Vibration			

7.6.1 Impacts on Environmental Resources

7.6.1.1 Air Quality

1. Ground Mounted Solar Power Plant

Construction Phase: Site clearing and earth work activities will be the main cause of dust emission and will affect during dry season. Operating construction machines such as wheel loaders, bulldozers, backhoes, compactors, dumpers and generators for temporary office will emit gaseous and dust into air. There will be transportation vehicles used for delivering electrical equipment such as PV modules, tracking brackets, inverters, box transformers, cables and construction materials to the project site will also emit gas and dust. Odors and noise from construction of multiple-use building such as painting and welding can affect indoor air quality.

Operation Phase: Dust emission from the operation activities of the project is insignificant but gaseous emission from office vehicles, maintenance vehicles and generators of the project may affect the air quality. Odor and smoke can be emitted from multi-use building kitchen.

2. Overhead Transmission Line

Construction Phase: Operating of construction machines and vehicles are the main cause for the dust and gaseous emission. Earth work and leveling for pole of transmission line can also make dust emission.

Operation Phase: Inspecting and maintenance of overhead transmission line can emit dust when operating of vehicles.

7.6.1.2 Water Quality

1. **Ground Mounted Solar Power Plant**

Construction Phase: There is no surface water such as rivers, streams, lakes or reservoirs near the project area. Groundwater can be contaminated by earth work activities during rainy season. Oil spillage and leakage from construction vehicles, transportation vehicles and generators can also affect the groundwater quality. Water discharged from construction activities for foundation of tracking brackets, switchyard, multi-use building were need to use cement and hardener chemicals which will impact on groundwater quality. Improper method of sewage disposal from toilets used by construction workers can also lead to groundwater pollution. The improper storage of PV modules, fuel storage, waste storage and machinery maintenance can affect the groundwater quality. Water usage demand will also increase for site clearing, preparation, spraying to reduce dust emission and other requirement for construction activities and construction workers.

Operation Phase: groundwater can be contaminated by oil and waste spillage and leakage from transformers, improper waste storage, fuel storage and refueling. Poor waste management may also lead blockage of drainage which will lead to flooding. Improper handling of damaged PV modules due to improper cleaning and maintenance activities and uninstalled expired PV modules can cause groundwater pollution because these PV modules contain toxic chemicals. Water consumption will also increase for cleaning of PV modules in order to enhance their efficiency for generation electricity.

2. **Overhead Transmission Line**

Construction Phase: Water discharged from construction activities for foundation for pole of overhead transmission line can impact groundwater if it is not properly discharged.

Operation Phase: There will no impact for operation phase.

7.6.1.3 Soil

1. **Ground Mounted Solar Power Plant**

Construction Phase: Site clearing, preparation and leveling activities will be carried out for the construction of ground mounted solar power plant. Soil excavation for the foundation of tracking brackets, switchyard, multi-use building and pole for transmission line can affect soil structures will cause a chance to soil erosion at project site. Soil contamination can also be occurred due to spillage and leakage from construction machines, vehicles, transportation vehicles, maintenance area for vehicles and generator. Improper storage area for PV modules, damage PV modules from improper installation, waste storage, fuel storage can also cause leakage and affect to soil.

Operation Phase: Improper handling of damage PV modules, cleaning and maintenance activities and uninstalling of expired PV modules. Soil can also contaminated because of leakage of waste disposal, oil and fuel storage.

2. Overhead Transmission Line

Construction Phase: Soil excavation for the foundation of pole for transmission line can affect soil structures will cause soil erosion at project site.

7.6.1.4 Noise and Vibration

1. Ground Mounted Solar Power Plant

Construction Phase: Operating of construction vehicles such as wheel loaders, backhoes, bulldozers, dumpers, compactors and trucks can generate noises and vibrations. Transportation vehicles and generators can also make noise and vibration. Loading and unloading of electrical equipment for solar power plant, construction materials and others will also make noises if there is no proper plan for loading-unloading plan.

Operation Phase: Operating generators, management and maintenance vehicles can generate noise and vibration in project area. Transformers and inverter can also make some noise and vibration which is not significant to surrounding area.

2. Overhead Transmission Line

Construction Phase: Loading and unloading of electrical equipment for solar power plant, construction materials and others will also make noises if there is no proper plan for loading-unloading plan. Construction of overhead transmission line can generate noise and vibration to surrounding area.

Operation Phase: Vehicles for maintenance and inspection for transmission pole can be the only source in this phase and it is not significant impacts to surrounding area.

7.6.2 Impacts on Fauna and Flora

7.6.2.1 Terrestrial Ecology

1. Ground Mounted Solar Power Plant

The impact on terrestrial ecology is not too significant in both construction and operation phase as the project area is originally a farm land for rubber plantations as well as construction of transmission line. However, clearing of rubber trees can lead to deforestation. There is no national park, reserved forest, protected public forest, protected area or wildlife within the project area.

2. Overhead Transmission Line

Transmission line will pass through mostly on rubber plantation areas but there is no national park, reserved forest, protected public forest, protected area or wildlife within the project area.

7.6.2.2 Aquatic Ecology

1. Ground Mounted Solar Power Plant

The impact on aquatic ecology is insignificant in both construction and operation phase because there is no water body such as river, creek, stream, lake or reservoir within the project area.

2. Overhead Transmission Line

The impact on aquatic ecology is insignificant in both construction and operation phase because there is no water body such as river, creek, stream, lake or reservoir within the project area.

7.6.3 Impacts on Human Resources

7.6.3.1 Occupational Health and Safety

1. Ground Mounted Solar Power Plant

Construction Phase: Most of the injuries are accident of construction vehicles, falling and slipping from height, electrical shocks which can cause minor injuries to fatal or permanent disability. Construction activities such as erection and installation of electrical equipment, metal grinding and cutting, concrete works, pilling, use of lifting equipment for transmission line strings, access road construction can cause if there is no proper management. Poor working condition and absence of traffic sign and warning sign can impact to occupational health and safety of project workers. Working environment is also important for workers as operating machinery and using construction materials can pose physical contact, spill, dust emission, noise and vibration. The safety of workers can be improve by providing Personal Protective Equipments (PPEs) such as

helmets, glove, safety vests, safety shoes and safety glasses. Domestic wastewater which is not properly discharged by project site can impact on health of workers. A certain number of migrant construction workers will come to project which can lead health issues such as infectious diseases including insect borne diseases, water borne diseases and sexually transmitted infections (STIs) such as HIV and AIDS. The workers can also infected by pandemic such as COVID-19 if they do not follow the instructions of Ministry of Health and Sport.

Operation Phase: Falling and slipping from height, electrical shocks which can cause minor injuries to fatal or permanent disability. The electromagnetic field can be occurred due to the operation of PV modules, transformers and switchyards which can impact on occupational health and safety of workers. The safety of workers can be improve by providing Personal Protective Equipments (PPEs) such as helmets, glove, safety vests, safety shoes and safety glasses and worker must be used properly. There must be lockout-tagout system while repair and maintaining the electrical equipment of solar power plant and transmission line. Domestic wastewater which is not properly discharged by project site can impact on health of workers. A certain number of migrant construction workers will come to project which can lead health issues such as infectious diseases including insect borne diseases, water borne diseases and sexually transmitted infections (STIs) such as HIV and AIDS. The workers can also infected by pandemic such as COVID-19 if they do not follow the instructions of Ministry of Health and Sport.

2. Overhead Transmission Line

Construction Phase: Most of the injuries are from accident falling and slipping from height, electrical shocks which can cause minor injuries to fatal or permanent disability. The installation of electrical equipment, metal grinding, welding and cutting, concrete work can impact on workers if there is no proper managements. The safety of workers can be improve by providing Personal Protective Equipments (PPEs) such as helmets, glove, safety vests, safety shoes and safety glasses. The workers can also infected by pandemic such as COVID-19 if they do not follow the instructions of Ministry of Health and Sport.

Operation Phase: Falling and slipping from height, electrical shocks which can cause minor injuries to fatal or permanent disability. The electromagnetic field can be occurred around transmission pole which can impact on occupational health and safety of workers. The workers can also infect by pandemic such as COVID-19 if they do not follow the instructions of Ministry of Health and Sport.

7.6.3.2 Community Health and Safety

1. Ground Mounted Solar Power Plant

Construction Phase: Road accidents by construction vehicles and transportation vehicles are common for community health and safety. Construction activities such as earth works, poles for switchyard, multi-use building and access road can generate dusts, gases, noise and vibration to surrounding area which can impact to local community by nuisance. However, this will be affect insignificant as the construction period is only 6 months and there is no houses near project site.

Operation Phase: The electromagnetic field can be occurred due to the operation of PV modules, transformers and switchyards which can impact on occupational health and safety of villagers. There is a certain distance from project site to local communities, glint and glare from PV modules can affect to nearby local communities under particular reasons. Local people can also affect electric shock because of illegally entering the project site and climbing on the transmission line towers. Operating vehicles and maintenance vehicles at public roads can also impact on community health and safety.

2. Overhead Transmission Line

Construction Phase: Road accidents by construction vehicles and transportation vehicles are common for community health and safety. Construction activities such as earth works, poles for overhead transmission lines and cabling can generate noise and vibration to surrounding area which can impact to local community by nuisance. However, this will be affect insignificant as the construction period is only 6 months and there is no houses near project site.

Operation Phase: The electromagnetic field can be occurred due to the operation can impact on occupational health and safety of villagers. There is a certain distance from project site to local communities. Local people can also affect electric shock because of illegally entering climbing on the transmission line towers. Operating vehicles and maintenance vehicles at public roads can also impact on community health and safety.

7.6.3.3 Fire Hazards Impacts

1. Ground Mounted Solar Power Plant

Construction Phase: Poor installation of electrical equipment and overloads, heating from bunched cables and damaged cables at construction workers camp are common high risks of fire hazards. Improper storage of raw materials for electrical equipment and construction materials can cause fire hazards. Fuel storage area, improper fuel handling, improper maintenance of construction machines and construction vehicles can cause fire hazards.

Operation Phase: Lack of regular and proper maintenance of electrical equipment of solar power plant can cause fire hazards. Fuel storage area, improper fuel handling, improper maintenance of construction machines and construction vehicles can also cause fire hazards.

2. Overhead Transmission Line

Construction Phase: Poor installation and heating from bunched cables and damaged cables are common high risks of fire hazards.

Operation Phase: Lack of regular and proper maintenance of electrical equipment of transmission poles and cables can cause fire hazards. Surrounding trees can cause forest fire to lead fire to transmission lines and poles.

7.6.4 Waste Generation

7.6.4.1 Solid Waste Generation

1. Ground Mounted Solar Power Plant

Construction Phase: Wastes will be generated at various stages of project development. The primary forms of solid waste will be cement paper bags, broken bricks, concrete residual waste, scrap metals, glass, woods from construction activities and cutting trees. Improper solid waste management may lead to impact on visual environment and soil because those wastes may contain hazardous substance such as cement and other chemical substances, in additional to health and safety of workers. Construction soil waste will be generated by site clearance, earth working and leveling activities as well as vegetable debris will be generated at the time of land clearance for PV modules, switchyard, multiple-use building and right of way for overhead transmission line. Domestic solid wastes such as garbage and organic waste, communal waste from construction workers camp are other sources of solid waste generation. Additionally, night soil may be generated from the construction base camp.

Operation Phase: During the operation phase, there is no operation solid waste which is disposed of from the proposed project's operation processes. However, domestic solid waste such as garbage, rejected office materials and organic waste from multiple-use building are common solid wastes generation. Waste can be generated in case of inappropriate behavior by personnel like careless littering.

2. Overhead Transmission Line

Construction Phase: The primary forms of solid waste will be cement paper bags, broken bricks, concrete residual waste, scrap metals, woods and cutting trees from construction of transmission poles along right of way.

Operation Phase: There is no significant impact in this phase.

7.6.4.2 Liquid Waste Generation

1. Ground Mounted Solar Power Plant

Construction Phase: During the construction phase, cleaning construction machines and construction vehicles, concrete mixing plant within the project site will generate liquid waste. Sanitary wastewater will be discharged of from toilet depending on the number of workers involved. Domestic liquid waste from construction workers camp will be also discharged.

Operation Phase: During the operation phase, main source of operation liquid waste is cleaning activities for PV modules to promote their efficiency for electricity generation. Domestic liquid waste such as black water from toilets and grey water from basins and bathrooms within the project site will be discharged.

2. Overhead Transmission Line

Construction Phase: Concrete mixing plant for foundation of transmission poles will generate liquid waste.

Operation Phase: There is no significant impact in this phase.

7.6.4.3 Hazardous Waste Generation

1. Ground Mounted Solar Power Plant

Construction Phase: During the construction phase, damaged PV modules due to improper installation are common, hazardous waste generation of the proposed project because PV modules contain toxic chemicals such as lead and cadium. Spillage or leakage of diesel and engine oil from vehicles and machine may release as hazardous waste.

Operation Phase: During the operation phase, damaged PV modules due to improper handling during cleaning activities and maintenance activities are common hazardous wastes generation. Uninstalled lifespan-expired PV modules due to exchanging new PV modules at the time of extending operation period of the project are also common hazardous wastes. Hazardous waste like waste oil and lubricants and oil containing jutes and rags will be generated during maintenance activities. For generation of batteries waste, this project does not used batteries to store electricity from PV modules and will distribute directly to Shwekyin Substation via overhead transmission line.

2. Overhead Transmission Line

Construction/ Operation Phase: There is no significant impact in this phase.

7.7 Impact Significance

Project activities and impact significance level during pre-construction, construction and operation phase for the proposed project are described in the following tables.

Table 7.4 - Impacts Significance of the Project (Ground Mounted Solar Power Plant)

No.	Potential Adverse Impacts	Project Activities	Significance of Potential Adverse Impacts					Impact Significance
			M	D	E	P	SP	
A.	**Construction Phase**							
1.	Impacts on Air	• Dust and gaseous emission can occur due to site clearing, leveling and earth working activities, which will get worse during dry season • Operating and movement of construction machines and vehicles • Operating generators • Vehicles which used for delivering electrical equipment • Odor from painting of multiple-use building, staff quarters, briefing hall, kitchen and dining hall.	4	1	2	4	28	Low
2.	Impacts on Water	• Groundwater impacted by oil spillage and leakage from construction machines, construction vehicles, transportation vehicles and generators • Water discharged from construction activities • Especially, concrete foundation of tracking brackets, switchyard, multiple-use building and other buildings in the project and deeply excavated foundation processes need to use cement and hardener chemicals • Sewage disposed of from toilets used by construction workers	2	1	2	3	15	Low

No.	Potential Adverse Impacts	Project Activities	Significance of Potential Adverse Impacts					Impact Significance
			M	D	E	P	SP	
		• Improper temporary PV modules storage, damaged PV modules released from improper installing, improper waste storage, fuel storage, refueling, machineries maintenance and parking area • Water usage demand will also increase for site clearing, site preparation, water spraying activities and other water required construction activities and construction workers.						
3.	Impacts on Soil	• Soil structure and formation will be disturbed due to site preparation and leveling activities • Soil excavation for the foundation of tracking brackets, switchyard, multiple-use building and other buildings can cause soil structure disturbance, soil erosion and release of sediments into the natural drainage system and surface water • Top soil nutrient layers will be removed, lower soil will be covered and in somewhere soil layer will be mixed • Oil spills and leakage from construction machines, construction	5	1	1	5	35	Moderate

No.	Potential Adverse Impacts	Project Activities	Significance of Potential Adverse Impacts					Impact Significance
			M	D	E	P	SP	
		vehicles, generators and transportation vehicles can cause soil pollution • Improper temporary PV modules storage, damaged PV modules due to improper installing, improper waste storage, fuel storage, refueling, machineries maintenance and parking area.						
4.	Noise and Vibration Impacts	• Operating and movement of construction vehicles and machines generate noise and vibration • Operating generators • Improper mobilization of construction machines and vehicles, unloading electrical equipment, construction materials and other equipment.	3	1	1	5	25	Low
5.	Impacts on Occupational Health and Safety	• Common possible accidental injuries include falling from height related to ladder • Small injuries due to slips and falls, accidents and electric shock can also occur due to mismanagement • Improper management of construction activities in erection and installation of electrical equipment, metal grinding, welding and cutting, concrete work, piling, access roads construction, high-speed vehicles driving, absence of	5	1	2	5	40	Moderate

No.	Potential Adverse Impacts	Project Activities	Significance of Potential Adverse Impacts					Impact Significance
			M	D	E	P	SP	
		proper traffic sign and warning sign board • Poor working conditions will damage health and put workers at risk as well as operating machinery and using materials in the construction site can pose temporary hazard • Lack of adequate Personal Protective Equipment (PPEs) • Domestic wastewater such as grey water and black water discharged by construction workers can impact on worker's health if not managed properly because of its adverse smell • A certain number of migrant construction workers will enter into the project site for construction, which can lead the issues related to infectious diseases • The construction workers can also be infected COVID-19 virus during Pandemic period.						
6.	Impacts on Community Health and Safety	• Accidents due to operating and movement of construction machines, vehicles and transportation vehicles at public roads • Construction activities, earth working and site leveling can generate dust,	5	1	2	5	40	Moderate

No.	Potential Adverse Impacts	Project Activities	Significance of Potential Adverse Impacts					Impact Significance
			M	D	E	P	SP	
		gases, noise and vibration, which can impact directly and indirectly on community health and safety in terms of nuisance and health effects						
7.	Fire Hazard Impacts	• Poor installation of electrical equipment and overloads, heating from bunched cables and damaged cables • Improper storage of raw materials for electrical equipment and construction materials at storage yard • Fuel storage area, improper fuel handling and improper maintenance of construction machines and vehicles	5	1	2	3	24	Low
8.	Solid Waste Generation Impacts	• Rejected components and packaging materials of electrical equipment and building materials, surplus materials, papers, containers, broken bricks, solvent containers • These solid wastes can be injurious to the environment through blockage of drainage systems because these wastes may contain hazardous substances • Construction soil wastes will be also excavated mainly from site preparation, access road construction and leveling activities • Vegetation debris will be generated during site clearance activities	5	1	2	5	40	Moderate

No.	Potential Adverse Impacts	Project Activities	Significance of Potential Adverse Impacts					Impact Significance
			M	D	E	P	SP	
		• Domestic solid wastes such as garbage and organic waste from construction workers camp and staff quarters, briefing hall, kitchen and dining hall.						
9.	Liquid Waste Generation Impacts	• Cleaning construction machines and vehicles • Domestic liquid waste such as black water from toilets used by construction workers and grey water from basins and bathrooms in construction workers camp, staff quarters, briefing hall, kitchen and dining hall	3	1	1	3	15	Low
10.	Hazardous Waste Generation Impacts	• Damaged PV modules due to improper installation because PV modules release toxic chemicals such as lead and cadium, if cracked • Used oil disposed of from repair and maintenance of construction machines and vehicles • Oil spills and leakage from refueling, fuel storage area, machineries maintenance area and parking area	4	1	1	5	30	Moderate
B.	**Operation Phase**							
1.	Impacts on Air	• Gaseous emission from office vehicles, maintenance vehicles, generators, refrigerators and air conditioning system • Odor and smoke from kitchen	3	4	2	3	27	Low

No.	Potential Adverse Impacts	Project Activities	Significance of Potential Adverse Impacts					Impact Significance
			M	D	E	P	SP	
2.	Impacts on Water	• Oil and waste spillage and leakage from transformers accident, improper waste storage, fuel storage and refueling can lead to groundwater and surface water contamination • Poor waste management may also lead to blocking of drains, which will lead to flooding and unsanitary conditions • Improper handling of damaged PV modules due to improper cleaning and maintenance activities • Uninstalled lifespan-expired PV modules can cause groundwater pollution because these PV modules release toxic chemicals, if cracked • Water consumption will also increase for cleaning PV modules in order to enhance their efficiency for generating electricity	3	4	2	4	36	Moderate
3.	Impacts on Soil	• Improper handling of damaged PV modules due to improper cleaning and maintenance activities • Uninstalled lifespan-expired PV modules because these PV modules release toxic chemicals, if cracked • Leakage from improper waste storage, oil spillage and leakage from	4	4	1	3	27	Low

No.	Potential Adverse Impacts	Project Activities	Significance of Potential Adverse Impacts					Impact Significance
			M	D	E	P	SP	
		transformers accident, fuel storage and refueling						
4.	Noise Impacts	• Operating generators, movement of management vehicles and maintenance vehicles • Operating transformers and inverters.	3	4	1	3	24	Low
5.	Impacts on Occupational Health and Safety	• Falling from height related to ladder for maintenance activities • Small injuries due to slips and falls, accidents and electric shock • Electromagnetic field can be occurred due to the operations of PV modules and switchyard • Lack of adequate Personal Protective Equipment (PPEs) and lockout-tagout system while repair and maintenance • Domestic wastewater such as grey water and black water from the project if not managed properly because of its adverse smell • Poor waste management at multiple-use building, staff quarters, briefing hall, kitchen and dining hall can also lead to the blocking of drains, which in turn can lead to flooding and unsanitary conditions	5	4	1	5	50	High

No.	Potential Adverse Impacts	Project Activities	Significance of Potential Adverse Impacts					Impact Significance
			M	D	E	P	SP	
		• Operation workers and staffs can also be infected COVID-19 virus during Pandemic period						
6.	Impacts on Community Health and Safety	• Electromagnetic field can be occurred due to the operations of PV modules and switchyard • Glint and glare from PV modules • Electric shock can also be anticipated due to entering into the project site without permission by nearby villagers • Operating management vehicles and maintenance vehicles at public roads.	4	4	2	4	40	Moderate
7.	Fire Hazard Impacts	• Improper and irregular maintenance of electrical equipment • Fuel storage area, improper fuel handling, overloads, heating from bunched cables and damaged cables at multiple-use building, staff quarters, briefing hall, kitchen, dining hall	5	4	1	4	40	Moderate
8.	Solid Waste Generation Impacts	• Domestic solid waste such as garbage, rejected office materials • Organic waste from multiple-use building, staff quarters, briefing hall, kitchen and dining hall	3	4	1	3	24	Low
9.	Liquid Waste Generation Impacts	• Cleaning activities for PV modules to promote their efficiency for electricity generation	3	4	1	5	40	Moderate

No.	Potential Adverse Impacts	Project Activities	Significance of Potential Adverse Impacts					Impact Significance
			M	D	E	P	SP	
		• Domestic liquid waste such as black water from toilets and grey water from basins and bathrooms of staff quarters, briefing hall, kitchen and dining hall						
10.	Hazardous Waste Generation Impacts	• Damaged PV modules due to improper cleaning activities and maintenance activities • Uninstalled lifespan-expired PV modules due to exchanging new PV modules at the time of extending operation period of the project • Used oil from transformers, oil spills and leakage from maintenance activities, vehicles, refueling and fuel storage area	4	4	1	4	36	Moderate

Table 7.5 - Impacts significant of the project (Overhead Transmission Line)

No.	Potential Adverse Impacts	Project Activities	Significance of Potential Adverse Impacts					Impact Significance
			M	D	E	P	SP	
A.	**Construction Phase**							
1.	Impacts on Air	• Dust and gaseous emission can occur due to operating and movement of construction vehicles and transportation vehicles • Site clearing, leveling and earth moving activities	3	1	1	5	25	Low

No.	Potential Adverse Impacts	Project Activities	Significance of Potential Adverse Impacts					Impact Significance
			M	D	E	P	SP	
2.	Impacts on Water	• Groundwater and surface water quality will be negatively impacted by water discharged from construction activities • Especially, concrete foundation of poles of overhead transmission line	2	1	2	3	15	Low
3.	Impacts on Soil	• Soil structure and formation will be disturbed due to soil excavation for the foundation of poles of overhead transmission line • Stringing cables for overhead transmission line will also disturb soil structure and upper soil layer	3	1	2	5	30	Moderate
4.	Noise and Vibration Impacts	• Improper unloading electrical equipment and cables for overhead transmission line will generate noise and vibration • Operating and movement of construction machines and vehicles for erecting poles and stringing cables	3	1	1	5	25	Low
5.	Impacts on Occupational Health and Safety	• Falling from height related to poles of overhead transmission line for poles erection and cable stringing which can cause fatal or permanent disabling injury • Use of lifting equipment • Poor working conditions will damage health and put workers at risk as well	4	1	1	4	24	Low

No.	Potential Adverse Impacts	Project Activities	Significance of Potential Adverse Impacts					Impact Significance
			M	D	E	P	SP	
		as operating machinery and using materials in the overhead transmission line construction • Lack of adequate Personal Protective Equipment (PPEs) and warning signs						
6.	Impacts on Community Health and Safety	• Overhead transmission line's cable stringing and poles erection along the route • Movement of construction machines and vehicles	4	1	2	4	28	Low
7.	Fire Hazard Impacts	• Poor installation of electrical equipment and overloads, heating from bunched cables and damaged cables.	3	1	1	4	20	Low
8.	Solid Waste Generation Impacts	• Vegetation debris will be generated during site clearance along right of way for overhead transmission line	2	1	2	5	25	Low
9.	Liquid Waste Generation Impacts	• Cleaning construction machines and vehicles	2	1	2	4	20	Low
10.	Hazardous Waste Generation Impacts	• Used oil disposed of from repair and maintenance of construction machines and vehicles	1	1	1	3	9	Very Low
B.	**Operation Phase**							
1.	Impacts on Air	• Operating and movement of maintenance vehicles	1	4	2	3	21	Low
2.	Impacts on Water	• No significant impacts for this phase.	1	4	1	2	12	Very Low
3.	Impacts on Soil	• Leakage of oils from accident of maintenance vehicles	1	4	2	2	14	Very Low

No.	Potential Adverse Impacts	Project Activities	Significance of Potential Adverse Impacts					Impact Significance
			M	D	E	P	SP	
4.	Noise Impacts	• Operating and movement of maintenance vehicles	1	4	2	3	21	Low
5.	Impacts on Occupational Health and Safety	• Falling from height related to poles of overhead transmission line for maintenance activities • Lack of adequate Personal Protective Equipment (PPEs) and lockout-tagout system while repair and maintenance for overhead transmission line	3	4	1	4	32	Moderate
6.	Impacts on Community Health and Safety	• Climbing poles of overhead transmission line by nearby local people.	2	4	2	4	32	Moderate
7.	Fire Hazard Impacts	• Improper and irregular maintenance of overhead transmission line	1	4	2	4	28	Low

During **Construction Phase** ground mounted solar power plant, impacts on soil, occupational health and safety, community health and safety, solid waste generation and hazardous waste generation can be found as **Moderate Impacts**. Impacts on air, noise and vibration, fire hazard and liquid waste generation can be found as **Low Impacts**. During **Operation Phase**, the impact on occupational health and safety can be categorized as **High Impact**. Impacts on water, community health and safety, fire hazard, liquid waste and hazardous generation can be found as **Moderate Impacts**. Other impacts such as air, soil, noise and vibration and solid waste generation are categorized as **Low Impacts**.

For **Construction Phase** of the overhead transmission line, impacts such as air, water, noise and vibration, occupational health and safety, community health and safety, solid waste generation, liquid waste generation can be found as **Low Impacts**. For **Operation Phase**, air, noise and vibration and fire hazard are as **Low Impacts** and, water and soil are as **Very Low Impacts**.

For **Decommissioning Phase,** the project proponent will extend the operation periods with the approval of relevant departments to generate electricity from solar energy. The project proponent will have prior to submission of the decommissioning plan if they have a plan to close their project permanently. Therefore, impacts identification, impacts assessment and mitigation measures formulating for decommissioning phase of the project is excluded in this Environmental Management Plan Report.

7.8 Mitigation Measures

7.8.1 Mitigation Measures for Environmental Impacts

7.8.1.1 Mitigation Measures for Air Quality

1. **Ground Mounted Solar Power Plant**

Construction Phase: Limit the speed of vehicles within the project area to reduce dust emission. All the access roads in project areas need to regular water spraying to reduce dust emission. If possible, all access roads within project area should pave. All transportation vehicles must cover when carrying the load such as soil, sand and cement to avoid failing of loads.

Construction activities and earth work which generate dust must be done after spraying water. Temporary covers must be installed in working areas. Regular inspection and proper maintenance is required to the construction machines, vehicles and generators to control emission.

Operation Phase: All roads within the project should be paved in order to prevent dust emission. Regularly maintaining and inspecting for all vehicles, machines and generators to control emission. Some trees must be plant around the project area.

2. Overhead Transmission Line

Construction Phase: Limit the speed of vehicles within the project area to reduce dust emission. All transportation vehicles must cover when carrying transmission pole to avoid failing of loads. Construction activities and earth work which generate dust must be done after spraying water.

Operation Phase: Limit the speed of maintenance vehicles and roads within the project should be paved to reduced dust emission.

7.8.1.2 Mitigation Measures for Impacts on Water

1. Ground Mounted Solar Power Plant

Construction Phase: Site leveling should be done with minimum alteration in contour level to prevent natural drainage system of the project. There should be schedule for regular maintenance and inspection for machines, vehicles and generators, that there is no leakage or spillage. Domestic waste must be discharge properly. The project proponent must manage groundwater usage for construction to prevent depletion of groundwater.

Operation Phase: Project proponent must install proper drainage system within the project site to reduce impacts on water. The process for cleaning of PV modules and maintaining must be carried out properly to prevent damaging PV modules. Damaged PV modules and expired modules must be disposed properly by authorized waste management services and disposed directly by burying must be avoided. Transformers, generators, vehicles and machine must be maintained regularly and refueling must be done properly with appropriate place with suitable drainage. Domestic waste must be disposed properly to avoid blockage of local and nearby drainage systems.

2. Overhead Transmission Line

Construction Phase: Site leveling should be done with minimum alteration in contour level to prevent natural drainage system of the project. There should be schedule for regular maintenance and inspection for machines, vehicles and generators, that there is no leakage or spillage.

Operation Phase: No significant impacts in this phase.

7.8.1.3 Mitigation Measures for Impacts on Soil

1. Ground Mounted Solar Power Plant

Construction Phase: earth working activities and concrete mixing processes for foundation of PV modules brackets, poles of overhead transmission line, switchyard, booster station and multiple-use building must be carried out properly. Soil contamination must be avoided by properly usage

of containers and storage area. Refilling the fuel must be carefully done to avoid spills and leaks. Modernized construction machines and vehicles should be used in this project. The installation of PV modules must be done with care to prevent damaging the modules. If PV modules are damage, disposing by authorized waste management services and disposed directly by burying must be avoided. Tress must be planted around the project area. Storage area for construction materials, electrical equipment and fuel must be seal and not to leak into top soil.

Operation Phase: Project proponent must install proper drainage system within the project site to reduce impacts on water. The process for cleaning of PV modules and maintaining must be carried out properly to prevent damaging PV modules. Damaged PV modules and expired modules must be disposed properly by authorized waste management services and disposed directly by burying must be avoided. Transformers, generators, vehicles and machine must be maintained regularly and refueling must be done properly with appropriate place with suitable area. Domestic waste storage and fuel storage area must be sealed properly to avoid leakage to soil.

2. Overhead Transmission Line

Construction Phase: Site leveling should be done with minimum alteration in contour level to prevent natural drainage system of the project. There should be schedule for regular maintenance and inspection for machines, vehicles and generators, that there is no leakage or spillage.

Operation Phase: No significant impacts in this phase.

7.8.1.4 Mitigation Measures for Noise and Vibration Impacts

1. Ground Mounted Solar Power Plant

Construction Phase: Excessive noise and vibration generated construction activities must be notified to nearby communities. The constructions machines, generators and vehicles used in project must be maintain regularly to perform well in construction phase. Construction machines and vehicles with high noise and vibration must be operated only at day time.

Operation Phase: The inverters, transformers, generators and vehicles used in project must be maintain regularly to reduce noise. No specific mitigation measure for vibration was needed as this project is to generate electricity from Solar and distribute to Shwekyin Substation via overhead transmission line.

2. Overhead Transmission Line

Construction Phase: Excessive noise and vibration generated construction activities must be notified to nearby communities. The constructions machines, generators and vehicles used in

project must be maintain regularly to perform well in construction phase. Construction machines and vehicles with high noise and vibration must be operated only at day time.

Operation Phase: No significant impacts in this phase.

7.8.2 Mitigation Measures for Impacts on Flora and Fauna

7.8.2.1 Terrestrial Ecology

1. Ground Mounted Solar Power Plant

Site clearance of Rubber plantation for Solar Power Plant must be minimized as much as possible. Introduction to exotic species by project should not be allowed during both construction and operation phase.

2. Overhead Transmission Line

Site clearance of Rubber plantation for right of way of overhead transmission line must be minimized as much as possible.

7.8.2.2 Aquatic Ecology

1. Ground Mounted Solar Power Plant

There is no marine park, coastal resource, mangrove area or any other water body as river, creek, stream, lake and reservoir within the project area. Therefore, no specific mitigation measure is needed for this project.

2. Overhead Transmission Line

No specific mitigation measures is needed for this project.

7.8.3 Mitigation Measures for Impacts on Human

7.8.3.1 Occupational Health and Safety

1. Ground Mounted Solar Power Plant

Construction Phase: The project proponent must provide Personal Protective Equipment (PPEs) such as helmets, goggles, ear plugs, masks, safety vest, gloves and safety shoes or boots to all construction workers. The PPEs must be regularly inspected to ensure for safety of workers. Lockout-tagout system must be used for installation of electrical equipment. Training such as First Aid, OHS, Firefighting and other essential training must be provided to all construction workers

and first aid kit must be provided. Construction machines and vehicles must be operated by trained and licensed operators. Purified drinking water must be provided for health of workers. All construction workers must follow the instruction issued by the Ministry of Health and Sports to prevent COVID-19 virus infection during pandemic period.

Operation Phase: The project proponent must provide Personal Protective Equipment (PPEs) such as helmets, goggles, ear plugs, masks, safety vest, gloves and safety shoes or boots to all operation workers. The PPEs must be regularly inspected to ensure for safety of workers. Lockout-tagout system must be used for maintaining of electrical equipment. All electrical equipment must be marked with warning sign. Proper management for electricity generation and distributing such as checking all electric cords, cables and do not use overload voltage must be carried out. Housekeeping staffs must be trained and assigned to do regular cleaning and housekeeping for prevention of accidents due to poor housekeeping in the project. Purified drinking water must be provided for health of workers. All construction workers must follow the instruction issued by the Ministry of Health and Sports to prevent COVID-19 virus infection during pandemic period.

2. Overhead Transmission Line

Construction Phase: The project proponent must provide Personal Protective Equipment (PPEs) such as helmets, goggles, ear plugs, masks, safety vest, gloves and safety shoes or boots to all construction workers. The PPEs must be regularly inspected to ensure for safety of workers. Personal fall restraint system must be provided to the workers who work at height. Construction machines and vehicles must be operated by trained and licensed operators. All construction workers must follow the instruction issued by the Ministry of Health and Sports to prevent COVID-19 virus infection during pandemic period.

Operation Phase: The project proponent must provide Personal Protective Equipment (PPEs) such as helmets, goggles, ear plugs, masks, safety vest, gloves and safety shoes or boots to all operation workers. The PPEs must be regularly inspected to ensure for safety of workers. Personal fall restraint system must be provided to the workers who work at height. All construction workers must follow the instruction issued by the Ministry of Health and Sports to prevent COVID-19 virus infection during pandemic period.

7.8.3.2 Mitigation Measures for Community Health and Safety Impacts

1. Ground Mounted Solar Power Plant

Construction Phase: Drivers must drive with speed limit on public road and project site. Before installation of PV modules, project proponent must assess glint and glare on local people and consult with experts to reduce the impacts.

Operation Phase: The project proponent must follow international guidelines and standards to generate electricity and distribute to Shwekyin Substation.

2. Overhead Transmission Line

Construction Phase: Drivers must drive with speed limit on public road when maintenance is needed for transmission lines. Cable stringing and construction of poles for overhead transmission line must be informed to local people before the works start.

Operation Phase: Safety notices and warning signs must be placed at the fence of the project area and poles of overhead transmission line not to illegally entering the area or climbing on the poles.

7.8.3.3 Mitigation Measures for Fire Hazard Impacts

1. Ground Mounted Solar Power Plant

Construction Phase: Fire extinguishers must be installed sufficiently enough near temporary office building, storage area, generator and worker camps. Water for firefighting must be stored enough in proper water storage. Firefighting training and fire drills must be provided to all construction workers for in case of emergency. Assembly point must be assigned for emergency and gathering of workers and smoking area must be assigned at appropriate place in project site.

Operation Phase: Regular inspection and maintenance must be done to all PV modules, electrical equipment and overhead transmission line. Fire extinguishers must be placed at fuel storage area, generators, switchyard, multiple-use building and must be inspect regularly. Fire hose reels and fire hydrants must be placed around the project site. Around the project site there must be fire protection lane to prevent fire in dry season. Assembly point must be assigned for emergency and gathering of workers and smoking area must be assigned at appropriate place in project site. Visible and audible fire alarm system must be installed and emergency route and exit sign must be assigned at multiple-use building and there must no blockage for emergency cases.

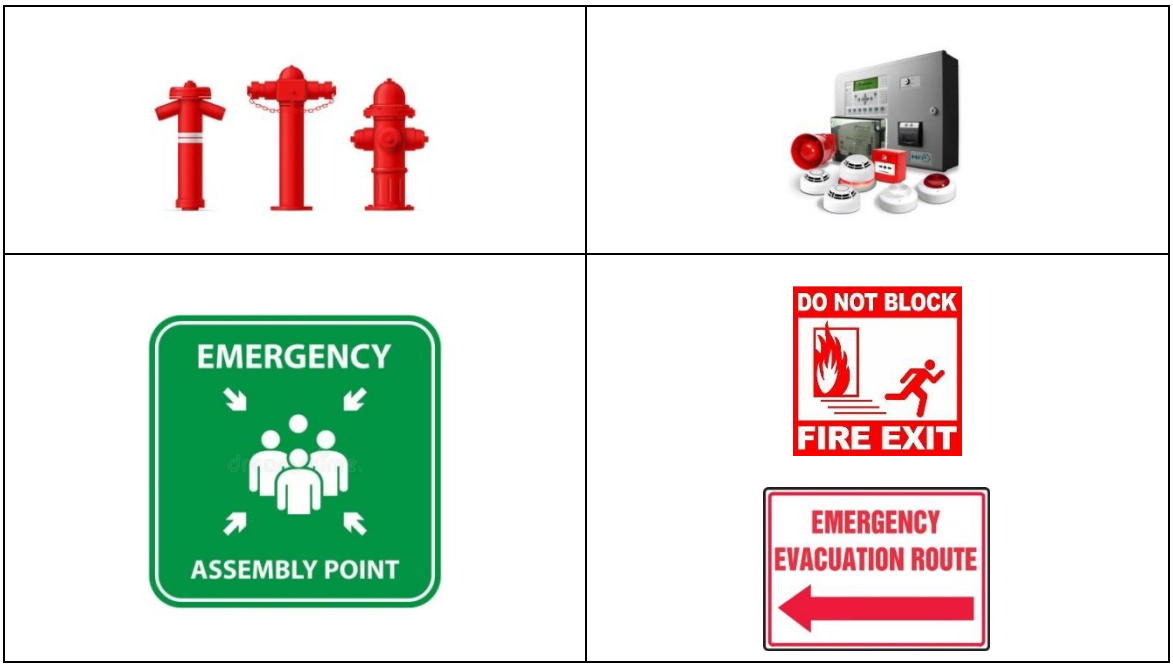


Figure 7.1– Firefighting equipment and Emergency Signs

2. Overhead Transmission Line

Construction Phase: Regular and proper maintenance of electrical equipment of transmission poles and cables.

Operation Phase: **Operation Phase**: Regular inspection and maintenance must be done to all electrical equipment and overhead transmission line.

7.8.4 Mitigation Measures for Waste Generation Impacts

7.8.4.1 Solid Waste

1. Ground Mounted Solar Power Plant

Construction Phase: Trees and vegetation from site clearance must be collected properly and other debris from earth works must be used for filling and leveling in project site. The proponent must calculate detail requirement of raw materials for purchasing electrical equipment and construction materials to reduce solid waste generation. There must be proper waste disposal site and different waste bins in the project site.

Operation Phase: There is no operation solid waste as the proposed project is generation of electricity from solar and distribute to Shwekyin Substation. However, The proponent must calculate detail requirement of raw materials for purchasing electrical equipment and construction

materials to reduce solid waste generation. There must be proper waste disposal site and different waste bins in the project site.

2. Overhead Transmission Line

Construction Phase: Trees and vegetation from site clearance for right of way of transmission poles must be collected properly.

Operation Phase: No significant impacts in this phase.

7.8.4.2 Liquid Waste Generation

1. Ground Mounted Solar Power Plant

Construction Phase: Sanitation facilities such as toilets, washing basins and septic tanks must be provided.

Operation Phase: Project proponent must install proper drainage system within the project site to reduce liquid waste generation impacts.

2. Overhead Transmission Line

Construction Phase: No significant impacts in this phase.

Operation Phase: No significant impacts in this phase.

7.8.4.3 Hazardous Waste Generation Impacts

1. Ground Mounted Solar Power Plant

Construction Phase: Fuel and lubricants for construction machines and vehicles must be kept and handle with care. Used oil must be disposed properly and collect with container. Storage and maintenance area must be paved to prevent leakage. Damage PV modules which contain lead and cadmium must be dispose properly with authorized waste collectors.

Residual cement, solvent-based paints and other lubricants must be collected separated at designated area and final disposal a hazardous waste must be transferred to the Township Development Committee.

Operation Phase: Fuel and lubricants for operation of machines and vehicles must be kept and handle with care. Used oil must be disposed properly and collect with container. Storage and maintenance area must be paved to prevent leakage. Damage PV modules which contain lead and

cadmium must be dispose properly with authorized waste collectors. This project does not use battery to store electricity and therefore there is no old or expire batteries wastes.

Residual cement, solvent-based paints and other lubricants must be collected separated at designated area and final disposal a hazardous waste must be transferred to the Township Development Committee.

2. Overhead Transmission Line

Construction Phase: No significant impacts in this phase.

Operation Phase: No significant impacts in this phase.

CHAPTER 8 - ENVIRONMENTAL MANAGEMENT PLAN (EMP)

8.1 Institutional Requirement

This Environmental Management Plan (EMP) report is prepared as an environmental management framework for 40 MW Ground Mounted Solar Power Plant Project in Shwkyin Substation. The environmental management practices, procedures and responsibilities are defined herein to get full compliance with the existing environmental policy, laws, rules and instructions of the Republic of the Union of Myanmar. The project proponent should appoint Health, Safety and Environment (HSE) Coordinator or Environmental Staff throughout the life span of the project. The environmental coordinator/staff will review and update this plan at least one time annually to cover all potential impacts, mitigations and modifications as necessary. Revisions will be made as need throughout the year. Myanmar Shwekyin Solar Company Limited is responsible party for the Environmental Management Plan for 40 MW Ground Mounted Solar Power Plant Project. Moreover, if the cost estimation for the implementation of Environmental Management Plan and Environmental Monitoring Plan does not fully cover the practical solutions stated in this report at the time of implementation, we, Myanmar Shwekyin Solar Company Limited will add additional finds to get the target of these plans through the project lifespan. Any suggestions, comments and questions must be directed to 40MW Ground Mounted Solar Power Plant Project. We, Myanmar Shwekyin Solar Company Limited, had made commitment that we will construct and operate our project according to our commitments and implement Environmental Management Plans (EMP) and mitigation measures that are mentioned in this EMP report and if any impacts that are not anticipated in the report occur, appropriate mitigation measures must be implemented accordingly.

8.2 Environmental Management Plan (EMP)

The Environmental Management Plan (EMP) prepared for the prepared for the proposed project covers the anticipated impacts of the project, mitigation measures, management and monitoring plans during each phase:

- Construction Phase
- Operation Phase
- Decommissioning Phase**:** after operation period, the project proponent will extend the operation periods with the approval of relevant departments to generate electricity from solar energy. The project proponent will have prior to submission of the decommissioning plan if they have a plan to close their project permanently. Therefore, impacts identification, impacts assessment and mitigation measures formulating for decommissioning phase of the project is excluded in this Environmental Management Plan Report.

The objectives of the Environmental Management Plan (EMP) are to:

- Identify possible impacts from implementation of the proposed project;
- Identify a range of mitigation measures which could reduce and mitigate the potential impacts to minimal or insignificant levels;
- Establish a method of monitoring and auditing environmental management practices during all phases of development;
- Detail specific actions deemed necessary to assist in mitigating the environmental impact of the project;
- Ensure that the safety recommendations are complied with;
- Specify time periods within which the measures contemplated in the final environmental management plan must be implemented, where appropriate.

Since not all the data can bring out all variations induced by the natural or human activities, regular monitoring program of the environmental parameters is essential to take into account the changes in the environment.

Myanmar Shwekyin Solar Power Company Limited must manage the development of the proposed project by implementing this EMP, which is comprised the following parts:

- Environmental Management Plan
- Environmental Monitoring Plan
- Corporate Social Responsibility Plan
- Firefighting Plan
- Emergency Preparedness and Response Plan and
- Grievance Redress Mechanism

8.3 Responsibility of EMP

The responsibilities are required to identify and to establish the development and effective implementation of the EMP. The environmental management practices, procedures, and responsibilities defined herein to get full compliance with the existing national environmental policy, laws, rules, and regulations.

In order to implement this EMP effectively, it will be necessary to define the responsibilities of various stakeholders. The following entities should be involved in the implementation of this EMP:

1. Project Proponents

- ✓ Myanmar Shwekyin Solar Power Company Limited.
- ✓ Project Contractors

2. Environmental Conservation Department, ECD

3. Third-Party Environmental Consultancy

1. The Project Proponent

- ✓ Project Owner (Myanmar Shwekyin Solar Power Company Limited)

Myanmar Shwekyin Solar Power Company Limited is mainly responsible for implementation of successful EMP both during construction and operation period. Project owner will employ environmental staff to monitor and report the project implementation. Environmental staff will overview and supervise the implementation of the EMP by the contractors and evaluate the success of mitigation measures by monitoring the outcome of the measures.

- ✓ Project Contractors

We are responsible for all the construction activities which may induce impacts to the surrounding environment. We are responsible to implement the mitigation measures of the impacts induced by their activities as per the measures in the EMP and directed by the project proponent.

2. Environmental Conservation Department (ECD)

We will coordinate with the ECD during their inspection and monitoring. Periodical reporting will be done according to the instruction of ECD.

3. Third Party Environmental Consultancy

We may employ a third-party environmental consultant to ensure the proposed EMP is up to date and is being followed properly by the proponent. Periodic audits of the EMP will have to be done to ensure that its performance is as expected, by comparing with operating standards so that any corrective actions can be taken.

8.3.1 Responsible Person for EMP and Mitigation Measures

Implementation of the EMP, management practices and mitigation measures are the responsibility of all project implementers: however, key personnel (Project Director, Site Manager, HSE Coordinator, HSE Assistant, Ministry of Natural Resources and Environmental Conservation (MONREC)) are main responsible persons for communicating environmental matters and ensuring management practices and procedures are being implemented. The list of responsible persons for implementing EMP and mitigation measures are described in the following table in terms of their name, position, department, phone number and responsibilities.

Table 8.1 Responsible Persons for EMP and Mitigation Measures

No.	Name	Position	Department	Responsibilities and Duties
1.	Responsible person	Project Manger	Myanmar Shwekyin Solar Power Company Limited	• Implementation of the EMP • Supervision and management of the implementation of EMP
2.	Responsible person	Project Engineer		• Implementation of the EMP • Supervision and monitoring of the implementation of EMP
3.	The project proponent shall appoint one HSE Coordinator	HSE Coordinator		• Implementation of the EMP • Oversight of overall implementation of the project environmental activities • Supervision and monitoring of the implementation of EMP • Supervision, monitoring and performing of Health and safety for workers
4.	Members of MONREC	Department	MONREC	• Monitoring and inspection of projects to determine compliance with all environmental and social requirements • The Ministry may impose penalties and/ or require the project proponent to undertake corrective action • Where, the Ministry views that the project is not in compliance, it shall ➢ Promptly inform the project proponent ➢ Indicate specific noncompliance of the project environmental and social requirements; and ➢ Specify a time period for the project proponent to bring the project into compliance • In the event of noncompliance ➢ Inform the project proponent indicating the specific noncompliance with

				environmental and social requirements; • Where a project is not in compliance or not likely to comply with its environmental and social requirements, take enforcement action including: ➢ Suspension of project operation; and ➢ Employing third parties to correct non-compliance **Source: Environmental Impact Assessment Procedure (2015).**

8.4 Environmental Management Plan

Table 8.2 - Environmental Management Plan for Shwekyin Solar Power Plant Project (Ground Mounted Solar Power Plant)

No.	Potential Environmental Impact	Impacts	Mitigation Measures	Location	Estimated Cost per Year (MMK)	Residual Impacts	Responsible Party
1.	Air Quality	Dust and Gaseous emission	Construction Phase: - Limit the speed of vehicles within the project area to reduce dust emission. - All the access roads in project areas need to regular water spraying to reduce dust emission. - If possible, all access roads within project area should pave. - All transportation vehicles must cover when carrying the load such as soil, sand and cement to avoid failing of loads.	- Within project site.	Already included in cost estimation for EMP	- Low	- Myanmar Shwekyin Solar Power Company Limited
			Operation Phase: - All roads within the project should be paved in order to prevent dust emission.	- Within project site.	Already included in cost estimation for EMP	- Low	- Myanmar Shwekyin Solar Power Company Limited

No.	Potential Environmental Impact	Impacts	Mitigation Measures	Location	Estimated Cost per Year (MMK)	Residual Impacts	Responsible Party
2.	Water Quality	Ground Water pollution and Ground water depletion	Construction Phase: - Site leveling should be done with minimum alteration in contour level to prevent natural drainage system of the project. - There should be schedule for regular maintenance and inspection for machines, vehicles and generators, that there is no leakage or spillage. - Domestic waste must be discharge properly. - The project proponent must manage groundwater usage for construction to prevent depletion of groundwater.	- Within project site.	Already included in cost estimation for EMP	- Very Low	- Myanmar Shwekyin Solar Power Company Limited
			Operation Phase: - Transformers, generators, vehicles and machine must be	- Within project site.	Already included in cost estimation for EMP	- Low	- Myanmar Shwekyin Solar Power Company Limited

No.	Potential Environmental Impact	Impacts	Mitigation Measures	Location	Estimated Cost per Year (MMK)	Residual Impacts	Responsible Party
			maintained regularly and refueling must be done properly with appropriate place with suitable drainage.				
3.	Soil Quality	Soil contamination	Construction Phase: - Earth working activities and concrete mixing processes for foundation of PV modules brackets, poles of overhead transmission line, switchyard, booster station and multiple-use building must be carried out properly. - Soil contamination must be avoided by properly usage of containers and storage area. - Refilling the fuel must be carefully done to avoid spills and leaks. Modernized construction	- Where baseline study was carried out	Already included in cost estimation for EMP	- Low	- Myanmar Shwekyin Solar Power Company Limited

No.	Potential Environmental Impact	Impacts	Mitigation Measures	Location	Estimated Cost per Year (MMK)	Residual Impacts	Responsible Party
			machines and vehicles should be used in this project. - The installation of PV modules must be done with care to prevent damaging the modules. - If PV modules are damage, disposing by authorized waste management services and disposed directly by burying must be avoided. - Tress must be planted around the project area. Storage area for construction materials, electrical equipment and fuel must be seal and not to leak into top soil.				
			Operation Phase: - Transformers, generators, vehicles and machine must be maintained	- Within project site.	Already included in cost estimation for EMP	- Very Low	- Myanmar Shwekyin Solar Power Company Limited

No.	Potential Environmental Impact	Impacts	Mitigation Measures	Location	Estimated Cost per Year (MMK)	Residual Impacts	Responsible Party
			regularly and refueling must be done properly with appropriate place with suitable area.				
4.	Noise and Vibration	Nuisance due to noise and vibration	Construction Phase: - Excessive noise and vibration generated construction activities must be notified to nearby communities. - The constructions machines, generators and vehicles used in project must be maintain regularly to perform well in construction phase. - Construction machines and vehicles with high noise and vibration must be operated only at day time.	- Where baseline study was carried out	Already included in cost estimation for EMP	- Low	- Myanmar Shwekyin Solar Power Company Limited
			Operation Phase: - No specific mitigation measure for vibration was needed as this project is to	- Within project site.	Already included in cost estimation for EMP	- Very Low	- Myanmar Shwekyin Solar Power Company Limited

No.	Potential Environmental Impact	Impacts	Mitigation Measures	Location	Estimated Cost per Year (MMK)	Residual Impacts	Responsible Party
			generate electricity from Solar and distribute to Shwekyin Substation via overhead transmission line.				
5.	Flora	Disturbance ecology and habitats	Construction Phase: - Site clearance of Rubber plantation for Solar Power Plant must be minimized as much as possible. - Introduction to exotic species by project should not be allowed during both construction and operation phase.	- Within project site.	Already included in cost estimation for EMP	- Very Low	- Myanmar Shwekyin Solar Power Company Limited
6.	Fauna	Disturbance ecology and habitats	Construction Phase: - There is no marine park, coastal resource, mangrove area or any other water body as river, creek, stream, lake and reservoir within the project area. - Therefore, no specific mitigation	- Within project site.	Already included in cost estimation for EMP	- Very Low	- Myanmar Shwekyin Solar Power Company Limited

No.	Potential Environmental Impact	Impacts	Mitigation Measures	Location	Estimated Cost per Year (MMK)	Residual Impacts	Responsible Party
			measure is needed for this project.				
7.	Occupational Health and Safety	Health and Safety problems for workers	Construction Phase: - The project proponent must provide Personal Protective Equipment (PPEs) such as helmets, goggles, ear plugs, masks, safety vest, gloves and safety shoes or boots to all construction workers. - The PPEs must be regularly inspected to ensure for safety of workers. - Lockout-tagout system must be used for installation of electrical equipment. Training such as First Aid, OHS, Firefighting and other essential training must be provided to all construction workers and first	- Within project site.	Already included in cost estimation for EMP	- Low	- Myanmar Shwekyin Solar Power Company Limited

No.	Potential Environmental Impact	Impacts	Mitigation Measures	Location	Estimated Cost per Year (MMK)	Residual Impacts	Responsible Party
			aid kit must be provided. - Construction machines and vehicles must be operated by trained and licensed operators. - Purified drinking water must be provided for health of workers. - All construction workers must follow the instruction issued by the Ministry of Health and Sports to prevent COVID-19 virus infection during pandemic period.				
			Operation Phase: - The project proponent must provide Personal Protective Equipment (PPEs) such as helmets, goggles, ear plugs, masks, safety vest, gloves and safety	- Within project site.	Already included in cost estimation for EMP	- Low	- Myanmar Shwekyin Solar Power Company Limited

No.	Potential Environmental Impact	Impacts	Mitigation Measures	Location	Estimated Cost per Year (MMK)	Residual Impacts	Responsible Party
			shoes or boots to all operation workers. - The PPEs must be regularly inspected to ensure for safety of workers. - All electrical equipment must be marked with warning sign. - Proper management for electricity generation and distributing such as checking all electric cords, cables and do not use overload voltage must be carried out. - Purified drinking water must be provided for health of workers.				
8.	Community Health and Safety	Health and safety problems for nearby local communities	Construction Phase: - Drivers must drive with speed limit on public road and project site. - Before installation of PV modules, project proponent	- Within project site.	Already included in cost estimation for EMP	- Low	- Myanmar Shwekyin Solar Power Company Limited

No.	Potential Environmental Impact	Impacts	Mitigation Measures	Location	Estimated Cost per Year (MMK)	Residual Impacts	Responsible Party
			must assess glint and glare on local people and consult with experts to reduce the impacts.				
			Operation Phase: - The project proponent must follow international guidelines and standards to generate electricity and distribute to Shwekyin Substation.	- Within project site.	Already included in cost estimation for EMP	- Very Low	- Myanmar Shwekyin Solar Power Company Limited
9.	Fire Hazard	Loss of properties and life	Construction Phase - Fire extinguishers must be installed sufficiently enough near temporary office building, storage area, generators and worker camps. - Water for firefighting must be stored enough in proper water storage. - Firefighting training and fire drills must be	- Within project site.	Already included in cost estimation for EMP	- Very Low	- Myanmar Shwekyin Solar Power Company Limited

No.	Potential Environmental Impact	Impacts	Mitigation Measures	Location	Estimated Cost per Year (MMK)	Residual Impacts	Responsible Party
			provided to all construction workers for in case of emergency. - Assembly point must be assigned for emergency and gathering of workers and smoking area must be assigned at appropriate place in project site.				
			Operation Phase: - Regular inspection and maintenance must be done to all PV modules, electrical equipment and overhead transmission line.	- Within project site.	Already included in cost estimation for EMP	- Very Low	- Myanmar Shwekyin Solar Power Company Limited
12.	Solid Waste Generation	Water and soil pollution and impacts on health	Construction Phase: - Trees and vegetation from site clearance must be collected properly and other debris from earth works must be used for filling and leveling in project site.	- Within project site.	Already included in cost estimation for EMP	- Low	- Myanmar Shwekyin Solar Power Company Limited

No.	Potential Environmental Impact	Impacts	Mitigation Measures	Location	Estimated Cost per Year (MMK)	Residual Impacts	Responsible Party
			- The proponent must calculate detail requirement of raw materials for purchasing electrical equipment and construction materials to reduce solid waste generation. - There must be proper waste disposal site and different waste bins in the project site.				
			Operation Phase - There is no solid waste generation as the proposed project is generation of electricity from solar and distribute to Shwekyin Substation.	- Within project site.	Already included in cost estimation for EMP	- Very Low	- Myanmar Shwekyin Solar Power Company Limited
13.	Liquid Waste Generation	Water and soil pollution and impacts on health	Construction Phase - Sanitation facilities such as toilets, washing basins and septic tanks must be provided.	- Within project site.	Already included in cost estimation for EMP	- Low	- Myanmar Shwekyin Solar Power Company Limited

No.	Potential Environmental Impact	Impacts	Mitigation Measures	Location	Estimated Cost per Year (MMK)	Residual Impacts	Responsible Party
			- There are 8 toilets and 14 basins for constructions workers.				
			Operation Phase - There is no solid waste generation as the proposed project is generation of electricity from solar and distribute to Shwekyin Substation.	- Within project site.	Already included in cost estimation for EMP	- Very Low	- Myanmar Shwekyin Solar Power Company Limited
14.	Hazardous Waste Generation	Water and soil pollution and impacts on health	Construction Phase: - Fuel and lubricants for construction machines and vehicles must be kept and handle with care. - Used oil must be disposed properly and collect with container. Storage and maintenance area must be paved to prevent leakage. - Damage PV modules which contain lead and cadmiun must be dispose properly	- Within project site.	Already included in cost estimation for EMP	- Low	- Myanmar Shwekyin Solar Power Company Limited

No.	Potential Environmental Impact	Impacts	Mitigation Measures	Location	Estimated Cost per Year (MMK)	Residual Impacts	Responsible Party
			with authorized waste collectors. - Residual cement, solvent-based paints and other lubricants must be collected separated at designated area and final disposal a hazardous waste must be transferred to the Township Development Committee.				
			Operation Phase: - Fuel and lubricants for maintenance vehicles must be kept and handled systematically - Damaged PV modules and uninstalled lifespan-expired PV modules due to exchanging new PV modules at the time of extending operation period of the project must be disposed with adequate	- Within project site.	Already included in cost estimation for EMP	- Very Low	- Myanmar Shwekyin Solar Power Company Limited

No.	Potential Environmental Impact	Impacts	Mitigation Measures	Location	Estimated Cost per Year (MMK)	Residual Impacts	Responsible Party
			packaging at waste management authorities or service providers, according to the instructions of the government and direct burry and open burning must be strictly prohibited.				

Table 8.3 - Environmental Management Plan for Shwekyin Solar Power Plant Project (Overhead Transmission Line)

No.	Potential Environmental Impact	Impacts	Mitigation Measures	Location	Estimated Cost per Year (MMK)	Residual Impacts	Responsible Party
1.	Air Quality	Dust and Gaseous emission	Construction Phase: - Limit the speed of vehicles within the project area to reduce dust emission. - All the access roads in project areas need to regular water spraying to reduce dust emission. - If possible, all access roads within project area should pave.	- Within project site.	Already included in cost estimation for EMP	- Low	- Myanmar Shwekyin Solar Power Company Limited

No.	Potential Environmental Impact	Impacts	Mitigation Measures	Location	Estimated Cost per Year (MMK)	Residual Impacts	Responsible Party
			- All transportation vehicles must cover when carrying the load such as soil, sand and cement to avoid failing of loads.				
			Operation Phase: - All roads within the project should be paved in order to prevent dust emission.	- Within project site.	Already included in cost estimation for EMP	- Very Low	- Myanmar Shwekyin Solar Power Company Limited
2.	Water Quality	Ground Water pollution and Ground water depletion	Construction Phase: - Site leveling should be done with minimum alteration in contour level to prevent natural drainage system of the project. - There should be schedule for regular maintenance and inspection for machines, vehicles and generators, that there is no leakage or spillage.	- Within project site.	Already included in cost estimation for EMP	- Low	- Myanmar Shwekyin Solar Power Company Limited

No.	Potential Environmental Impact	Impacts	Mitigation Measures	Location	Estimated Cost per Year (MMK)	Residual Impacts	Responsible Party
			- Domestic waste must be discharge properly. - The project proponent must manage groundwater usage for construction to prevent depletion of groundwater.				
			Operation Phase: - Transformers, generators, vehicles and machine must be maintained regularly and refueling must be done properly with appropriate place with suitable drainage.	- Within project site.	Already included in cost estimation for EMP	- Very Low	- Myanmar Shwekyin Solar Power Company Limited
3.	Soil Quality	Soil contamination	Construction Phase: - Earth working activities and concrete mixing processes for foundation of PV modules brackets, poles of overhead transmission line, switchyard, booster station and	- Where baseline study was carried out	Already included in cost estimation for EMP	- Low	- Myanmar Shwekyin Solar Power Company Limited

No.	Potential Environmental Impact	Impacts	Mitigation Measures	Location	Estimated Cost per Year (MMK)	Residual Impacts	Responsible Party
			multiple-use building must be carried out properly. - Soil contamination must be avoided by properly usage of containers and storage area. - Refilling the fuel must be carefully done to avoid spills and leaks. Modernized construction machines and vehicles should be used in this project. - The installation of PV modules must be done with care to prevent damaging the modules. - If PV modules are damage, disposing by authorized waste management services and disposed directly by burying must be avoided.				

No.	Potential Environmental Impact	Impacts	Mitigation Measures	Location	Estimated Cost per Year (MMK)	Residual Impacts	Responsible Party
			- Tress must be planted around the project area. Storage area for construction materials, electrical equipment and fuel must be seal and not to leak into top soil.				
			Operation Phase: - Transformers, generators, vehicles and machine must be maintained regularly and refueling must be done properly with appropriate place with suitable area.	- Within project site.	Already included in cost estimation for EMP	- Very Low	- Myanmar Shwekyin Solar Power Company Limited
4.	Noise and Vibration	Nuisance due to noise and vibration	Construction Phase: - Excessive noise and vibration generated construction activities must be notified to nearby communities. - The constructions machines, generators and vehicles used in	- Where baseline study was carried out	Already included in cost estimation for EMP	- Low	- Myanmar Shwekyin Solar Power Company Limited

No.	Potential Environmental Impact	Impacts	Mitigation Measures	Location	Estimated Cost per Year (MMK)	Residual Impacts	Responsible Party
			project must be maintain regularly to perform well in construction phase. - Construction machines and vehicles with high noise and vibration must be operated only at day time.				
			Operation Phase: - No specific mitigation measure for vibration was needed as this project is to generate electricity from Solar and distribute to Shwekyin Substation via overhead transmission line.	- Within project site.	Already included in cost estimation for EMP	- Very Low	- Myanmar Shwekyin Solar Power Company Limited
5.	Flora	Disturbance ecology and habitats	Construction Phase: - Site clearance of Rubber plantation for Solar Power Plant must be minimized as much as possible. - Introduction to exotic species by project should not	- Within project site.	Already included in cost estimation for EMP	- Very Low	- Myanmar Shwekyin Solar Power Company Limited

No.	Potential Environmental Impact	Impacts	Mitigation Measures	Location	Estimated Cost per Year (MMK)	Residual Impacts	Responsible Party
			be allowed during both construction and operation phase.				
6.	Fauna	Disturbance ecology and habitats	Construction Phase: - There is no marine park, coastal resource, mangrove area or any other water body as river, creek, stream, lake and reservoir within the project area. - Therefore, no specific mitigation measure is needed for this project.	- Within project site.	Already included in cost estimation for EMP	- Very Low	- Myanmar Shwekyin Solar Power Company Limited
7.	Occupational Health and Safety	Health and Safety problems for workers	Construction Phase: - The project proponent must provide Personal Protective Equipment (PPEs) such as helmets, goggles, ear plugs, masks, safety vest, gloves and safety shoes or boots to all construction workers.	- Within project site.	Already included in cost estimation for EMP	- Low	- Myanmar Shwekyin Solar Power Company Limited

No.	Potential Environmental Impact	Impacts	Mitigation Measures	Location	Estimated Cost per Year (MMK)	Residual Impacts	Responsible Party
			- The PPEs must be regularly inspected to ensure for safety of workers. - Lockout-tagout system must be used for installation of electrical equipment. Training such as First Aid, OHS, Firefighting and other essential training must be provided to all construction workers and first aid kit must be provided. - Construction machines and vehicles must be operated by trained and licensed operators. - Purified drinking water must be provided for health of workers. - All construction workers must follow the				

No.	Potential Environmental Impact	Impacts	Mitigation Measures	Location	Estimated Cost per Year (MMK)	Residual Impacts	Responsible Party
			instruction issued by the Ministry of Health and Sports to prevent COVID-19 virus infection during pandemic period.				
			Operation Phase: - The project proponent must provide Personal Protective Equipment (PPEs) such as helmets, goggles, ear plugs, masks, safety vest, gloves and safety shoes or boots to all operation workers. - The PPEs must be regularly inspected to ensure for safety of workers. - All electrical equipment must be marked with warning sign. - Proper management for electricity generation and distributing such as checking all	- Within project site.	Already included in cost estimation for EMP	- Low	- Myanmar Shwekyin Solar Power Company Limited

No.	Potential Environmental Impact	Impacts	Mitigation Measures	Location	Estimated Cost per Year (MMK)	Residual Impacts	Responsible Party
			electric cords, cables and do not use overload voltage must be carried out. - Purified drinking water must be provided for health of workers.				
8.	Community Health and Safety	Health and safety problems for nearby local communities	Construction Phase: - Drivers must drive with speed limit on public road and project site. - Before installation of PV modules, project proponent must assess glint and glare on local people and consult with experts to reduce the impacts.	- Within project site.	Already included in cost estimation for EMP	- Low	- Myanmar Shwekyin Solar Power Company Limited
			Operation Phase: - The project proponent must follow international guidelines and standards to generate electricity and distribute to Shwekyin Substation.	- Within project site.	Already included in cost estimation for EMP	- Very Low	- Myanmar Shwekyin Solar Power Company Limited

No.	Potential Environmental Impact	Impacts	Mitigation Measures	Location	Estimated Cost per Year (MMK)	Residual Impacts	Responsible Party
9.	Fire Hazard	Loss of properties and life	Construction Phase - Fire extinguishers must be installed sufficiently enough near temporary office building, storage area, generators and worker camps. - Water for firefighting must be stored enough in proper water storage. - Firefighting training and fire drills must be provided to all construction workers for in case of emergency. - Assembly point must be assigned for emergency and gathering of workers and smoking area must be assigned at appropriate place in project site.	- Within project site.	Already included in cost estimation for EMP	- Very Low	- Myanmar Shwekyin Solar Power Company Limited
			Operation Phase: - Regular inspection and maintenance	- Within project site.	Already included in cost	- Very Low	- Myanmar Shwekyin Solar Power

No.	Potential Environmental Impact	Impacts	Mitigation Measures	Location	Estimated Cost per Year (MMK)	Residual Impacts	Responsible Party
			must be done to all PV modules, electrical equipment and overhead transmission line.		estimation for EMP		Company Limited

8.5 Environmental Monitoring Plan (EMoP)

Monitoring of the anticipated environmental and social impacts in the receiving environments is important in evaluating the effectiveness of mitigation plan and compliance with the regulatory measures in place. During the operation phase and decommissioning phase monitoring will be undertaken to ensure that proposed mitigation measures for negative impacts and enhancement measures for positive impacts are implemented.

Main objectives of environment monitoring plan include;

- To identify and resolve environmental issues and other functions that may arise during the operation phase
- To implement water quality, air quality and noise impact monitoring plan during the operation phase
- To check and quantify the overall environmental performance, implement action plans and recommend and implement remedial actions
- To conduct regular reviews of monitored data as the basis for assessing mitigation measures are identified, designed and implemented;
- To assess and interpret all environmental monitoring, data to ascertain whether environmental control measures and practices are functioning in accordance to specifications
- To predict the unforeseen impacts.

Table 8.4 - Environmental Monitoring Plan (40MW Ground Mounted Solar Power Plant)

Environmental Concern	Parameters	Target Level	Measurement Method	Frequency	Location	Estimated Cost per One Time (MMK)	Responsible Party
Construction Period							
Air Quality	PM_{10}, $PM_{2.5}$, CO, CO_2, NO_2, SO_2	Within NEQ Guideline and International Standards	Relevant Air Quality Monitoring or Measuring Equipment	Once a year	A suitable point within the project site	Already included in cost estimation for EMP	Myanmar Shwekyin Solar Power Company Limited
Noise and Vibration	Equivalent Noise Level dB (A)	Within NEQ Guideline and International Standards	Relevant Noise and Vibration Meter Equipment	Once a year	A suitable point within the project site and a suitable point at the boundary of project site	Already included in cost estimation for EMP	Myanmar Shwekyin Solar Power Company Limited
Groundwater Quality	pH, Dissolve Oxygen, Turbidity, Conductivity, Salinity, Total Suspended Solids, Total Dissolved Solids, Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Caliform Count	Within WHO Guideline	Sampling and Relevant Laboratory	Once a year	An outlet from tube well within the project site	Already included in cost estimation for EMP	Myanmar Shwekyin Solar Power Company Limited
Waste Quantity	Waste			Four time a year	At project waste disposal site	Already included in	Myanmar Shwekyin Solar Power

						cost estimation for EMP	Company Limited
Operation Period							
Air Quality	PM_{10}, $PM_{2.5}$, CO, CO_2, NO_2, SO_2	Within NEQ Guideline and International Standards	Relevant Air Quality Monitoring or Measuring Equipment	Once a year	A suitable point within the project site	Already included in cost estimation for EMP	Myanmar Shwekyin Solar Power Company Limited
Noise and Vibration	Equivalent Noise Level dB (A)	Within NEQ Guideline and International Standards	Relevant Noise and Vibration Meter Equipment	Once a year	A suitable point within the project site and a suitable point at the boundary of project site	Already included in cost estimation for EMP	Myanmar Shwekyin Solar Power Company Limited
Groundwater Quality	pH, Dissolve Oxygen, Turbidity, Conductivity, Salinity, Total Suspended Solids, Total Dissolved Solids, Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Caliform Count	Within WHO Guideline	Sampling and Relevant Laboratory	Once a year	An outlet from tube well within the project site	Already included in cost estimation for EMP	Myanmar Shwekyin Solar Power Company Limited
Discharged water quality	pH, Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Oil and	Within NEQ Guideline and WHO Standards	Relevant Laboratory	Once a year	Within the Project site	Already included in cost estimation for EMP	Myanmar Shwekyin Solar Power Company Limited

	Grease, Total Coliform Bacteria, Total Nitrogen, Total Phosphorus, Total Suspended Solids						
Waste Quantity	Waste			Four time a year	At project waste disposal site	Already included in cost estimation for EMP	Myanmar Shwekyin Solar Power Company Limited
Environmental auditing	Assess the compliances with this EMP as well as laws, rules, policies and regulations			Once a year	At the project site	Already included in cost estimation for EMP	Myanmar Shwekyin Solar Power Company Limited

Table 8.5 - Environmental Monitoring Plan (Overhead Transmission Line)

Environmental Concern	Parameters	Target Level	Measurement Method	Frequency	Location	Estimated Cost per One Time (MMK)	Responsible Party
Construction Period							
Air Quality	PM_{10}, $PM_{2.5}$, CO, CO_2, NO_2, SO_2	Within NEQ Guideline and International Standards	Relevant Air Quality Monitoring or Measuring Equipment	Once a year	A suitable point within the project site	Already included in cost estimation for EMP	Myanmar Shwekyin Solar Power Company Limited
Noise and Vibration	Equivalent Noise Level dB (A)	Within NEQ Guideline and International Standards	Relevant Noise and Vibration Meter Equipment	Once a year	A suitable point within the project site and a suitable point at the	Already included in cost estimation for EMP	Myanmar Shwekyin Solar Power Company Limited

					boundary of project site		
Groundwater Quality	pH, Dissolve Oxygen, Turbidity, Conductivity, Salinity, Total Suspended Solids, Total Dissolved Solids, Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Caliform Count	Within WHO Guideline	Sampling and Relevant Laboratory	Once a year	A suitable point within the project site	Already included in cost estimation for EMP	Myanmar Shwekyin Solar Power Company Limited
Waste Quantity	Waste			Four time a year	At project waste disposal site	Already included in cost estimation for EMP	Myanmar Shwekyin Solar Power Company Limited
Operation Period							
Air Quality	PM_{10}, $PM_{2.5}$, CO, CO_2, NO_2, SO_2	Within NEQ Guideline and International Standards	Relevant Air Quality Monitoring or Measuring Equipment	Once a year	A suitable point within the project site	Already included in cost estimation for EMP	Myanmar Shwekyin Solar Power Company Limited
Noise and Vibration	Equivalent Noise Level dB (A)	Within NEQ Guideline and International Standards	Relevant Noise and Vibration Meter Equipment	Once a year	A suitable point within the project site and a suitable point at the boundary of project site	Already included in cost estimation for EMP	Myanmar Shwekyin Solar Power Company Limited

Waste Quantity	Waste			Four time a year	At project waste disposal site	Already included in cost estimation for EMP	Myanmar Shwekyin Solar Power Company Limited
Environmental auditing	Assess the compliances with this EMP as well as laws, rules, policies and regulations			Once a year	At the project site	Already included in cost estimation for EMP	Myanmar Shwekyin Solar Power Company Limited

8.6 Cost Estimation for EMP and EMoP

The following table describes the cost estimation for Environmental Monitoring, Reporting and Capacity Building Programs and these will cost annually. Prices may be varied according to the implementation time and service providers.

Table 8.6 – Cost Estimation for Monitoring, Reporting and Capacity Building

No.	Item	Unit	Quantity	Unit Cost (MMK)	Annual Cost (MMK)
A.	**Environmental Monitoring Plan**				
1.	Air Quality	Frequency per Year	1	800,000	800,000
2.	Water Quality		1	900,000	900,000
3.	Noise Level		1	400,000	400,000
4.	Waste Quantity		4	150,000	600,000
5.	Monitoring and Reporting		1	800,000	800,000
Subtotal					**3,500,000**
B.	**Supervision**				
1.	Environmental Officer	Months	12	500,000	6,000,000
Subtotal					**9,500,000**
C.	**Capacity Building (Training Programs for workers)**				**1,500,000**
Total					**11,000,000**

8.7 Air Quality Sub-Management Plan

(i) Objectives

The purposes of the plan are

- To minimize dust and gaseous emission from the project
- To sustain ambient air quality of the project

(ii) Legal Requirement

The project proponent shall adopt the requirements of National Laws and Regulations as described in Chapter 5: Policy, Legal and Institutional Framework.

(iii) Action Plan

- To improve road design by using gravels rather than normal earth road
- Reduce traffic and use vehicles only for necessary cases.

- Control speed of construction vehicles and transportation vehicles within the project site
- Spray water regularly on access roads and working places, if possible, pave all access roads of the project
- Install proper covers for transportation vehicles when carrying soil, sand, and cement
- Avoid construction activities and earth working activities which generate excessive dust on extremely windy days
- Install Temporary Building Enclosures at excessive dust generated working area
- Provide Personal Protective Equipment (PPEs) such as masks and dust respirators for construction workers who work in intensive dust generation area
- Implement regular inspection and proper maintenance for the construction machines, generators, construction vehicles and transportation vehicles
- Overhead transmission line construction activities and earth working and excavation activities which generate excessive dust must be avoided on extremely windy days
- Temporary building enclosures (green shade net fencing) must be installed at excessive dust generated working area
- Pave all roads within the project
- Implement regular maintenance and inspection for management vehicles, maintenance vehicles, generators, refrigerators, and air conditioning system
- Drive vehicles properly with low speed at public road
- Plant some shady trees

(iv) Implementation Schedule

The Action Plan will be implemented during the construction phase and operation phase.

(v) Monitoring Plans

The Environmental Monitoring Report will include the items listed in the following table.

No.	Environmental Concerns	Parameters	Frequency	Location	Responsible Party
1.	Air quality (Construction Phase)	PM_{10}, $PM_{2.5}$, CO, CO_2, SO_2, NO_2	Once	A suitable point within the project site	Myanmar Shwekyin Solar Power Co., Ltd.
2.	Air quality (Construction Phase)	PM_{10}, $PM_{2.5}$, CO, CO_2, SO_2, NO_2	Once	In the middle of transmission line's route	Myanmar Shwekyin Solar Power Co., Ltd.

No.	Environmental Concerns	Parameters	Frequency	Location	Responsible Party
3.	Air quality (Operation Phase)	PM_{10}, $PM_{2.5}$, CO, CO_2, SO_2, NO_2	Once a year	A suitable point within the project site	Myanmar Shwekyin Solar Power Co., Ltd.

(vi) Budget Allocation

Estimated budget allocation for Air Quality Management Plan is already included in cost estimation for EMPs.

8.8 Water Quality Sub-Management Plan

(i) Objectives

The purposes of the plan are

- To minimize discharge from the project
- To sustain surface and groundwater quality of the project

(ii) Legal Requirement

The project proponent shall adopt the requirements of National Laws and Regulations as described in Chapter 5: Policy, Legal and Institutional Framework

(iii) Action Plan

- Establish green space just like garden in order to fill ground water from raining
- Avoid to build concrete flooring for a wide space
- Carry out site levelling with minimum alteration in contour level
- Provide toilets, washing basins and septic tanks adequately
- Manage groundwater usage systematically in construction activities
- Built systematic waterways, gutters, and canals direct to waste sedimentation ponds to prevent sediments flowing into irrigation weir through creeks
- Establish waste sedimentation pond for construction waste water
- Establish waste water treatment system for domestic waste water from staff housing and offices
- Domestic solid, liquid wastes and water discharged from construction activities shall not be discharged into the Mezali Weir nearby project site
- Install proper drainage system within the project site
- Carry out PV modules cleaning and maintenance properly
- Damaged PV modules and uninstalled lifespan-expired PV modules must be disposed

with adequate packaging at authorized waste management services providers and direct buried must be strongly prohibited

- Inspect and maintain transformers, management vehicles, maintenance vehicles and generators regularly
- Carry out refuelling properly
- Check and clean drainage system properly
- Prohibit direct disposing domestic waste from multiple-use building into the drains
- Make sure that untreated site runoff water does not flow into the nearby water body, and manage systematically

(iv) Implementation Schedule

The Action Plan will be implemented during the construction phase and operation phase.

(v) Monitoring Plans

The Environmental Monitoring Report will include the items listed in the following table.

No.	Environmental Concerns	Parameters	Frequency	Location	Responsible Party
1.	Ground water quality (Operation Phase)	pH, Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Oil and Grease, Total Coliform Bacteria, Total Nitrogen, Total Phosphorus, Total Suspended Solids	Once a year	Same as baseline water quality sampling location	Myanmar Shwkyin Solar Power Co., Ltd.

(vi) Budget Allocation

Estimated budget allocation for Water Quality Management Plan is already included in cost estimation for EMPs.

8.9 Noise Sub-Management Plan

(i) Objectives

The purposes of the plan are

- To minimize noise level due to the project activities
- To minimize noise impacts of the project

(ii) Legal Requirement

The project proponent shall adopt the requirements of National Laws and Regulations as described in Chapter 5: Policy, Legal and Institutional Framework

(iii) Action Plan

- Notify excessive noise and vibration generated construction activities to nearby local communities
- Inspect and maintain construction machines, construction vehicles and transportation vehicles regularly
- Provide Personal Protective Equipment (PPEs) such as earplugs and earmuffs for construction workers who work in excessive noise generated area
- Instruct transportation vehicles' drivers to avoid gunning of vehicle engines or hooting when passing through sensitive areas across transportation routes
- Place highly noise and vibration generated construction machines and generators in enclosures
- Avoid working noise and vibration generated construction activities at night, if possible
- Excessive noise and vibration generated construction activities must be notified to nearby local communities, firstly
- Transportation vehicles' drivers should be instructed to avoid gunning of vehicle engines or hooting when passing through sensitive areas
- Noise and vibration generated construction activities must not be carried out at night, if possible
- Inspect and maintain generators, inverters, transformers, management vehicles and maintenance vehicles regularly
- Install silence-type generators
- Plant some shady trees

(iv) Implementation Schedule

The Action Plan will be implemented during the construction phase and operation phase.

(v) Monitoring Plans

The Environmental Monitoring Report will include the items listed in the following table.

No.	Environmental Concerns	Parameters	Frequency	Location	Responsible Party
1.	Noise level (Construction Phase)	Equivalent Noise Level dB (A)	Once	A suitable point within the project site and a suitable point at the boundary of project site	Myanmar Shwekyin Solar Power Co., Ltd.
2.	Noise level (Construction Phase)	Equivalent Noise Level dB (A)	Once	In the middle of transmission line's route	Myanmar Shwekyin Solar Power Co., Ltd.
3.	Noise level (Operation Phase)	Equivalent Noise Level dB (A)	Once a year	A suitable point within the project site and a suitable point at the boundary of project site	Myanmar Shwekyin Solar Power Co., Ltd.

(vi) Budget Allocation

Estimated budget allocation for Noise Management Plan is already included in cost estimation for EMPs.

8.10 Occupational Health and Safety Sub-Management Plan

(i) Objectives

The purposes of the plan are

- To reduce occupational health and safety impacts of the project
- To minimize near-miss, incidents and accidents due to the project activities

(ii) Legal Requirement

The project proponent shall adopt the requirements of National Laws and Regulations as described in Chapter 5: Policy, Legal and Institutional Framework

(iii) Action Plan

- Provide personal fall restraint system for installation workers who are working at height
- Use lockout-tagout system for installation and testing of electrical equipment
- Provide Personal Protective Equipment (PPEs) such as safety helmets, splash goggles, dust respirators, ear muffs, safety gloves, reflected safety suits and safety boots for all construction workers
- Monitor regularly whether construction workers use PPEs adequately or not
- Tag safety notices and emergency contact numbers of the Fire Services Department, Hospitals and Police Stations and contact persons for emergency cases at noticeable places
- Provide First aid training, safety training, firefighting training, electrical equipment installation training and other essential trainings for construction activities
- Provide first aid kits at visible and convenient places
- Operate construction machines and construction vehicles by trained and licensed industrial machine operators
- Prepare health and safety management plan for construction workers based on the EMP in Myanmar language and any other language that construction workers can read and display prominently
- Provide purified drinking water for construction workers
- Follow the instructions issued by the Ministry of Health and Sports to prevent COVID-19 virus infection during pandemic period
- Personal fall restraint system must be provided for overhead transmission line installation workers who are working at height
- The project proponent provides Personal Protective Equipment (PPEs) for all construction workers
- The project proponent must monitor regularly whether construction workers use PPEs adequately or not
- Cable stringing processes must be carried out properly
- Construction machines and construction vehicles must be operated by trained and licensed industrial machine operators
- Provide Personal Protective Equipment (PPEs) such as safety helmets, safety gloves, reflected safety suits and safety boots for all maintenance workers
- Monitor regularly whether maintenance workers use PPEs adequately or not
- Mark all energized electrical equipment with warning sign
- Carry out proper management for electricity generation and distributing such as checking all electrical cords, cables and do not use overload voltage
- Train and assign housekeeping staffs to do regular cleaning and housekeeping
- Manage the drainage systems of the project properly

(iv) Implementation Schedule

The Action Plan will be implemented during the construction phase and operation phase.

(v) Monitoring Plans

The Environmental Monitoring Report will include the items listed in the following table.

No.	Environmental Concerns	Parameters	Frequency	Location	Responsible Party
1.	Incident reporting	Description, causes, corrective and preventative measures for incidents	If occurs	Project Office	Myanmar Shwekyin Solar Power Co., Ltd.

(vi) Budget Allocation

Estimated budget allocation for Occupational Health and Safety Management Plan is already included in cost estimation for EMPs.

8.11 Waste Sub-Management Plan

(i) Objectives

The purposes of the plan are

- To ensure that classification of wastes and waste disposal are done properly
- To provide clear directions on waste management
- To ensure all personal involved with waste perform their roles and responsibilities as outlined
- To ensure proper implementation and compliance, including segregation

(ii) Legal Requirement

The project proponent shall adopt the requirements of National Laws and Regulations as described in Chapter 5: Policy, Legal and Institutional Framework

(iii) Action Plan

- Collect vegetable debris generated from land clearance activities at separate places
- Reuse excavated soil at other places of the project as soil filling and leveling
- Calculate detail requirement of raw materials for purchasing electrical equipment and construction materials
- Implement recycling, reuse, and refurbishment of solid waste
- Define temporary disposal site within the project, before final disposal
- Segregate solid wastes by using different appropriate waste bins
- Prohibit burning and landfilling solid waste at the project site strictly

- Establish a certain pit or landfill area with adequate landfill system such as by using impermeable base to avoid soil and ground water contaminations
- Cover landfills and waste pits to protect from animals and avoid bad odors
- Provide adequate sanitation facilities such as toilets, washing basins and septic tanks for construction workers
- Keep and handle fuel and lubricants for construction machines and vehicles systematically
- Dispose of used oil by collecting with leak proof containers with secondary containments
- Identify isolated Machineries maintenance area with paved ground
- If PV modules are damaged during installing, direct buried is prohibited. Damaged PV modules are properly stored, transport with proper package and disposal at authorized waste disposal sites.
- Collect residual cement, solvent-based paints, and other lubricants separately at designated area
- Transfer final disposal of solid wastes and hazardous wastes to the Township Development Committee
- Vegetation debris generated from land clearance activities along right of way of overhead transmission line must be collected at separate place
- Excavated soil must be reused as soil filing and levelling activities
- Define temporary disposal site within the project for domestic waste, before final disposal
- Segregate domestic waste by using different appropriate waste bins
- Prohibit burning and landfilling solid waste at the project site strongly
- Install proper drainage system within the project site
- Provide adequate sanitation facilities such as toilets, washing basins and septic tanks
- Keep and handle fuel and lubricants for maintenance vehicles
- Damaged PV modules and uninstalled lifespan-expired PV modules must be disposed with adequate packaging at authorized waste management services providers and direct buried must be strongly prohibited.
- Dispose of used oil by collecting with leak proof containers
- Transfer final disposal of solid wastes and hazardous wastes to the Township Development Committee

(iv) Implementation Schedule

The Action Plan will be implemented during the construction phase and operation phase.

(v) Monitoring Plans

The Environmental Monitoring Report will include the items listed in the following table.

No.	Environmental Concerns	Parameters	Frequency	Location	Responsible Party
1.	Waste Quantity (Construction Phase)	Amount of construction solid waste, domestic solid waste, and hazardous waste disposal	Quarter per year	Within the project site	Myanmar Shwekyin Solar Power Co., Ltd.
2.	Waste Quantity (Operation Phase)	Amount of construction solid waste, domestic solid waste, and hazardous waste disposal	Quarter per year	Within the project site	Myanmar Shwekyin Solar Power Co., Ltd.

(vi) Budget Allocation

Estimated budget allocation for Waste Management Plan is already included in cost estimation for EMPs.

8.12 Firefighting Sub-Management Plan

(i) Objectives

The purposes of the plan are

- To reduce risks of fire in the project

(ii) Legal Requirement

The project proponent shall adopt the requirements of National Laws and Regulations as described in Chapter 5: Policy, Legal and Institutional Framework

(iii) Action Plan

- Fire extinguishers must be installed near fuel storage area, generators, switchyard, multiple-use building and these fire extinguishers must be inspected regularly. Especially, dry powder type fire extinguishers must be used to extinguish electrical fire and water shall not be used
- Water must be stored adequately and properly with storage tanks for other type of fire.
- Fire hose reels and fire hydrants must be installed around the facility.
- Firefighting training and fire drills must be provided for all workers.

- Besides, safety notices and emergency contact numbers of Myanmar Fire Service Department, Hospitals and Police Stations of persons must be tagged at noticeable places in the project sites.
- An assembly point must be assigned for emergency cases to gather workers.
- Smoking must be strongly prohibited in the project site and must be assigned for smoking area.
- Visible and audible fire alarm system must be installed and emergency routes and exits must be assigned at multiple-use building, these emergency routes and exits must not block. Moreover, must assigned team as firefighting team, evacuation team and first-aid team.

(iv) Implementation Schedule

The Action Plan will be implemented during the construction phase and operation phase.

(v) Monitoring Plans

The Environmental Monitoring Report will include the items listed in the following table.

No.	Environmental Concerns	Parameters	Frequency	Location	Responsible Party
1.	Incident reporting	Description, causes, corrective and preventative measures for incidents	If occurs	Project Office	Myanmar Shwekyin Solar Power Co., Ltd.

(vi) Budget Allocation

Estimated budget allocation for Firefighting Plan is already included in cost estimation for EMPs.

8.13 Emergency Preparedness and Response Sub-Management Plan

(i) Objectives

The purposes of the plan are

- To reduce risks of emergency cases like flood and earthquake in the project

(ii) Legal Requirement

The project proponent shall adopt the requirements of National Laws and Regulations as described in Chapter 5: Policy, Legal and Institutional Framework

(iii) Action Plan

In case of emergency, all the workers including guests must be evacuated systematically as soon as possible. Firefighting group must be assigned which will cooperate with Pwint Phyu Township Fire Service Department. We committed to abide guidelines provided by Myanmar Fire Services Department. Emergency escape plan must be tagged at multiple-use building.

For all emergency cases, emergency response plan must be developed by the project proponent and train to all workers in order to evacuate systematically during emergency cases. Recovery plan must be developed because recovery plan must be followed severe damages due to emergency cases.

In case of Fire, the following emergency response plan must be done immediately.

- Alert other workers to gather at assembly point
- For electrical fire, turn off electricity distributing devices before extinguishing
- For electrical fire, oil and lubricant fire DO NOT USE WATER, rather use dry powder fire extinguishers
- If small, control using an extinguisher or fire hose reel
- Immediately contact Fire Services Department
- Once out of the building, stay outside. Do not allow people to go back into the burning building to collect valuables. While exiting the building, close doors to slow down the spread of fire but do not lock the door.
- Obey all instruction
- Proceed to assembly point
- First aiding to all injured persons and transfer to clinic or hospital

As the project is located within the **Zone III (Strong Zone)** earthquake zone, the emergency preparedness for earthquake must also be taken. The workers must have the knowledge concerning with the earthquake.

In case of earthquake-

If you are at indoors: "DROP, COVER AND HOLD ON"

- Stay inside.
- **Drop** under heavy furniture such as a table, desk, bed, or any solid furniture.
- **Cover** your head and torso to prevent being hit by falling objects.
- **Hold on** to the object that you are under so that you remain covered. Be prepared to move with the object until the shaking has finished.

- If you can't get under something strong, or if you are in a hallway, flatten yourself or crouch against an interior wall and protect your head and neck with your arms.
- If you are in a shopping mall, go into the nearest store. Stay away from windows, and shelves with heavy objects.
- If you are at school, get under a desk or table and hold on. Face away from windows.
- If you are in a wheelchair, lock the wheels and protect the back of your head and neck.

If you are at outdoors

- Stay outside.
- Go to an open area away from buildings. The most dangerous place is near exterior walls.
- If you are in a crowded public place, take cover where you won't be trampled.

If you are in a vehicle

- Pull over to a safe place where you are not blocking the road. Keep roads clear for rescue and emergency vehicles.
- Avoid bridges, overpasses, underpasses, buildings, or anything that could collapse.
- Stop the car and stay inside.
- Listen to your car radio for instructions from emergency officials.
- Do not attempt to get out of your car if downed power lines are across it. Wait to be rescued.
- Place a HELP sign in your window if you need assistance.
- If you are on a bus, stay in your seat until the bus stops. Take cover in a protected place. If you can't take cover, sit in a crouched position, and protect your head from falling debris.

AVOID the following in an earthquake

- Doorways. Doors may slam shut and cause injuries.

- Windows, bookcases, tall furniture, and light fixtures. You could be hurt by shattered glass or heavy objects.
- Elevators. If you are in an elevator during an earthquake, hit the button for every floor and get out as soon as you can.
- Downed power lines – stay at least 10 meters away to avoid injury

(iv) Implementation Schedule

The Action Plan will be implemented during the construction phase and operation phase.

(v) Monitoring Plans

The Environmental Monitoring Report will include the items listed in the following table.

No.	Environmental Concerns	Parameters	Frequency	Location	Responsible Party
1.	Incident reporting	Description, causes, corrective and preventative measures for incidents	If occurs	Project Office	Myanmar Shwekyin Solar Power Co., Ltd.

(vi) Budget Allocation

Estimated budget allocation for Emergency Preparedness and Response Plan is already included in cost estimation for EMPs.

8.14 Corporate Social Responsibility Plan (CSR) Plan

Myanmar Shwekyin Solar Power Company Limited will implement Corporate Social Responsibility (CSR) Plan together with Environmental Management Plan (EMP) through the project lifespan. The objective of this plan is to create social welfare for local community and to prove that implement of the proposed project is beneficial for not only the project proponent but also for local community. The project proponent has a plan to use 2% of Annual Net Profit for the corporate social responsibility fund for the following subjects. Detail CSR Plan of the proposed project is as the following.

Table 8.7 - Corporate Social Responsibility Plan of the Project

No.	Subjects	Percentage of the Fund
1.	Education	25%

2.	Health Care	25%
3.	Social Aid	25%
4.	Environmental Conservation	25%

8.15 Firefighting Plan

Fire extinguishers must be installed near fuel storage area, generators, switchyard, multiple-use building and these fire extinguishers must be inspected regularly. Especially, dry powder type fire extinguishers must be used to extinguish electrical fire and water shall not be used. Water must be stored adequately and properly with storage tanks for other type of fire. Fire hose reels and fire hydrants must be installed around the facility. Firefighting training and fire drills must be provided for all workers. Besides, safety notices and emergency contact numbers of Myanmar Fire Service Department, Hospitals and Police Stations of persons must be tagged at noticeable places in the project sites. An assembly point must be assigned for emergency cases to gather workers. Smoking must be strongly prohibited in the project site and must be assigned for smoking area. Visible and audible fire alarm system must be installed and emergency routes and exits must be assigned at multiple-use building, these emergency routes and exits must not block. Moreover, must assigned team as firefighting team, evacuation team and first-aid team.

8.16 Emergency Preparedness and Response Plan

For all emergency cases, emergency response plan must be developed by the project proponent and train to all workers in order to evacuate systematically during emergency cases. Recovery plan must be developed because recovery plan must be followed after severe damages due to emergency cases.

In case of Fire, the following emergency response plan must be done immediately.

- Alert other workers to gather at assembly point
- For electrical fire, turn off electricity distributing devices before extinguishing
- For electrical fire, oil and lubricant fire DO NOT USE WATER, rather use dry powder fire extinguishers
- If small, control using an extinguisher or fire hose reel
- Immediately contact Fire Services Department
- Once out of the building, stay outside. Do not allow people to go back into the burning building to collect valuables. While exiting the building, close doors to slow down the spread of fire but do not lock the door.
- Obey all instruction
- Proceed to assembly point
- First aiding to all injured persons and transfer to clinic or hospital

Figure 8.1 - Safety card for Awareness of Emergency Cases for Fire

In case of Earthquake –

If you are at indoor; “DROP, COVER and HOLD ON”

- Stay inside
- Drop under heavy furniture such as table, bed or any solid materials
- Cover your head to prevent being hit by falling objects
- Hold on to the object that you are under so that you remain cover
- Be prepared to move with the object until the earthquake is finish
- If you can’t get under something strong, or if you are in a hallway, flatten yourself or crouch against an interior wall and protect your head and neck with your arms

- If you are in shopping mall, go into the nearest store
- Stay away from windows
- If you are at school, get under table and hold on, face away from windows
- If you are in a wheelchair, lock the wheels and protect the back of your head and neck

If you are at Outdoor;

- Stay outside
- Go to an open area away from buildings, the most dangerous place is near exterior walls
- If you are in a crowded public place, take cover where you won't be trampled

If you are in a Vehicle;

- Pull over to a safe place where you are not blocking the road.
- Keep roads clear for rescue and emergency vehicles
- Avoid bridges, overpasses, underpasses, building or anything that could collapse
- Stop the car and stay outside
- Listen to your car radio for instructions from emergency officials
- Do not attempt to get out of your car if downed power lines are across it
- Wait for the rescue
- Place a HELP sign in your window if you need assistance

If you are on a Bus;

- Stay in your seat until the bus is stop
- Take cover in a protected place
- If you can't cover, sit in a crouch position, and protect your head from falling debris

AVOID the following in an Earthquake

(1) Doorways - doors may slam shut and cause injuries
(2) Windows, bookcases, tall furniture and light fixtures - you could be hurt by shattered glass or heavy objects
(3) Elevators – if you are in an elevator during earthquake, hit the button for every floor and get out as soon as you can
(4) Downed power lines – stay at least 10 meters away to avoid injury

Figure 8.2 - Safety card for Awareness of Emergency Cases for Earthquake

8.17 Grievance Redress Mechanism

Grievance Redress Mechanism (GRM) is a complaint and proposal consideration mechanism that provides an additional and accessible channel for submission of complaints and feedback to individuals and communities. The aim of the Grievance Redress Mechanisms (GRM) is to ensure that grievances and concerns raised by PAPs or other people within the communities can be effectively dealt with in a timely and satisfactory manner.

People who live near the project site or stakeholders concerned with the problems and impacts that they suffer by the proposed project; they can complain though Grievance Committee, which includes the responsible persons of the project proponent, representatives from Ingani Village and representative from General Administration Department (Shwekyin Township). Small

issues will be solved at the Grievance Committee stage and other unsolved problems will be submitted to higher responsible authorities and finally the court will decide in legal terms. The following diagram shows detail steps of Grievance Redress Mechanism of the proposed project.

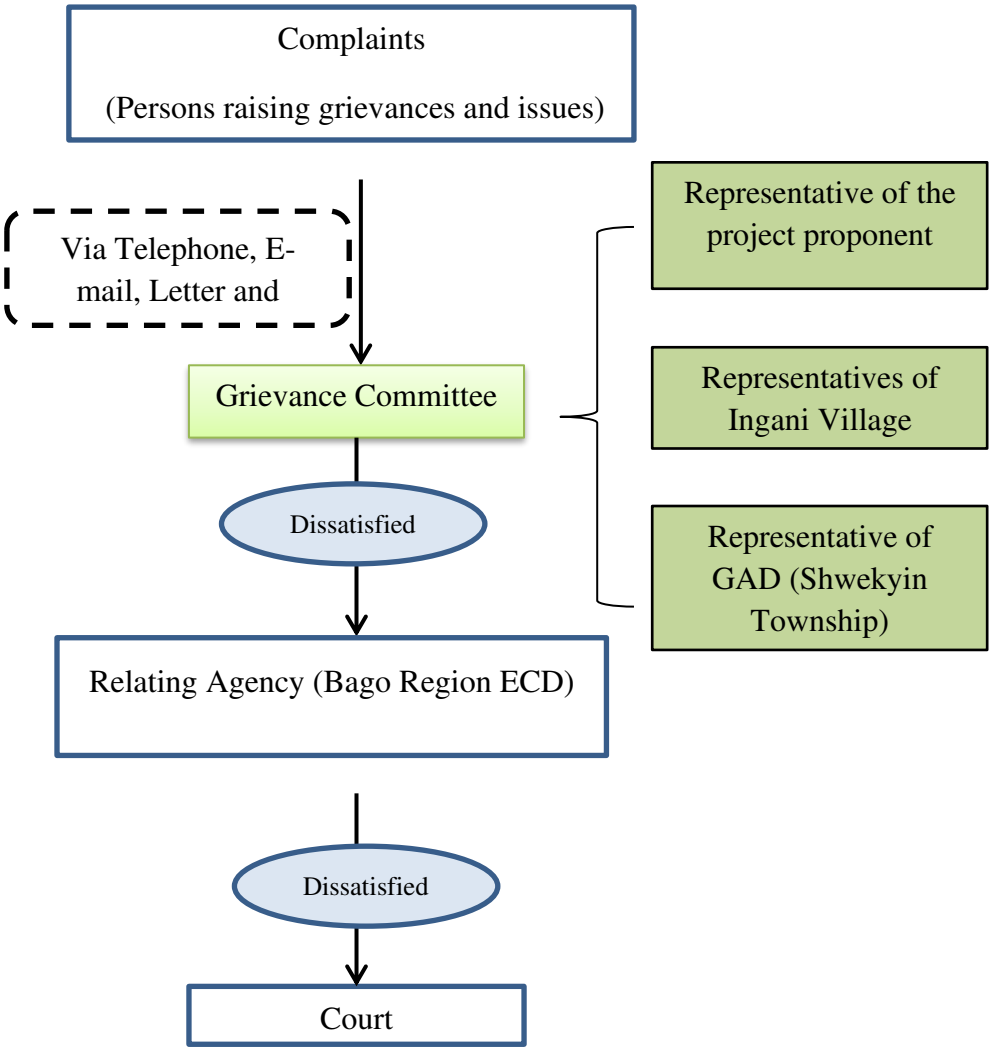


Figure 8.3 - Grievance Redress Mechanism (GRM)

CHAPTER 9 - RESULT OF THE STAKEHOLDER MEETING

9.1 Purpose of the Consultation Meeting

It is important to disclose the information of the project during the EMP report preparation and the opinions of attendees must be considered in implementation of the project. Consultation meeting should be held with local people to be affected by the project, administrative bodies and community-based organizations. Especially, results of consultation with Project Affected Persons (PAPs) should be considered in identification of impacts, impact assessment, mitigation measures formulating and environmental monitoring plans.

9.2 Methodology and Approach

As methodology, information disclosure should be carried out by announcing the public consultation meeting for the proposed project to local people within an adequate time needed for invitation. All feedbacks from public consultation meeting should be well-addressed and considered in the formulating the EMP, environmental monitoring plan and CSR plan. For the proposed project, the project proponent informed and invited local people to attend the public consultation meeting. The EMP report will be finalized and submitted to ECD for environmental approval. After submission, the submitted EMP report will be ensured for available to interested parties and public at Shwekyin Township General Administrative Department, Bago Region Environmental Conservation Department, proposed ground mounted solar power plant's office and E Guard Environmental Services office, where interested parties can review for further comments and suggestions.

Public consultation and information disclosure concerning with the Environmental Management Plan (EMP) for the construction and operation of 40MW ground mounted solar power plant project connected to Shwekyin Substation, proposed by Myanmar Shwekyin Solar Power Company Limited was held on 2nd June, 2022 at temporary office in Project Site, Ingani Village Tract, Shwekyin Township. The meeting was start at 2:00PM – 3:00PM. The objectives of the meeting is to disclosed about the information of the project, potential impacts of project activities and mitigation measures and to receive public recommendations and feedbacks for the projects. The project proponent invited local people by negotiating with village administrators. As the public consultation meeting was held during COVID-19 Pandemic period, there was some limitations. The attendance list, presentation file and photos are described in **Appendix**. The following table shows the number of attendees for the meeting.

No.	Category	Number of Participants
1.	Local People from Ingani Village	23
2.	Representatives of Myanmar Shwekyin Solar Power Company Limited	2

3.	Representatives of E Guard Environmental Services	3
	Total	28

9.3 Agenda of Public Consultation Meeting

The meeting was held in accordance with the following agenda;

1) Opening Ceremony
2) Presentation of Project Information by U Thiha Tun (Site Translator, Myanmar Shwekyin Solar Power Company Limited)
3) Presentation of Environmental Management Plan (EMP) for construction and operation of 40 MW ground mounted solar power plant project connected to Shwekyin Substation by U Htet Aung (Project Associate, E Guard Environmental Services Co., Ltd.)
4) Questions, Comments and Suggestions from the attendees.
5) Closing Ceremony

The detail of each agenda is described in the following:

1. Opening Ceremony

2. Presentation of Project Information by U Thiha Tun (on behalf of Mr. Lee (Project Manager, Myanmar Shwekyin Solar Power Co., Ltd)

U Thiha Tun briefly explained the project information such as type of business, construction and operation processes of the project, project proponent information and project description.

3. Presentation of Environmental Management Plan (EMP) for construction and operation of 40 MW ground mounted solar power plant project connected to Shwekyin Substation by U Htet Aung (Project Associate, E Guard Environmental Services Co., Ltd.)

U Htet Aung explained the processes of environmental management plan preparation, potential positive impacts of the project, potential negative impacts of the project, proposed mitigation measures to reduce these negative impacts, proposed monitoring plan, grievance redress mechanism and environmental quality measurements processes of the proposed project.

4. Questions, Comments and Suggestions from the Attendees

There is no Questions, Comments and Suggestion from the Attendees in the meeting.

5. Closing Ceremony

CHAPTER 10 – CONSLUSION AND RECOMMADATION

10.1 Conclusion and Recommadation

This Environmental Management Plan (EMP) is formulated for the proposed project in accordance with Environmental Impact Assessment Procedure as per instructions of Environmental Conservation Department (ECD). The project proponent will implement the EMP during construction and operation in compliance with the National laws and regulations for environmental protection.

The effective implementation of the mitigation measures proposed will ensure towards good environmental management within the proposed project area. Implementation of appropriate mitigation measures are needed to be implemented by establishing an EMS (Environmental Management System) based on the description from this EMP. Employment of Environmental Staff, training to the engineers and workers, budget allocation, etc., is vital for the success of an EMS.

A GRM will be implemented from the earlier stage of the commencement of the project and engage the problem arise from the public or encounter due to the activities by the project proponent or contractors.

Though, the main objective of the study is to identify the major environmental impacts due to the implementation of the project activities in two phases; construction phase and operation phase but descriptions of decommissioning phase is excluded as the project proponent will extend the operation periods with the approval of relevant departments to generate electricity from solar energy as per Build, Own, Operate (BOO) basis at the end of contracted operation period. The project proponent is committed to submit decommissioning plan when the project is to be closed permanently due to any reasons; operational, technical, financial, social or political.

This EMP report will be used as guidance for implementing the environmental management tasks practically and cost effectively with continuous improvement.

The findings of the EMP study indicated that the proposed project would generate positive impacts such as local employment and business opportunities, and enhancement of capabilities and working skills of the employees. Consequently, local socio-economic in the region is expected to be improved. Successful implementation of the proposed project will raise confidence for investors and aid agencies to develop further solar and other renewable projects in Myanmar. Major benefits of this project is that it will increase the supply of electrical energy in Myanmar from a renewable source, which is in line with the aim of the Myanmar Government to increase energy supply and reduce the overall CO_2 emission of Myanmar by substituting energy from the predominating coal-fired Power Plants.

References

- General Administration Department (Shwekyin Township), 2020, “Shwekyin Township Data”.
- Ministry of Environmental Conservation and Forestry (MOECAF), 2015, “Environmental Impact Assessment Procedure”.
- Ministry of Environmental Conservation and Forestry (MOECAF), 2015, “National Environmental Quality (Emission) Guidelines”.

Appendixes

(1) Instruction to prepare EMP Report

ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်အစိုးရ
သယံဇာတနှင့်သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာန
ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန
ညွှန်ကြားရေးမှူးချုပ်ရုံး

စာအမှတ်၊ EIA - ၂/၉/ သဘောထား (PP-N)(ခ၆၃၃/ ၂၀၂၂)
ရက်စွဲ ။ ၂ ဝ ၂ ၂ ခုနှစ် ဩ ဂုတ် လ ၃ ရက်

သို့

အုပ်ချုပ်မှုဒါရိုက်တာ
Myanmar Shwe Kyin Solar Power Co.,Ltd
အမှတ် (၆၈၀) စိန်ပန်းလမ်းနှင့် သရဖီလမ်းထောင့်၊ သပြေကုန်းရပ်ကွက်၊ ဇမ္ဗူသီရိမြို့နယ်၊
နေပြည်တော်၊ ဖုန်း - ၀၉- ၂၂၂၀၉၈၂

အကြောင်းအရာ။ **Myanmar Shwe Kyin Solar Power Co.,Ltd ၏ ၄၀ မဂ္ဂါဝပ် နေရောင်ခြည်သုံး လျှပ်စစ်ဓာတ်အားထုတ်လုပ်ခြင်းလုပ်ငန်းနှင့်ပတ်သက်၍ ပေးပို့လာသော စီမံကိန်းအဆိုပြုလွှာအပေါ် သဘောထားမှတ်ချက်ပြန်ကြားခြင်း**

ရည်ညွှန်းချက်။ (၁) Myanmar Sedawgyi Solar Power Co.,Ltd ၏ ၂၁-၇-၂၀၂၂ ရက်နေ့ ရက်စွဲပါ စာအမှတ်၊ shwekyin/ECD/2022-01

(၂) ဤဝန်ကြီးဌာန၊ ပြည်ထောင်စုဝန်ကြီးရုံး၏ ၂၂-၄-၂၀၂၁ ရက်စွဲပါ စာအမှတ်၊ (သစ်တော) ၃(၂) /၀၃ (EC) / (၁၀၉၄ /၂၀၂၁)

၁။ အကြောင်းအရာပါကိစ္စနှင့်ပတ်သက်၍ Myanmar Shwe Kyin Solar Power Co.,Ltdက ပံ့ခူးတိုင်းဒေသကြီး၊ ပံ့ခူးခရိုင်၊ ရွှေကျင်မြို့နယ်တွင် အကောင်အထည်ဖော်ဆောင်ရွက်မည့် ၄၀ မဂ္ဂါဝပ် နေရောင်ခြည်သုံးလျှပ်စစ်ဓာတ်အား ထုတ်လုပ်မည့်စီမံကိန်းအတွက် စီမံကိန်းအဆိုပြုလွှာအား စိစစ်သုံးသပ်ပေးနိုင်ပါရန် ရည်ညွှန်း (၁) ပါစာဖြင့် ပေးပို့တင်ပြလာပါသည်။

၂။ Myanmar Shwe Kyin Solar Power Co.,Ltd က အကောင်အထည်ဖော်ဆောင်ရွက်မည့် ၄၀ မဂ္ဂါဝပ် နေရောင်ခြည်သုံး လျှပ်စစ်ဓာတ်အားထုတ်လုပ်မည့် စီမံကိန်းအတွက် စီမံကိန်းအဆိုပြုလွှာအား စိစစ်သုံးသပ်ရာတွင် အောက်ဖော်ပြပါအတိုင်း တွေ့ရှိရပါသည်-

(က) နေရောင်ခြည်သုံး လျှပ်စစ်ဓာတ်အားထုတ်လုပ်မည့် စီမံကိန်းအကျယ်အဝန်းမှာ ၁၆၃ ဧက ကျယ်ဝန်းပြီး အဆိုပါ မြေနေရာအား Super One Holding Co.,Ltd မှ China ITS (Holdings) Col.,Ltd ထံသို့ ငှားရမ်းထားခြင်းဖြစ်ကြောင်း၊

J

(ခ) 540Wp monocrystalline silicon double-sided PV module အား တပ်ဆင် အသုံးပြုသွားမည်ဖြစ်ပြီး စုစုပေါင်း PV module 89,600 ခန့် တပ်ဆင်သွားမည် ဖြစ်ကြောင်း၊

(ဂ) Photovoltic Cells များမှ ထွက်ရှိလာသော 33kV လျှပ်စစ်ဓာတ်အားအား Power Collection Line တစ်ခုချင်းစီအနေဖြင့် PV Power 20MWac စုဆောင်းနိုင်သည့် Two Circuit Power Collection Lines အား အသုံးပြု၍ 230 kV booster station သို့ ပို့ဆောင်ထုတ်လွှတ်သွားမည်ဖြစ်ကြောင်း၊

(ဃ) ဇီဝမျိုးစုံမျိုးကွဲများနှင့် ပတ်ဝန်းကျင်ဆိုင်ရာအခြေအနေများအနေဖြင့် စီမံကိန်း ဧရိယာ အနီးတွင် Vegetation Cover မြင့်မားသော်လည်း အဖိုးတန်သစ်ပင်မျိုးများမရှိဘဲ ချုံနွယ်များ၊အပင်ငယ်မျိုးများသာပေါက်ရောက်ကြောင်း။ သတ္တဝါမျိုးစိတ်များအနေဖြင့်လည်း ကြီးမားသည့် နို့တိုက်သတ္တဝါမျိုးစိတ်များမရှိဘဲ ရှဉ့်နှင့်ကြွက်ကဲ့သို့သော အကောင်ငယ် များသာ ရှိကြောင်း။

၃။ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာလုပ်ထုံးလုပ်နည်းနောက်ဆက်တွဲ(က)ဆန်းစစ်ခြင်း ဆောင်ရွက်ရန်လိုအပ်သည့် စီမံကိန်းလုပ်ငန်းအမျိုးအစားများ သတ်မှတ်ချက်ဇယား အမှတ်စဉ် (၁၁) အရ နေရောင်ခြည်သုံးလျှပ်စစ်ဓာတ်အားထုတ်လုပ်ခြင်းလုပ်ငန်းအတွက်ထုတ်လုပ်မှုပမာဏ ၅၀ မဂ္ဂါဝပ် နှင့်အထက်လုပ်ငန်းများအနေဖြင့် ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း ပြုလုပ်ရမည်ဖြစ်ပြီး ဝန်ကြီးဌာနက ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းပြုလုပ်ရန် လိုအပ်သည်ဟု သတ်မှတ်သည့် စီမံကိန်းအားလုံးကို ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း ပြုလုပ်ရမည်ဟု ဖော်ပြပါရှိပါသည်။ ထို့အပြင် ပတ်ဝန်းကျင် ထိခိုက်မှုဆန်းစစ်ခြင်းလုပ်ထုံးလုပ်နည်း အပိုဒ်(၂၄)တွင် "ဝန်ကြီးဌာနသည် အခြား မည်သည့်စီမံကိန်း သို့မဟုတ် လုပ်ငန်းကိုမဆို ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်ရေးဆွဲရန် လိုအပ်ခြင်း ရှိ မရှိ ရွေးချယ် သတ်မှတ်နိုင်သည်"ဟု ဖော်ပြထားပါသည်။

၄။ သို့ဖြစ်ပါ၍ Myanmar Shwe Kyin Solar Power Co.,Ltdက ပဲခူးတိုင်းဒေသကြီး၊ ပဲခူးခရိုင်၊ ရွှေကျင်မြို့နယ်တွင် အကောင်အထည်ဖော်ဆောင်ရွက်မည့် ၄၀ မဂ္ဂါဝပ် နေရောင်ခြည်သုံး လျှပ်စစ် ဓာတ်အားထုတ်လုပ်မည့်စီမံကိန်းနှင့်ပတ်သက်၍ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံး လုပ်နည်း အပိုဒ် (၂၄) အရ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ် ရေးဆွဲရန်လိုအပ်ပါကြောင်း သုံးသပ်ရ ပါသဖြင့် အောက်ပါအတိုင်း ဆောင်ရွက်ရန်လိုအပ်ကြောင်း အကြောင်းပြန်ကြားပါသည်-

(က) ၄၀ မဂ္ဂါဝပ် နေရောင်ခြည်သုံးလျှပ်စစ်ဓာတ်အားထုတ်လုပ်ခြင်း စီမံကိန်းနှင့် ၎င်း၏ ဆက်စပ်လုပ်ငန်းများဖြစ်သည့် Battery Square Area တည်ဆောက်ခြင်း၊ ၂၃၀ kV Booster Station တည်ဆောက်ခြင်း၊ ၃၃ကေဗွီ လျှပ်စစ်ဓာတ်အားလိုင်းသွယ်တန်းခြင်း၊ လမ်းဖောက်ခြင်း၊ ဝန်ထမ်းများနေထိုင်ရာနေရာများတည်ဆောက်ခြင်း စသည့်လုပ်ငန်း များအားလုံးကို ခြုံငုံသော ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်ကို ပတ်ဝန်းကျင်

ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာလုပ်ထုံးလုပ်နည်း အပိုဒ် ၆၃ (ဇ)နှင့် အပိုဒ်၇၇ တို့နှင့်အညီ သယံဇာတနှင့်သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာနသို့ တင်ပြအတည်ပြုချက် ရယူရန်၊

(ခ) ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်ရေးဆွဲရာတွင်နေရောင်ခြည်သုံးလျှပ်စစ်ဓာတ်အားထုတ်လုပ်ခြင်းလုပ်ငန်းကြောင့် ဖြစ်ပေါ်လာနိုင်သော ပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာသက်ရောက်မှုများဖြစ်သော ဂေဟစနစ်နှင့် ဇီဝမျိုးစုံမျိုးကွဲ၊ မြေအသုံးချမှု၊ စွန့်ပစ်ပစ္စည်း (အစိုင်အခဲ/အရည်) စီမံခန့်ခွဲခြင်း၊လူမှုစီးပွားရေး၊ လုပ်ငန်းခွင်ကျန်းမာရေးနှင့် ဘေးအန္တရာယ်ကင်းရှင်းရေးစသည့် နယ်ပယ်များဆိုင်ရာ ကျွမ်းကျင်ပညာရှင်များဖြင့် ပြည့်စုံစွာရေးဆွဲတင်ပြရန်၊

(ဂ) ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်ကို ဦးစီးဌာနသို့ တင်သွင်းပြီးနောက် ၁၅ ရက် ထက်နောက်မကျစေဘဲ လူမှုအဖွဲ့အစည်း၊ စီမံကိန်းကြောင့် ထိခိုက်ခံစားရသူများ၊ ဒေသဆိုင်ရာအဖွဲ့အစည်းနှင့် အခြားအကျိုးသက်ဆိုင်သူများ သိရှိနိုင်စေရန် စီမံကိန်းသို့မဟုတ် စီမံကိန်းအဆိုပြုသူ၏ ဝက်ဘ်ဆိုဒ်များနှင့် သတင်းစာစသည့် ပြည်တွင်းမီဒီယာများမှ လည်းကောင်း၊ စာကြည့်တိုက်၊ လူထုစုဝေးခန်းမစသည့် အများပြည်သူစုဝေးရာနေရာများတွင်လည်းကောင်း၊ စီမံကိန်းအဆိုပြုသူ၏ ရုံးများတွင်လည်းကောင်း ထုတ်ပြန်ကြေညာ၍ ထုတ်ပြန်ကြေညာကြောင်း အထောက်အထား သို့မဟုတ် ဝက်ဘ်ဆိုဒ်လိပ်စာတို့အား အစီရင်ခံစာတင်သွင်းပြီး ၁၅ ရက်အတွင်း reporting.eia@gmail.com သို့ တင်ပြရန်။

ညွှန်ကြားရေးမှူးချုပ် (ကိုယ်စား)
(ဒေါက်တာဆန်းဦး၊ ဒုတိယညွှန်ကြားရေးမှူးချုပ်)

မိတ္တူကို
ပြည်ထောင်စုဝန်ကြီးရုံး၊ သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာန၊ ရုံးအမှတ် (၂၈)
ဦးဆောင်ညွှန်ကြားရေးမှူး၊ လျှပ်စစ်ဓာတ်အားထုတ်လုပ်ရေးလုပ်ငန်း ညွှန်ကြားရေးမှူးရုံး၊ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန၊ ပဲခူးတိုင်းဒေသကြီးရုံးလက်ခံ၊ မျှောစာတွဲ

(2) Project Proponent's Company Registration

ကုမ္ပဏီမှတ်ပုံတင်လက်မှတ်

Certificate of Incorporation

MYANMAR SHWEKYIN SOLAR POWER COMPANY LIMITED
Company Registration No. 132890447

မြန်မာနိုင်ငံကုမ္ပဏီများဥပဒေ၂၀၁၇ အရ
MYANMAR SHWEKYIN SOLAR POWER COMPANY LIMITED
အား ၂၀၂၂ ခုနှစ် မတ်လ ၂၈ ရက်နေ့တွင်
အစုရှယ်ယာအားဖြင့် တာဝန်ကန့်သတ်ထား သည့် အများနှင့်မသက်ဆိုင်သောကုမ္ပဏီ
အဖြစ် ဖွဲ့စည်းမှတ်ပုံတင်ခွင့်ပြုလိုက်သည်။

This is to certify that
MYANMAR SHWEKYIN SOLAR POWER COMPANY LIMITED
was incorporated under the Myanmar Companies Law 2017 on 28 March 2022 as a Private Company Limited by Shares.

ကုမ္ပဏီမှတ်ပုံတင်အရာရှိ
Registrar of Companies
ရင်းနှီးမြှုပ်နှံမှုနှင့်ကုမ္ပဏီများညွှန်ကြားမှုဦးစီးဌာန
Directorate of Investment and Company Administration

(3) Third-party's and its experts' certificate for transitional consultant registration

REPUBLIC OF THE UNION OF MYANMAR
Ministry of Natural Resources and Environmental Conservation
CERTIFICATE FOR TRANSITIONAL CONSULTANT REGISTRATION
(ကြားကာလအကြံပေးလုပ်ကိုင်သူမှတ်ပုံတင်ခြင်း အထောက်အထားလက်မှတ်)

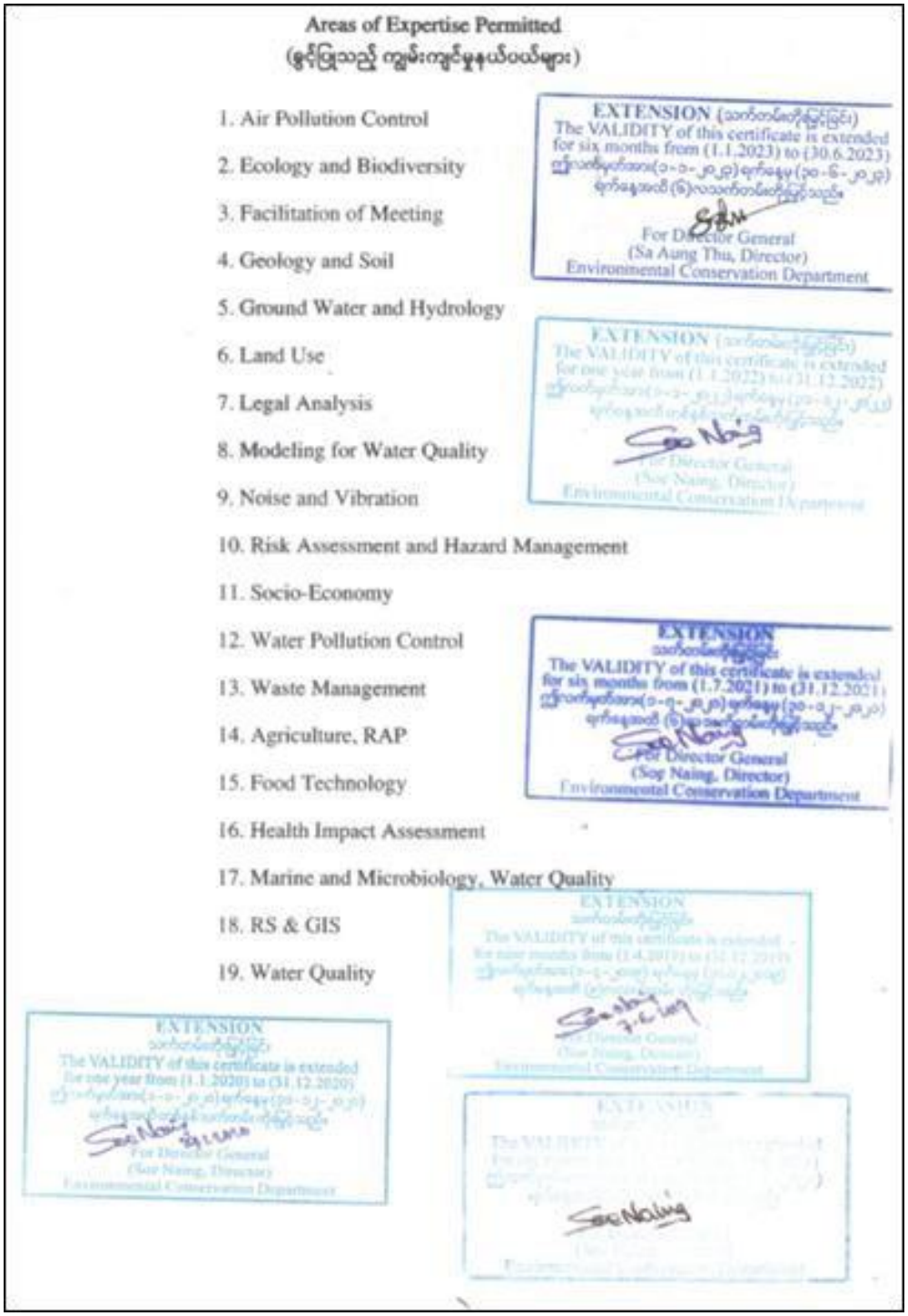
No. 0028 Date 14 JAN 2019

The Ministry of Natural Resources and Environmental Conservation, hereby, issues this certificate to the organization under Environmental Impact Assessment Procedure, Notification No. 616/2015.
(ပတ်ဝန်းကျင် ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း၊ အမိန့်ကြော်ငြာစာအမှတ်၊ ၆၁၆/၂၀၁၅ အရ သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာနသည် ဤအထောက်အထားလက်မှတ်ကို အခွဲအရေးအား ထုတ်ပေးလိုက်သည်။)

(a)	Name of Organization (အခွဲအရေးအမည်)	E Guard Environmental Services Co., Ltd.
(b)	Name of the representative in the organization (အခွဲအရေးကိုယ်စားလှယ်၏ အမည်)	U Aye Thiha
(c)	Citizenship of the representative in the organization (အခွဲအရေးကိုယ်စားလှယ်၏နိုင်ငံသား)	Myanmar
(d)	Identity Card /Passport Number of the representative person in the organization (အခွဲအရေးကိုယ်စားလှယ်၏ မှတ်ပုံတင်/ နိုင်ငံကူးလက်မှတ် အမှတ်)	12/ MRK (Naing) 069784
(e)	Address of organization (ဆက်သွယ်ရန်လိပ်စာ)	No. 99, Mya Kan Thar Lane, Nyein Chan Yay Street, 10 Miles, Pyay Road, Saw Bwar Gyi Gone, Insein Township, Yahgon. info@eguardservices.com, 09448001676
(f)	Type of Consultancy (အကြံပေးလုပ်ကိုင်မှုအမျိုးအစား)	Organization
(g)	Duration of validity (သက်တမ်းကုန်ဆုံးရက်)	31 March 2018

EXTENSION
The VALIDITY of this certificate is extended for one year from (1.4.2018) to (31.3.2019)
For Director General
(Soe Naing, Director)
Environmental Conservation Department

Director General
Environmental Conservation Department
Ministry of Natural Resources and Environmental Conservation



Areas of Expertise Permitted
(ခွင့်ပြုထားသည့် ကျွမ်းကျင်မှုနယ်ပယ်များ)

1. Air Pollution Control
2. Ecology and Biodiversity
3. Facilitation of Meeting
4. Geology and Soil
5. Ground Water and Hydrology
6. Land Use
7. Legal Analysis
8. Modeling for Water Quality
9. Noise and Vibration
10. Risk Assessment and Hazard Management
11. Socio-Economy
12. Water Pollution Control
13. Waste Management
14. Agriculture, RAP
15. Food Technology
16. Health Impact Assessment
17. Marine and Microbiology, Water Quality
18. RS & GIS
19. Water Quality

EXTENSION
The VALIDITY of this certificate is extended for six months from (1.1.2023) to (30.6.2023)
For Director General
(Sa Aung Thu, Director)
Environmental Conservation Department

EXTENSION
The VALIDITY of this certificate is extended for one year from (1.1.2022) to (31.12.2022)
For Director General
(Soe Naing, Director)
Environmental Conservation Department

EXTENSION
The VALIDITY of this certificate is extended for six months from (1.7.2021) to (31.12.2021)
For Director General
(Soe Naing, Director)
Environmental Conservation Department

EXTENSION
The VALIDITY of this certificate is extended for one year from (1.1.2020) to (31.12.2020)
For Director General
(Soe Naing, Director)
Environmental Conservation Department

REPUBLIC OF THE UNION OF MYANMAR

Ministry of Natural Resources and Environmental Conservation

CERTIFICATE FOR TRANSITIONAL CONSULTANT REGISTRATION

(ကြားကာလအကြံပေးလုပ်ကိုင်သူမှတ်ပုံတင်ခြင်းအထောက်အထားလက်မှတ်)

No. 10067 Date

The Ministry of Natural Resources and Environmental Conservation, hereby, issues this certificate to the person under Environmental Impact Assessment Procedure, Notification No. 616/2015.

(ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း၊ အမိန့်ကြော်ငြာစာအမှတ်၊ ၆၁၆/၂၀၁၅ အရ သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာနသည် ဤအထောက်အထားလက်မှတ်ကို လူပုဂ္ဂိုလ်အားထုတ်ပေးလိုက်သည်။)

(a)	Name of Consultant (အကြံပေးပုဂ္ဂိုလ်အမည်)	U Soe Min
(b)	Citizenship (နိုင်ငံသား)	Myanmar
(c)	Identity Card / Passport Number (မှတ်ပုံတင်/နိုင်ငံကူးလက်မှတ် အမှတ်)	7/ Pa Ma Na (N) 006103
(d)	Address (ဆက်သွယ်ရန်လိပ်စာ)	No.42(A), Bawdiyeiktha, Shwetaunggyar (2), Bahan Township, Yangon. usoemin@gmail.com usoemin@eguardservices.com , 09 448001676
(e)	Organization (အဖွဲ့အစည်း)	E Guard Environmental Services Co.,Ltd.
(f)	Type of Consultancy (အကြံပေးလုပ်ကိုင်မှုအမျိုးအစား)	Person
(g)	Duration of validity (သက်တမ်းကုန်ဆုံးရက်)	31 March 2018

EXTENSION

The VALIDITY of this certificate is extended for one year from (1.4.2018) to (31.3.2019)

For Director General
(Soe Naing, Director)
Environmental Conservation Department

Director General
Environmental Conservation Department
Ministry of Natural Resources and Environmental Conservation

Areas of Expertise Permitted
(ခွင့်ပြုသည့် ကျွမ်းကျင်မှုနယ်ပယ်များ)

1. Air Pollution Control

2. Modeling for Water Quality

3. Water Pollution Control

4. Water Resources Engineering

EXTENSION
သက်တမ်းတိုးပြုခြင်း
The VALIDITY of this certificate is extended for one year from (1.1.2020) to (31.12.2020)
ကြေလက်မှတ်အား(၁-၁-၂၀၂၀) ရက်နေ့မှ (၃၁-၁၂-၂၀၂၀)
ရက်နေ့အထိ တစ်နှစ်သက်တမ်းတိုးပြုသည်။
For Director General
(Soe Naing, Director)
Environmental Conservation Department

EXTENSION
သက်တမ်းတိုးပြုခြင်း
The VALIDITY of this certificate is extended for nine months from (1.4.2019) to (31.12.2019)
ကြေလက်မှတ်အား(၁-၄-၂၀၁၉) ရက်နေ့မှ (၃၁.၁၂.၂၀၁၉)
ရက်နေ့အထိ (၉)လသက်တမ်း တိုးပြုသည်။
For Director General
(Soe Naing, Director)
Environmental Conservation Department

EXTENSION
သက်တမ်းတိုးပြုခြင်း
The VALIDITY of this certificate is extended for six month from (1.1.2021) to (30.6.2021)
ကြေလက်မှတ်အား(၁-၁-၂၀၂၁) ရက်နေ့မှ (၃၀-၆-၂၀၂၁)
ရက်နေ့အထိ (၆)လသက်တမ်းတိုးပြုသည်။
For Director General
(Soe Naing, Director)
Environmental Conservation Department

EXTENSION
သက်တမ်းတိုးပြုခြင်း
The VALIDITY of this certificate is extended for six months from (1.7.2021) to (31.12.2021)
ကြေလက်မှတ်အား(၁-၇-၂၀၂၁) ရက်နေ့မှ (၃၁-၁၂-၂၀၂၁)
ရက်နေ့အထိ (၆)လသက်တမ်းတိုးပြုသည်။
For Director General
(Soe Naing, Director)
Environmental Conservation Department

EXTENSION (သက်တမ်းတိုးပြုခြင်း)
The VALIDITY of this certificate is extended for one year from (1.1.2022) to (31.12.2022)
ကြေလက်မှတ်အား(၁-၁-၂၀၂၂)ရက်နေ့မှ(၃၁-၁၂-၂၀၂၂)
ရက်နေ့အထိ တစ်နှစ်သက်တမ်းတိုးပြုသည်။
For Director General
(Soe Naing, Director)
Environmental Conservation Department

EXTENSION (သက်တမ်းတိုးပြုခြင်း)
The VALIDITY of this certificate is extended for six months from (1.1.2023) to (30.6.2023)
ကြေလက်မှတ်အား(၁-၁-၂၀၂၃) ရက်နေ့မှ(၃၀-၆-၂၀၂၃)
ရက်နေ့အထိ (၆)လသက်တမ်းတိုးပြုသည်။
For Director General
(Sa Aung Thu, Director)
Environmental Conservation Department

THE REPUBLIC OF THE UNION OF MYANMAR

Ministry of Natural Resources and Environmental Conservation

CERTIFICATE FOR TRANSITIONAL CONSULTANT REGISTRATION

(ကြားကာလအကြံပေးလုပ်ကိုင်သူမှတ်ပုံတင်ခြင်းအထောက်အထားလက်မှတ်)

No. 00281 Date 13 FEB 2023

The Ministry of Natural Resources and Environmental Conservation, hereby, issues this certificate to the organization under Environmental Impact Assessment Procedure, Notification No. 616/2015.
(ပတ်ဝန်းကျင် ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း၊ အမိန့်ကြော်ငြာစာအမှတ်၊ ၆၁၆/၂၀၁၅ အရ သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာနသည် ဤအထောက်အထားလက်မှတ်ကို ထုတ်ပေးလိုက်သည်။)

(a)	Name of Consultant (အကြံပေးပုဂ္ဂိုလ်အမည်)	Mr. Aung Si Thu Thein
(b)	Citizenship (နိုင်ငံသား)	Myanmar
(c)	Identity Card / Passport Number (မှတ်ပုံတင်/ နိုင်ငံကူးလက်မှတ် အမှတ်)	12/AhSaNa (N) 199101
(d)	Address (ဆက်သွယ်ရန်လိပ်စာ)	Room No. (1), Building No. (30), Gyogone Avenue, Western Gyogone Ward, Insein Tsp, Yangon. Mobile phone: 095504419, 09797005164 Telephone: +95 1 3644743 E mail: agsithuforestry@gmail.com, aungsithu@eguardservices.com
(e)	Organization (အဖွဲ့အစည်း)	E guard Environmental Services Co., Ltd
(f)	Type of Consultancy (အကြံပေးလုပ်ကိုင်မှုအမျိုးအစား)	Person
(g)	Duration of validity (သက်တမ်းကုန်ဆုံးရက်)	30th June, 2023.

Director General
Environmental Conservation Department
Ministry of Natural Resources and Environmental Conservation

ဤအထောက်အထားလက်မှတ်သည် ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်းနှင့် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းပြုလုပ်သည့် တတိယပုဂ္ဂိုလ် သို့မဟုတ် အဖွဲ့အစည်းများလုပ်ငန်းလိုင်စင်ဆိုင်ရာ လုပ်ထုံးလုပ်နည်း ထုတ်ပြန်သည့်ရက်မှစ၍ (၆) လ ပြည့်မြောက်သည့်နေ့တွင် ပျက်ပြယ်မည် ဖြစ်သည်။

Areas of Expertise Permitted (ခွင့်ပြုသည့် ကျွမ်းကျင်မှုနယ်ပယ်များ)

1. Ecology and Biodiversity;	2. O (GIS);
3. Land use.	4.
5.	6.
7.	8.
9.	10.
11.	12.
13.	14.

စည်းကမ်းချက်များ

၁။ ကြားကာလအကြံပေးလုပ်ကိုင်သူမှတ်ပုံတင်ခြင်းအထောက်အထားလက်မှတ်ရရှိသူသည်-

(က) ဤအထောက်အထားလက်မှတ်ကို ဖျက်ဆီးခြင်း၊ ပြင်ဆင်ခြင်း၊ မသက်ဆိုင်သူတစ်ဦးဦးသို့ ငှားရမ်းခြင်း၊ အမည်ခံ အသုံးပြုစေခြင်းနှင့် တစ်ဆင့်လွှဲပြောင်းကိုင်ဆောင်စေခြင်းမပြုရ၊

(ခ) ဤအထောက်အထားလက်မှတ်ကို သတ်မှတ်သည့် စည်းကမ်းဘောင်အတွင်း လုပ်ငန်းလုပ်ကိုင်ခွင့် အငြင်းပွားမှုများ၊ စောဒကတက်မှုများနှင့်စပ်လျဉ်း၍ တာဝန်ယူဖြေရှင်းရမည်။ ယင်းသို့ ဖြေရှင်းနိုင်ခြင်း မရှိပါက အထောက်အထားလက်မှတ် ရပ်ဆိုင်းခြင်း သို့မဟုတ် ပယ်ဖျက်ခြင်း ခံရမည်၊

(ဂ) ဤအထောက်အထားလက်မှတ်တွင် ခွင့်ပြုထားသည့် ကျွမ်းကျင်မှုနယ်ပယ်များအတွက်သာ တာဝန်ယူလေ့လာဆန်းစစ်ရေးဆွဲခွင့်ရှိသည်၊

(ဃ) မိမိအဖွဲ့အစည်းတွင် ပါဝင်သည့် အကြံပေးပုဂ္ဂိုလ်များ ပြောင်းလဲမှု တစ်စုံတစ်ရာရှိပါက ကြားကာလ အကြံပေးလုပ်ကိုင်သူမှတ်ပုံတင်ခြင်း အထောက်အထားလက်မှတ် ရရှိထားသူဖြင့်သာ အစားထိုး ပြောင်းလဲရမည်၊

(င) အဖွဲ့အစည်းဖြစ်ပါက အဖွဲ့အစည်းတွင် ဒါရိုက်တာဘုတ်အဖွဲ့ (Board of Director)၊ အကြံပေးပုဂ္ဂိုလ် (Consultant) များ ပြောင်းလဲလိုလျှင် တည်ဆဲဥပဒေများနှင့်အညီ ဆောင်ရွက်ပြီး ရက်ပေါင်း ၃၀ အတွင်း ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာနသို့ မဖျက်မကွက် အကြောင်းကြားရမည်၊

(စ) ဝန်ကြီးဌာနက အခါအားလျော်စွာ သတ်မှတ်သည့် စည်းကမ်းချက်များကိုလိုက်နာရမည်၊

(ဆ) ဖော်ပြပါ စည်းကမ်းချက်တစ်ရပ်ရပ်ကို ဖောက်ဖျက်ခြင်း၊ လိုက်နာရန်ပျက်ကွက်ခြင်း တစ်စုံတစ်ရာ ပေါ်ပေါက်ပါက အထောက်အထားလက်မှတ် ရပ်ဆိုင်းခြင်း သို့မဟုတ် ပယ်ဖျက်ခြင်း ခံရမည်၊

၂။ အထောက်အထားလက်မှတ်ရရှိသူသည် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာနက ခွင့်ပြုထားသော ပတ်ဝန်းကျင် ဆန်းစစ်ခြင်းအမျိုးအစားကိုသာ ဆောင်ရွက်ရမည်၊

၃။ အထောက်အထားလက်မှတ်ရရှိသူသည် မြန်မာနိုင်ငံ၏ တည်ဆဲဥပဒေတစ်ရပ်ရပ်ကို ဖောက်ဖျက်ကြောင်း သို့မဟုတ် ဆန်းစစ်ခြင်းလုပ်ငန်းများ ဆောင်ရွက်ရာတွင် သိသာထင်ရှားသော မှားယွင်းမှုများ ပါရှိနေပြီး သတ်မှတ် စံချိန်စံညွှန်း သို့မဟုတ် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဥပဒေ၊ နည်းဥပဒေများ၊ ပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်း ဆိုင်ရာ လုပ်ထုံးလုပ်နည်းတို့အရ စိစစ်သုံးသပ်ပြီး ကနဦးသဘောထားမှတ်ချက်နှင့်အညီ ပြန်လည်ပြင်ဆင်ခြင်း မရှိကြောင်း ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန၏ သတ်မှတ်ဆုံးဖြတ်ခြင်းခံရလျှင် အထောက်အထားလက်မှတ် ရပ်ဆိုင်းခြင်း သို့မဟုတ် ပယ်ဖျက်ခြင်း ခံရမည်၊

၄။ အထောက်အထားလက်မှတ်ရရှိသော အဖွဲ့အစည်းသည် သက်ဆိုင်ရာစီမံကိန်းအတွက် လေ့လာဆန်းစစ်ရေးဆွဲ ဆောင်ရွက်ရန် တတိယအဖွဲ့အစည်းအတည်ပြုချက်ရယူရာ၌ မိမိအဖွဲ့အစည်းတွင် မှတ်ပုံတင်ထားသည့် အကြံပေး ပုဂ္ဂိုလ်များ၏ အမည်စာရင်းကိုသာ တင်ပြရမည်၊

၅။ အထောက်အထားလက်မှတ်ရရှိသော အဖွဲ့အစည်းသည် မိမိအဖွဲ့အစည်းက လက်လှမ်းမမီသော ကျွမ်းကျင်မှု နယ်ပယ်များအတွက် လေ့လာဆန်းစစ်ရေးဆွဲ ဆောင်ရွက်နိုင်ရန် ကြားကာလအကြံပေးလုပ်ကိုင်သူ မှတ်ပုံတင်ခြင်း အထောက်အထားလက်မှတ် ရရှိပြီးဖြစ်သည့် တစ်သီးပုဂ္ဂလလုပ်ကိုင်သူ (Freelancer) ကို သက်ဆိုင်ရာစီမံကိန်း အတွက်သာ ငှားရမ်းဆောင်ရွက်ရမည်။

REPUBLIC OF THE UNION OF MYANMAR
Ministry of Natural Resources and Environmental Conservation
CERTIFICATE FOR TRANSITIONAL CONSULTANT REGISTRATION
(ကြားကာလအကြံပေးလုပ်ကိုင်သူမှတ်ပုံတင်ခြင်းအထောက်အထားလက်မှတ်)

No. 0104 Date

The Ministry of Natural Resources and Environmental Conservation, hereby, issues this certificate to the person under Environmental Impact Assessment Procedure, Notification No. 616/2015.
(ပတ်ဝန်းကျင် ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာလုပ်ထုံးလုပ်နည်း၊ အမိန့်ကြော်ငြာစာအမှတ်၊ ၆၁၆/၂၀၁၅ အရ သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာနသည် ဤအထောက်အထားလက်မှတ်ကို လူပုဂ္ဂိုလ်အားထုတ်ပေးလိုက်သည်။)

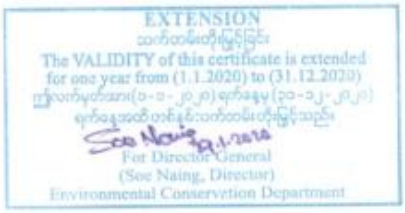
(a)	Name of Consultant (အကြံပေးပုဂ္ဂိုလ်အမည်)	Daw Thein Mwe Khin
(b)	Citizenship (နိုင်ငံသား)	Myanmar
(c)	Identity Card / Passport Number (မှတ်ပုံတင်/ နိုင်ငံကူးလက်မှတ် အမှတ်)	8/ Aa La Na (Naing) 140211
(d)	Address (ဆက်သွယ်ရန်လိပ်စာ)	99, Mya Kan Thar Lane, Nyein Chan Yay Street, 10 Mile, Pyay Road, Saw Bwar Gyi Kone Ward, Insein Township, Yangon Northern District, Yangon. theinmwe@eguardservices.com , 09 797005174
(e)	Organization (အဖွဲ့အစည်း)	E Guard Environmental Services Co., Ltd.
(f)	Type of Consultancy (အကြံပေးလုပ်ကိုင်မှုအမျိုးအစား)	Person
(g)	Duration of validity (သက်တမ်းကုန်ဆုံးရက်)	31 March 2018

သက်တမ်းတိုးမြှင့်ခြင်း
The VALIDITY of this certificate is extended for one year from (1.4.2018) to (31.3.2019)
ဤသက်မှတ်ထားသော (၀၁-၀၄-၂၀၁၈) ရက်နေ့မှ (၃၁.၃.၂၀၁၉) ထိ တစ်နှစ်တာကာလအတွက် တိုးမြှင့်ပေးသည်။
For Director General
(Soe Naing, Director)
Environmental Conservation Department

Director General
Environmental Conservation Department
Ministry of Natural Resources and Environmental Conservation

Areas of Expertise Permitted
(ခွင့်ပြုသည့် ကျွမ်းကျင်မှုနယ်ပယ်များ)

1. Forestry



THE REPUBLIC OF THE UNION OF MYANMAR

Ministry of Natural Resources and Environmental Conservation

CERTIFICATE FOR TRANSITIONAL CONSULTANT REGISTRATION

(ကြားကာလအကြံပေးလုပ်ကိုင်သူမှတ်ပုံတင်ခြင်းအထောက်အထားလက်မှတ်)

No. 00379 Date 17 FEB 2023

The Ministry of Natural Resources and Environmental Conservation, hereby, issues this certificate to the organization under Environmental Impact Assessment Procedure, Notification No. 616/2015.
(ပတ်ဝန်းကျင် ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း၊ အမိန့်ကြော်ငြာစာအမှတ်၊ ၆၁၆/၂၀၁၅ အရ သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာနသည် ဤအထောက်အထားလက်မှတ်ကို ထုတ်ပေးလိုက်သည်။)

(a)	Name of Consultant (အကြံပေးပုဂ္ဂိုလ်အမည်)	Mr. Htet Aung
(b)	Citizenship (နိုင်ငံသား)	Myanmar
(c)	Identity Card / Passport Number (မှတ်ပုံတင်/ နိုင်ငံကူးလက်မှတ် အမှတ်)	12/MaYaKa(N)144621
(d)	Address (ဆက်သွယ်ရန်လိပ်စာ)	(141), Yeikthar (2) Lane, Waizayandar Garden Housing, Mi Gyaung Kan (1) Ward, Thingangyun township, Yangon. Mobile phone: 095074307 Email: htetaung@eguardservices.com hahtetaung22@gmail.com
(e)	Organization (အဖွဲ့အစည်း)	E Guard Environmental Services. Co., Ltd.
(f)	Type of Consultancy (အကြံပေးလုပ်ကိုင်မှုအမျိုးအစား)	Person
(g)	Duration of validity (သက်တမ်းကုန်ဆုံးရက်)	30th June, 2023.

Director General
Environmental Conservation Department
Ministry of Natural Resources and Environmental Conservation

ဤအထောက်အထားလက်မှတ်သည် ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်းနှင့် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းပြုလုပ်သည့် တတိယပုဂ္ဂိုလ် သို့မဟုတ် အဖွဲ့အစည်းများလုပ်ငန်းလိုင်စင်ဆိုင်ရာ လုပ်ထုံးလုပ်နည်း ထုတ်ပြန်သည့်ရက်မှစ၍ (၆) လ ပြည့်မြောက်သည့်နေ့တွင် ပျက်ပြယ်မည် ဖြစ်သည်။

Areas of Expertise Permitted (ခွင့်ပြုသည့် ကျွမ်းကျင်မှုနယ်ပယ်များ)

1. Geology and Soil.	2.
3.	4.
5.	6.
7.	8.
9.	10.
11.	12.
13.	14.

စည်းကမ်းချက်များ

၁။ ကြားကာလအကြံပေးလုပ်ကိုင်သူမှတ်ပုံတင်ခြင်းအထောက်အထားလက်မှတ်ရရှိသူသည်-

(က) ဤအထောက်အထားလက်မှတ်ကို ဖျက်ဆီးခြင်း၊ ပြင်ဆင်ခြင်း၊ မသက်ဆိုင်သူတစ်ဦးဦးသို့ ငှားရမ်းခြင်း၊ အမည်ခံ အသုံးပြုစေခြင်းနှင့် တစ်ဆင့်လွှဲပြောင်းကိုင်ဆောင်စေခြင်းမပြုရ၊

(ခ) ဤအထောက်အထားလက်မှတ်ကို သတ်မှတ်သည့် စည်းကမ်းဘောင်အတွင်း လုပ်ငန်းလုပ်ကိုင်ခွင့်အငြင်းပွားမှုများ၊ စောဒကတက်မှုများနှင့်စပ်လျဉ်း၍ တာဝန်ယူဖြေရှင်းရမည်။ ယင်းသို့ ဖြေရှင်းနိုင်ခြင်း မရှိပါက အထောက်အထားလက်မှတ် ရပ်ဆိုင်းခြင်း သို့မဟုတ် ပယ်ဖျက်ခြင်း ခံရမည်၊

(ဂ) ဤအထောက်အထားလက်မှတ်တွင် ခွင့်ပြုထားသည့် ကျွမ်းကျင်မှုနယ်ပယ်များအတွက်သာ တာဝန်ယူလေ့လာဆန်းစစ်ရေးဆွဲခွင့်ရှိသည်၊

(ဃ) မိမိအဖွဲ့အစည်းတွင် ပါဝင်သည့် အကြံပေးပုဂ္ဂိုလ်များ ပြောင်းလဲမှု တစ်စုံတစ်ရာရှိပါက ကြားကာလအကြံပေးလုပ်ကိုင်သူမှတ်ပုံတင်ခြင်း အထောက်အထားလက်မှတ် ရရှိထားသူဖြင့်သာ အစားထိုးပြောင်းလဲရမည်၊

(င) အဖွဲ့အစည်းဖြစ်ပါက အဖွဲ့အစည်းတွင် ဒါရိုက်တာဘုတ်အဖွဲ့ (Board of Director)၊ အကြံပေးပုဂ္ဂိုလ် (Consultant) များ ပြောင်းလဲလိုလျှင် တည်ဆဲဥပဒေများနှင့်အညီ ဆောင်ရွက်ပြီး ရက်ပေါင်း ၃၀ အတွင်း ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာနသို့ မဖျက်မကွက် အကြောင်းကြားရမည်၊

(စ) ဝန်ကြီးဌာနက အခါအားလျော်စွာ သတ်မှတ်သည့် စည်းကမ်းချက်များကိုလိုက်နာရမည်၊

(ဆ) ဖော်ပြပါ စည်းကမ်းချက်တစ်ရပ်ရပ်ကို ဖောက်ဖျက်ခြင်း၊ လိုက်နာရန်ပျက်ကွက်ခြင်း တစ်စုံတစ်ရာပေါ်ပေါက်ပါက အထောက်အထားလက်မှတ် ရပ်ဆိုင်းခြင်း သို့မဟုတ် ပယ်ဖျက်ခြင်း ခံရမည်၊

၂။ အထောက်အထားလက်မှတ်ရရှိသူသည် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာနက ခွင့်ပြုထားသော ပတ်ဝန်းကျင်ဆန်းစစ်ခြင်းအမျိုးအစားကိုသာ ဆောင်ရွက်ရမည်၊

၃။ အထောက်အထားလက်မှတ်ရရှိသူသည် မြန်မာနိုင်ငံ၏ တည်ဆဲဥပဒေတစ်ရပ်ရပ်ကို ဖောက်ဖျက်ကြောင်း သို့မဟုတ် ဆန်းစစ်ခြင်းလုပ်ငန်းများ ဆောင်ရွက်ရာတွင် သိသာထင်ရှားသော မှားယွင်းမှုများ ပါရှိနေပြီး သတ်မှတ် စံချိန်စံညွှန်း သို့မဟုတ် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဥပဒေ၊ နည်းဥပဒေများ၊ ပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်း ဆိုင်ရာလုပ်ထုံးလုပ်နည်းတို့အရ စိစစ်သုံးသပ်ပြီး ကနဦးသဘောထားမှတ်ချက်နှင့်အညီ ပြန်လည်ပြင်ဆင်ခြင်း မရှိကြောင်း ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန၏ သတ်မှတ်ဆုံးဖြတ်ခြင်းခံရလျှင် အထောက်အထားလက်မှတ် ရပ်ဆိုင်းခြင်း သို့မဟုတ် ပယ်ဖျက်ခြင်း ခံရမည်၊

၄။ အထောက်အထားလက်မှတ်ရရှိသော အဖွဲ့အစည်းသည် သက်ဆိုင်ရာစီမံကိန်းအတွက် လေ့လာဆန်းစစ်ရေးဆွဲဆောင်ရွက်ရန် တတိယအဖွဲ့အစည်းအတည်ပြုချက်ရယူရာ၌ မိမိအဖွဲ့အစည်းတွင် မှတ်ပုံတင်ထားသည့် အကြံပေးပုဂ္ဂိုလ်များ၏ အမည်စာရင်းကိုသာ တင်ပြရမည်၊

၅။ အထောက်အထားလက်မှတ်ရရှိသော အဖွဲ့အစည်းသည် မိမိအဖွဲ့အစည်းက လက်လှမ်းမမီသော ကျွမ်းကျင်မှုနယ်ပယ်များအတွက် လေ့လာဆန်းစစ်ရေးဆွဲ ဆောင်ရွက်နိုင်ရန် ကြားကာလအကြံပေးလုပ်ကိုင်သူ မှတ်ပုံတင်ခြင်း အထောက်အထားလက်မှတ် ရရှိပြီးဖြစ်သည့် တစ်သီးပုဂ္ဂလလုပ်ကိုင်သူ (Freelancer) ကို သက်ဆိုင်ရာစီမံကိန်းအတွက်သာ ငှားရမ်းဆောင်ရွက်ရမည်။

THE REPUBLIC OF THE UNION OF MYANMAR

Ministry of Natural Resources and Environmental Conservation

CERTIFICATE FOR TRANSITIONAL CONSULTANT REGISTRATION

(ကြားကာလအကြံပေးလုပ်ကိုင်သူမှတ်ပုံတင်ခြင်းအထောက်အထားလက်မှတ်)

No. 00266 Date 13 FEB 2023

The Ministry of Natural Resources and Environmental Conservation, hereby, issues this certificate to the organization under Environmental Impact Assessment Procedure, Notification No. 616/2015.
(ပတ်ဝန်းကျင် ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း၊ အမိန့်ကြော်ငြာစာအမှတ်၊ ၆၁၆/၂၀၁၅ အရ သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာနသည် ဤအထောက်အထားလက်မှတ်ကို ထုတ်ပေးလိုက်သည်။)

(a)	Name of Consultant (အကြံပေးပုဂ္ဂိုလ်အမည်)	Ms. Htet Shwe Sin Aung
(b)	Citizenship (နိုင်ငံသား)	Myanmar
(c)	Identity Card / Passport Number (မှတ်ပုံတင်/ နိုင်ငံကူးလက်မှတ် အမှတ်)	12/TaMaNa (N) 117189
(d)	Address (ဆက်သွယ်ရန်လိပ်စာ)	No-25, 3rd floor, Thida Street, Kyaukmyaung ward, Tamwe Tsp, Yangon. Mobile phone: 09797005151 Telephone: 951 9667757 E mail: shwesinhtet@eguardservices.com
(e)	Organization (အဖွဲ့အစည်း)	E guard Environmental Services Co., Ltd
(f)	Type of Consultancy (အကြံပေးလုပ်ကိုင်မှုအမျိုးအစား)	Person
(g)	Duration of validity (သက်တမ်းကုန်ဆုံးရက်)	30th June, 2023.

Director General
Environmental Conservation Department
Ministry of Natural Resources and Environmental Conservation

ဤအထောက်အထားလက်မှတ်သည် ထိခိုက်မှုဆန်းစစ်ခြင်းနှင့် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းပြုလုပ်သည့် တတိယပုဂ္ဂိုလ် သို့မဟုတ် အဖွဲ့အစည်းများလုပ်ငန်းလိုင်စင်ဆိုင်ရာ လုပ်ထုံးလုပ်နည်း ထုတ်ပြန်သည့်ရက်မှစ၍ (၆) လ ပြည့်မြောက်သည့်နေ့တွင် ပျက်ပြယ်မည် ဖြစ်သည်။

Areas of Expertise Permitted (ခွင့်ပြုသည့် ကျွမ်းကျင်မှုနယ်ပယ်များ)

1. Ecology and Biodiversity.	2.
3.	4.
5.	6.
7.	8.
9.	10.
11.	12.
13.	14.

စည်းကမ်းချက်များ

၁။ ကြားကာလအကြံပေးလုပ်ကိုင်သူမှတ်ပုံတင်ခြင်းအထောက်အထားလက်မှတ်ရရှိသူသည်-

(က) ဤအထောက်အထားလက်မှတ်ကို ဖျက်ဆီးခြင်း၊ ပြင်ဆင်ခြင်း၊ မသက်ဆိုင်သူတစ်ဦးဦးသို့ ငှားရမ်းခြင်း၊ အမည်ခံ အသုံးပြုစေခြင်းနှင့် တစ်ဆင့်လွှဲပြောင်းကိုင်ဆောင်စေခြင်းမပြုရ၊

(ခ) ဤအထောက်အထားလက်မှတ်ကို သတ်မှတ်သည့် စည်းကမ်းဘောင်အတွင်း လုပ်ငန်းလုပ်ကိုင်ခွင့် အငြင်းပွားမှုများ၊ စောဒကတက်မှုများနှင့်စပ်လျဉ်း၍ တာဝန်ယူဖြေရှင်းရမည်။ ယင်းသို့ ဖြေရှင်းနိုင်ခြင်း မရှိပါက အထောက်အထားလက်မှတ် ရပ်ဆိုင်းခြင်း သို့မဟုတ် ပယ်ဖျက်ခြင်း ခံရမည်၊

(ဂ) ဤအထောက်အထားလက်မှတ်တွင် ခွင့်ပြုထားသည့် ကျွမ်းကျင်မှုနယ်ပယ်များအတွက်သာ တာဝန်ယူ လေ့လာဆန်းစစ်ရေးဆွဲခွင့်ရှိသည်၊

(ဃ) မိမိအဖွဲ့အစည်းတွင် ပါဝင်သည့် အကြံပေးပုဂ္ဂိုလ်များ ပြောင်းလဲမှု တစ်စုံတစ်ရာရှိပါက ကြားကာလ အကြံပေးလုပ်ကိုင်သူမှတ်ပုံတင်ခြင်း အထောက်အထားလက်မှတ် ရရှိထားသူဖြင့်သာ အစားထိုး ပြောင်းလဲရမည်၊

(င) အဖွဲ့အစည်းဖြစ်ပါက အဖွဲ့အစည်းတွင် ဒါရိုက်တာဘုတ်အဖွဲ့ (Board of Director)၊ အကြံပေးပုဂ္ဂိုလ် (Consultant) များ ပြောင်းလဲလိုလျှင် တည်ဆဲဥပဒေများနှင့်အညီ ဆောင်ရွက်ပြီး ရက်ပေါင်း ၃၀ အတွင်း ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာနသို့ မဖျက်မကွက် အကြောင်းကြားရမည်၊

(စ) ဝန်ကြီးဌာနက အခါအားလျော်စွာ သတ်မှတ်သည့် စည်းကမ်းချက်များကိုလိုက်နာရမည်၊

(ဆ) ဖော်ပြပါ စည်းကမ်းချက်တစ်ရပ်ရပ်ကို ဖောက်ဖျက်ခြင်း၊ လိုက်နာရန်ပျက်ကွက်ခြင်း တစ်စုံတစ်ရာ ပေါ်ပေါက်ပါက အထောက်အထားလက်မှတ် ရပ်ဆိုင်းခြင်း သို့မဟုတ် ပယ်ဖျက်ခြင်း ခံရမည်၊

၂။ အထောက်အထားလက်မှတ်ရရှိသူသည် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာနက ခွင့်ပြုထားသော ပတ်ဝန်းကျင် ဆန်းစစ်ခြင်းအမျိုးအစားကိုသာ ဆောင်ရွက်ရမည်၊

၃။ အထောက်အထားလက်မှတ်ရရှိသူသည် မြန်မာနိုင်ငံ၏ တည်ဆဲဥပဒေတစ်ရပ်ရပ်ကို ဖောက်ဖျက်ကြောင်း သို့မဟုတ် ဆန်းစစ်ခြင်းလုပ်ငန်းများ ဆောင်ရွက်ရာတွင် သိသာထင်ရှားသော မှားယွင်းမှုများ ပါရှိနေပြီး သတ်မှတ် စံချိန်စံညွှန်း သို့မဟုတ် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဥပဒေ၊ နည်းဥပဒေများ၊ ပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်း ဆိုင်ရာ လုပ်ထုံးလုပ်နည်းတို့အရ စိစစ်သုံးသပ်ပြီး ကနဦးသဘောထားမှတ်ချက်နှင့်အညီ ပြန်လည်ပြင်ဆင်ခြင်း မရှိကြောင်း ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန၏ သတ်မှတ်ဆုံးဖြတ်ခြင်းခံရလျှင် အထောက်အထားလက်မှတ် ရပ်ဆိုင်းခြင်း သို့မဟုတ် ပယ်ဖျက်ခြင်း ခံရမည်၊

၄။ အထောက်အထားလက်မှတ်ရရှိသော အဖွဲ့အစည်းသည် သက်ဆိုင်ရာစီမံကိန်းအတွက် လေ့လာဆန်းစစ်ရေးဆွဲ ဆောင်ရွက်ရန် တတိယအဖွဲ့အစည်းအတည်ပြုချက်ရယူရာ၌ မိမိအဖွဲ့အစည်းတွင် မှတ်ပုံတင်ထားသည့် အကြံပေး ပုဂ္ဂိုလ်များ၏ အမည်စာရင်းကိုသာ တင်ပြရမည်၊

၅။ အထောက်အထားလက်မှတ်ရရှိသော အဖွဲ့အစည်းသည် မိမိအဖွဲ့အစည်းက လက်လှမ်းမမီသော ကျွမ်းကျင်မှု နယ်ပယ်များအတွက် လေ့လာဆန်းစစ်ရေးဆွဲ ဆောင်ရွက်နိုင်ရန် ကြားကာလအကြံပေးလုပ်ကိုင်သူ မှတ်ပုံတင်ခြင်း အထောက်အထားလက်မှတ် ရရှိပြီးဖြစ်သည့် တစ်သီးပုဂ္ဂလလုပ်ကိုင်သူ (Freelancer) ကို သက်ဆိုင်ရာစီမံကိန်း အတွက်သာ ငှားရမ်းဆောင်ရွက်ရမည်။

THE REPUBLIC OF THE UNION OF MYANMAR

Ministry of Natural Resources and Environmental Conservation

CERTIFICATE FOR TRANSITIONAL CONSULTANT REGISTRATION

(ကြားကာလအကြံပေးလုပ်ကိုင်သူမှတ်ပုံတင်ခြင်းအထောက်အထားလက်မှတ်)

No. 00279 Date 13 FEB 2023

The Ministry of Natural Resources and Environmental Conservation, hereby, issues this certificate to the organization under Environmental Impact Assessment Procedure, Notification No. 616/2015.
(ပတ်ဝန်းကျင် ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း၊ အမိန့်ကြော်ငြာစာအမှတ်၊ ၆၁၆/၂၀၁၅ အရ သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာနသည် ဤအထောက်အထားလက်မှတ်ကို ထုတ်ပေးလိုက်သည်။)

(a)	Name of Consultant (အကြံပေးပုဂ္ဂိုလ်အမည်)	Ms. Shwe Ya Min Bo
(b)	Citizenship (နိုင်ငံသား)	Myanmar
(c)	Identity Card / Passport Number (မှတ်ပုံတင်/ နိုင်ငံကူးလက်မှတ် အမှတ်)	8/MaKaNa (N) 218158
(d)	Address (ဆက်သွယ်ရန်လိပ်စာ)	No. A 870, 6th road, AungMyitter Quarter, Magway Region, Magway. Mobile phone: 09441545461 E mail: shweyaminbo712016@gmail.com shweyaminbo@eguardservices.com
(e)	Organization (အဖွဲ့အစည်း)	E guard Environmental Services Co., Ltd
(f)	Type of Consultancy (အကြံပေးလုပ်ကိုင်မှုအမျိုးအစား)	Person
(g)	Duration of validity (သက်တမ်းကုန်ဆုံးရက်)	30th June, 2023.

Director General
Environmental Conservation Department
Ministry of Natural Resources and Environmental Conservation

ဤအထောက်အထားလက်မှတ်သည် ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်းနှင့် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းပြုလုပ်သည့် တတိယပုဂ္ဂိုလ် သို့မဟုတ် အဖွဲ့အစည်းများလုပ်ငန်းလိုင်စင်ဆိုင်ရာ လုပ်ထုံးလုပ်နည်း ထုတ်ပြန်သည့်ရက်မှစ၍ (၆) လ ပြည့်မြောက်သည့်နေ့တွင် ပျက်ပြယ်မည် ဖြစ်သည်။

Areas of Expertise Permitted (ခွင့်ပြုသည့် ကျွမ်းကျင်မှုနယ်ပယ်များ)

1. O (Forestry);	2. O (GIS);
3. Ecology and Biodiversity.	4.
5.	6.
7.	8.
9.	10.
11.	12.
13.	14.

စည်းကမ်းချက်များ

၁။ ကြားကာလအကြံပေးလုပ်ကိုင်သူမှတ်ပုံတင်ခြင်းအထောက်အထားလက်မှတ်ရရှိသူသည်-

(က) ဤအထောက်အထားလက်မှတ်ကို ဖျက်ဆီးခြင်း၊ ပြင်ဆင်ခြင်း၊ မသက်ဆိုင်သူတစ်ဦးဦးသို့ ငှားရမ်းခြင်း၊ အမည်ခံ အသုံးပြုစေခြင်းနှင့် တစ်ဆင့်လွှဲပြောင်းကိုင်ဆောင်စေခြင်းမပြုရ၊

(ခ) ဤအထောက်အထားလက်မှတ်ကို သတ်မှတ်သည့် စည်းကမ်းဘောင်အတွင်း လုပ်ငန်းလုပ်ကိုင်ခွင့် အငြင်းပွားမှုများ၊ စောဒကတက်မှုများနှင့်စပ်လျဉ်း၍ တာဝန်ယူဖြေရှင်းရမည်။ ယင်းသို့ ဖြေရှင်းနိုင်ခြင်း မရှိပါက အထောက်အထားလက်မှတ် ရပ်ဆိုင်းခြင်း သို့မဟုတ် ပယ်ဖျက်ခြင်း ခံရမည်၊

(ဂ) ဤအထောက်အထားလက်မှတ်တွင် ခွင့်ပြုထားသည့် ကျွမ်းကျင်မှုနယ်ပယ်များအတွက်သာ တာဝန်ယူလေ့လာဆန်းစစ်ရေးဆွဲခွင့်ရှိသည်၊

(ဃ) မိမိအဖွဲ့အစည်းတွင် ပါဝင်သည့် အကြံပေးပုဂ္ဂိုလ်များ ပြောင်းလဲမှု တစ်စုံတစ်ရာရှိပါက ကြားကာလ အကြံပေးလုပ်ကိုင်သူမှတ်ပုံတင်ခြင်း အထောက်အထားလက်မှတ် ရရှိထားသူဖြင့်သာ အစားထိုး ပြောင်းလဲရမည်၊

(င) အဖွဲ့အစည်းဖြစ်ပါက အဖွဲ့အစည်းတွင် ဒါရိုက်တာဘုတ်အဖွဲ့ (Board of Director)၊ အကြံပေးပုဂ္ဂိုလ် (Consultant) များ ပြောင်းလဲလိုလျှင် တည်ဆဲဥပဒေများနှင့်အညီ ဆောင်ရွက်ပြီး ရက်ပေါင်း ၃၀ အတွင်း ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာနသို့ မဖျက်မကွက် အကြောင်းကြားရမည်၊

(စ) ဝန်ကြီးဌာနက အခါအားလျော်စွာ သတ်မှတ်သည့် စည်းကမ်းချက်များကိုလိုက်နာရမည်၊

(ဆ) ဖော်ပြပါ စည်းကမ်းချက်တစ်ရပ်ရပ်ကို ဖောက်ဖျက်ခြင်း၊ လိုက်နာရန်ပျက်ကွက်ခြင်း တစ်စုံတစ်ရာ ပေါ်ပေါက်ပါက အထောက်အထားလက်မှတ် ရပ်ဆိုင်းခြင်း သို့မဟုတ် ပယ်ဖျက်ခြင်း ခံရမည်၊

၂။ အထောက်အထားလက်မှတ်ရရှိသူသည် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာနက ခွင့်ပြုထားသော ပတ်ဝန်းကျင် ဆန်းစစ်ခြင်းအမျိုးအစားကိုသာ ဆောင်ရွက်ရမည်၊

၃။ အထောက်အထားလက်မှတ်ရရှိသူသည် မြန်မာနိုင်ငံ၏ တည်ဆဲဥပဒေတစ်ရပ်ရပ်ကို ဖောက်ဖျက်ကြောင်း သို့မဟုတ် ဆန်းစစ်ခြင်းလုပ်ငန်းများ ဆောင်ရွက်ရာတွင် သိသာထင်ရှားသော မှားယွင်းမှုများ ပါရှိနေပြီး သတ်မှတ် စံချိန်စံညွှန်း သို့မဟုတ် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဥပဒေ၊ နည်းဥပဒေများ၊ ပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်း ဆိုင်ရာ လုပ်ထုံးလုပ်နည်းတို့အရ စိစစ်သုံးသပ်ပြီး ကနဦးသဘောထားမှတ်ချက်နှင့်အညီ ပြန်လည်ပြင်ဆင်ခြင်း မရှိကြောင်း ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန၏ သတ်မှတ်ဆုံးဖြတ်ခြင်းခံရလျှင် အထောက်အထားလက်မှတ် ရပ်ဆိုင်းခြင်း သို့မဟုတ် ပယ်ဖျက်ခြင်း ခံရမည်၊

၄။ အထောက်အထားလက်မှတ်ရရှိသော အဖွဲ့အစည်းသည် သက်ဆိုင်ရာစီမံကိန်းအတွက် လေ့လာဆန်းစစ်ရေးဆွဲ ဆောင်ရွက်ရန် တတိယအဖွဲ့အစည်းအတည်ပြုချက်ရယူရာ၌ မိမိအဖွဲ့အစည်းတွင် မှတ်ပုံတင်ထားသည့် အကြံပေး ပုဂ္ဂိုလ်များ၏ အမည်စာရင်းကိုသာ တင်ပြရမည်၊

၅။ အထောက်အထားလက်မှတ်ရရှိသော အဖွဲ့အစည်းသည် မိမိအဖွဲ့အစည်းက လက်လှမ်းမမီသော ကျွမ်းကျင်မှု နယ်ပယ်များအတွက် လေ့လာဆန်းစစ်ရေးဆွဲ ဆောင်ရွက်နိုင်ရန် ကြားကာလအကြံပေးလုပ်ကိုင်သူ မှတ်ပုံတင်ခြင်း အထောက်အထားလက်မှတ် ရရှိပြီးဖြစ်သည့် တစ်သီးပုဂ္ဂလလုပ်ကိုင်သူ (Freelancer) ကို သက်ဆိုင်ရာစီမံကိန်း အတွက်သာ ငှားရမ်းဆောင်ရွက်ရမည်။

THE REPUBLIC OF THE UNION OF MYANMAR

Ministry of Natural Resources and Environmental Conservation

CERTIFICATE FOR TRANSITIONAL CONSULTANT REGISTRATION

(ကြားကာလအကြံပေးလုပ်ကိုင်သူမှတ်ပုံတင်ခြင်းအထောက်အထားလက်မှတ်)

No. 00380 Date 17 FEB 2023

The Ministry of Natural Resources and Environmental Conservation, hereby, issues this certificate to the organization under Environmental Impact Assessment Procedure, Notification No. 616/2015.
(ပတ်ဝန်းကျင် ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း၊ အမိန့်ကြော်ငြာစာအမှတ်၊ ၆၁၆/၂၀၁၅ အရ သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာနသည် ဤအထောက်အထားလက်မှတ်ကို ထုတ်ပေးလိုက်သည်။)

(a)	Name of Consultant (အကြံပေးပုဂ္ဂိုလ်အမည်)	Ms May Thu Win
(b)	Citizenship (နိုင်ငံသား)	Myanmar
(c)	Identity Card / Passport Number (မှတ်ပုံတင်/ နိုင်ငံကူးလက်မှတ် အမှတ်)	12/Thakata(C)186124
(d)	Address (ဆက်သွယ်ရန်လိပ်စာ)	No.E/8, (9) Quarter, EPC (Staff Housing), Thaketa Township, Yangon Mobile phone: 09797005183, 09448033586 Email: maythuwin@eguardservices.com
(e)	Organization (အဖွဲ့အစည်း)	E Guard Environmental Services. Co., Ltd.
(f)	Type of Consultancy (အကြံပေးလုပ်ကိုင်မှုအမျိုးအစား)	Person
(g)	Duration of validity (သက်တမ်းကုန်ဆုံးရက်)	30th June, 2023.

Director General
Environmental Conservation Department
Ministry of Natural Resources and Environmental Conservation

ဤအထောက်အထားလက်မှတ်သည် ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်းနှင့် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းပြုလုပ်သည့် တတိယပုဂ္ဂိုလ် သို့မဟုတ် အဖွဲ့အစည်းများလုပ်ငန်းလိုင်စင်ဆိုင်ရာ လုပ်ထုံးလုပ်နည်း ထုတ်ပြန်သည့်ရက်မှစ၍ (၆) လ ပြည့်မြောက်သည့်နေ့တွင် ပျက်ပြယ်မည် ဖြစ်သည်။

Areas of Expertise Permitted (ခွင့်ပြုသည့် ကျွမ်းကျင်မှုနယ်ပယ်များ)

1. Legal Analysis	2.
3.	4.
5.	6.
7.	8.
9.	10.
11.	12.
13.	14.

စည်းကမ်းချက်များ

၁။ ကြားကာလအကြံပေးလုပ်ကိုင်သူမှတ်ပုံတင်ခြင်းအထောက်အထားလက်မှတ်ရရှိသူသည်-

(က) ဤအထောက်အထားလက်မှတ်ကို ဖျက်ဆီးခြင်း၊ ပြင်ဆင်ခြင်း၊ မသက်ဆိုင်သူတစ်ဦးဦးသို့ ငှားရမ်းခြင်း၊ အမည်ခံ အသုံးပြုစေခြင်းနှင့် တစ်ဆင့်လွှဲပြောင်းကိုင်ဆောင်စေခြင်းမပြုရ၊

(ခ) ဤအထောက်အထားလက်မှတ်ကို သတ်မှတ်သည့် စည်းကမ်းဘောင်အတွင်း လုပ်ငန်းလုပ်ကိုင်ခွင့် အငြင်းပွားမှုများ၊ စောဒကတက်မှုများနှင့်စပ်လျဉ်း၍ တာဝန်ယူဖြေရှင်းရမည်။ ယင်းသို့ ဖြေရှင်းနိုင်ခြင်း မရှိပါက အထောက်အထားလက်မှတ် ရပ်ဆိုင်းခြင်း သို့မဟုတ် ပယ်ဖျက်ခြင်း ခံရမည်၊

(ဂ) ဤအထောက်အထားလက်မှတ်တွင် ခွင့်ပြုထားသည့် ကျွမ်းကျင်မှုနယ်ပယ်များအတွက်သာ တာဝန်ယူ လေ့လာဆန်းစစ်ရေးဆွဲခွင့်ရှိသည်၊

(ဃ) မိမိအဖွဲ့အစည်းတွင် ပါဝင်သည့် အကြံပေးပုဂ္ဂိုလ်များ ပြောင်းလဲမှု တစ်စုံတစ်ရာရှိပါက ကြားကာလ အကြံပေးလုပ်ကိုင်သူမှတ်ပုံတင်ခြင်း အထောက်အထားလက်မှတ် ရရှိထားသူဖြင့်သာ အစားထိုး ပြောင်းလဲရမည်၊

(င) အဖွဲ့အစည်းဖြစ်ပါက အဖွဲ့အစည်းတွင် ဒါရိုက်တာဘုတ်အဖွဲ့ (Board of Director)၊ အကြံပေးပုဂ္ဂိုလ် (Consultant) များ ပြောင်းလဲလိုလျှင် တည်ဆဲဥပဒေများနှင့်အညီ ဆောင်ရွက်ပြီး ရက်ပေါင်း ၃၀ အတွင်း ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာနသို့ မဖျက်မကွက် အကြောင်းကြားရမည်၊

(စ) ဝန်ကြီးဌာနက အခါအားလျော်စွာ သတ်မှတ်သည့် စည်းကမ်းချက်များကိုလိုက်နာရမည်၊

(ဆ) ဖော်ပြပါ စည်းကမ်းချက်တစ်ရပ်ရပ်ကို ဖောက်ဖျက်ခြင်း၊ လိုက်နာရန်ပျက်ကွက်ခြင်း တစ်စုံတစ်ရာ ပေါ်ပေါက်ပါက အထောက်အထားလက်မှတ် ရပ်ဆိုင်းခြင်း သို့မဟုတ် ပယ်ဖျက်ခြင်း ခံရမည်၊

၂။ အထောက်အထားလက်မှတ်ရရှိသူသည် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာနက ခွင့်ပြုထားသော ပတ်ဝန်းကျင် ဆန်းစစ်ခြင်းအမျိုးအစားကိုသာ ဆောင်ရွက်ရမည်၊

၃။ အထောက်အထားလက်မှတ်ရရှိသူသည် မြန်မာနိုင်ငံ၏ တည်ဆဲဥပဒေတစ်ရပ်ရပ်ကို ဖောက်ဖျက်ကြောင်း သို့မဟုတ် ဆန်းစစ်ခြင်းလုပ်ငန်းများ ဆောင်ရွက်ရာတွင် သိသာထင်ရှားသော မှားယွင်းမှုများ ပါရှိနေပြီး သတ်မှတ် စံချိန်စံညွှန်း သို့မဟုတ် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဥပဒေ၊ နည်းဥပဒေများ၊ ပတ်ဝန်းကျင်ထိခိုက်မှု ဆန်းစစ်ခြင်း ဆိုင်ရာ လုပ်ထုံးလုပ်နည်းတို့အရ စိစစ်သုံးသပ်ပြီး ကနဦးသဘောထားမှတ်ချက်နှင့်အညီ ပြန်လည်ပြင်ဆင်ခြင်း မရှိကြောင်း ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန၏ သတ်မှတ်ဆုံးဖြတ်ခြင်းခံရလျှင် အထောက်အထားလက်မှတ် ရပ်ဆိုင်းခြင်း သို့မဟုတ် ပယ်ဖျက်ခြင်း ခံရမည်၊

၄။ အထောက်အထားလက်မှတ်ရရှိသော အဖွဲ့အစည်းသည် သက်ဆိုင်ရာစီမံကိန်းအတွက် လေ့လာဆန်းစစ်ရေးဆွဲ ဆောင်ရွက်ရန် တတိယအဖွဲ့အစည်းအတည်ပြုချက်ရယူရာ၌ မိမိအဖွဲ့အစည်းတွင် မှတ်ပုံတင်ထားသည့် အကြံပေး ပုဂ္ဂိုလ်များ၏ အမည်စာရင်းကိုသာ တင်ပြရမည်၊

၅။ အထောက်အထားလက်မှတ်ရရှိသော အဖွဲ့အစည်းသည် မိမိအဖွဲ့အစည်းက လက်လှမ်းမမီသော ကျွမ်းကျင်မှု နယ်ပယ်များအတွက် လေ့လာဆန်းစစ်ရေးဆွဲ ဆောင်ရွက်နိုင်ရန် ကြားကာလအကြံပေးလုပ်ကိုင်သူ မှတ်ပုံတင်ခြင်း အထောက်အထားလက်မှတ် ရရှိပြီးဖြစ်သည့် တစ်သီးပုဂ္ဂလလုပ်ကိုင်သူ (Freelancer) ကို သက်ဆိုင်ရာစီမံကိန်း အတွက်သာ ငှားရမ်းဆောင်ရွက်ရမည်။

(4) Public Consultation Meeting's Attendance Lists

၄၀ မဂ္ဂါဝပ် နေရောင်ခြည်စွမ်းအင်သုံး လျှပ်စစ်ဓာတ်အားထုတ်လုပ်ခြင်းစီမံကိန်း နှင့်ပတ်သက်၍ အများပြည်သူနှင့် တိုင်ပင်ဆွေးနွေးခြင်း အခမ်းအနား
(မြို့နယ်)

အစိုးရဌာနဆိုင်ရာအဖွဲ့အစည်းများ

ရက်စွဲ ။ ။ ၂၀၂၂ ခုနှစ်၊ ဇွန်လ ( ) ရက်

စဉ်	အမည်	ရာထူး	ဌာနအဖွဲ့အစည်း	ဆက်သွယ်ရန်ဖုန်း	လက်မှတ်
၁။	[illegible]	[illegible]	[illegible]	09.443883047	[illegible]
၂။	[illegible]	[illegible]	[illegible]	09.261757178	[illegible]
၃။	ဦးသက်ထိုက်ထွေး	[illegible]	ရွာသား		[illegible]
၄။					
၅။					
၆။					
၇။					
၈။					
၉။					
၁၀။					
၁၁။					
၁၂။					

၄၀ မဂ္ဂါဝပ် နေရောင်ခြည်စွမ်းအင်သုံး လျှပ်စစ်ဓာတ်အားထုတ်လုပ်ခြင်းစီမံကိန်း နှင့်ပတ်သက်၍ အများပြည်သူနှင့် တိုင်ပင်ဆွေးနွေးခြင်း အခမ်းအနား
(မြို့နယ်)

ပုဂ္ဂလိက ကုမ္ပဏီများ (Private Company)

ရက်စွဲ ။ ။ ၂၀၂၂ ခုနှစ်၊ ဇွန်လ ( ) ရက်

စဉ်	အမည်	ရာထူး	ကုမ္ပဏီများ	ဆက်သွယ်ရန်ဖုန်း	လက်မှတ်
၁။	[illegible]	[illegible]		09.43045659	[illegible]
၂။	[illegible]	[illegible]		09.799567849	[illegible]
၃။					
၄။					
၅။					
၆။					
၇။					
၈။					
၉။					
၁၀။					
၁၁။					
၁၂။					

၄၀ မဂ္ဂါဝပ် နေရောင်ခြည်စွမ်းအင်သုံး လျှပ်စစ်ဓာတ်အားထုတ်လုပ်ခြင်းစီမံကိန်း နှင့်ပတ်သက်၍ အများပြည်သူနှင့် တိုင်ပင်ဆွေးနွေးခြင်း အခမ်းအနား
(မြို့နယ်)

ရပ်ကွက်/ ကျေးရွာ ရက်စွဲ ။ ။ ၂၀၂၂ ခုနှစ်၊ ဇွန်လ ( ) ရက်

စဉ်	အမည်	ရပ်ကွက်	အလုပ်အကိုင်	ဖုန်းနံပါတ်	လက်မှတ်
၁။	[illegible]	အင်းမို	အထွေထွေ	09 254259330	[illegible]
၂။	[illegible]	ရုံးတိုင်း	အထွေထွေ	09.666369480	Sam
၃။	အောင်ဖေဦး	ရုံးတိုင်း	အထွေထွေ	09.650114714	အောင်
၄။	မျိုးထက်အောင်	အင်းမို	အထွေထွေ	09.442613568	မျိုး
၅။	ဦးအောင်ငွေ	အင်းမို	အထွေထွေ	-	[illegible]
၆။	ဒေါ်ချစ်ဝင်း	အင်းမို	အထွေထွေ	-	[illegible]
၇။	[illegible]	အင်းမို	အထွေထွေ	-	[illegible]
၈။	မမြင့်မြင့်မို	အင်းမို	အထွေထွေ	-	မြင့်
၉။	[illegible]	အင်းမို	အထွေထွေ	-	[illegible]
၁၀။	[illegible]	အင်းမို (ရေကျော်တန်း)	အထွေထွေ	-	[illegible]
၁၁။	ဖြိုးဝါမွှေ	အင်းမို	အထွေထွေ	-	ဖြိုး
၁၂။	ဟန်မိုးဦး	အင်းမို	အထွေထွေ	-	ဦး

၄၀ မဂ္ဂါဝပ် နေရောင်ခြည်စွမ်းအင်သုံး လျှပ်စစ်ဓာတ်အားထုတ်လုပ်ခြင်းစီမံကိန်း နှင့်ပတ်သက်၍ အများပြည်သူနှင့် တိုင်ပင်ဆွေးနွေးခြင်း အခမ်းအနား
(မြို့နယ်)

ရပ်ကွက်/ ကျေးရွာ ရက်စွဲ ။ ။ ၂၀၂၂ ခုနှစ်၊ ဇွန်လ ( ) ရက်

စဉ်	အမည်	ရပ်ကွက်	အလုပ်အကိုင်	ဖုန်းနံပါတ်	လက်မှတ်
၁။	မြသီတာ	ရုံးတိုင်း			[illegible]
၂။	စုစုလှိုင်	အင်းမို			စု
၃။	[illegible]	အင်းမို			[illegible]
၄။	ပပဦး	ရုံးတိုင်း			ဦး
၅။	တင်ဇာဝင်း	ရုံးတိုင်း			[illegible]
၆။	ဖူးငုံ	အင်းမို			ဖူး
၇။	မြစိုးဦး	ရုံးတိုင်း			[illegible]
၈။	[illegible]	အင်းမို			[illegible]
၉။					
၁၀။					
၁၁။					
၁၂။					

(5) Public Consultation Meeting's Meeting Minute

E Guard Environmental Services Co., Ltd.
Meeting Minutes

Subject: 40MW Ground Mounted Solar Power Plant connected to Shwekyin Substation	**Date**: 2nd June, 2022
Venue: Project Site	**Time**: 01:00PM – 02:30PM

Attendee Lists

No.	Category	Number of Participants
1.	Local People from Ingani Village	23
2.	Representatives of Sinohydro (Myanmar)	2
3.	Representatives of E Guard Environmental Services	3
Total		28

Prepared By: U Htet Aung

Agenda:

1) Opening Ceremony
2) Presentation of Project Information by U Thiha Tun (Site Translator, Sinohydro (Myanmar) Co., Ltd.)
3) Presentation of Environmental Management Plan (EMP) for construction and operation of 40 MW ground mounted solar power plant project connected to Shwekyin Substation by U Htet Aung (Assistant Consultant, E Guard Environmental Services Co., Ltd.)
4) Questions, Comments and Suggestions from the attendees.
5) Closing Ceremony

1. Opening Ceremony

2. Presentation of Project Information by U Thiha Tun (on behalf of Mr. Lee (Project Representative, Sinohydro (Myanmar) Co., Ltd.)

U Thiha Tun briefly explained the project information such as type of business, construction and operation processes of the project, project proponent information and project description.

3. Presentation of Environmental Management Plan (EMP) for construction and operation of 40 MW ground mounted solar power plant project connected to Shwekyin

Substation by U Htet Aung (Assistant Consultant, E Guard Environmental Services Co., Ltd.)

U Htet Aung explained the processes of environmental management plan preparation, potential positive impacts of the project, potential negative impacts of the project, proposed mitigation measures to reduce these negative impacts, proposed monitoring plan, grievance redress mechanism and environmental quality measurements processes of the proposed project.

4. Questions, Comments and Suggestions from the Attendees

There are no Questions, Comments and Suggestion from the Attendees in the meeting.

5. Closing Ceremony

(6) Public Consultation Meeting's Photos

Meeting with Township Administrator at Shwekyin Township GAD Office

Meeting with Ingani Village Administrator

Meeting with Myanmar Shwekyin Solar Company Limited

Presented by U Thiha Tun (Site Translator from Myanmar Shwekyin Solar Company Limited)

Presented by U Htet Aung (E Guard Environmental Services)	Attendance from local community.

(7) Presentation Files of Public Consultation Meeting

၄၀ မဂ္ဂါဝပ်နေရောင်ခြည်စွမ်းအင်သုံး

လျှပ်စစ်ဓာတ်အားထုတ်လုပ်ခြင်းစီမံကိန်း

ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်ရေးဆွဲခြင်းလုပ်ငန်းနှင့်ပတ်သက်၍

ရှင်းလင်းတင်ပြခြင်းနှင့် အများပြည်သူသဘောထားရယူခြင်းအခမ်းအနား

၂၀၂၂ ခုနှစ်၊ ဇွန်လ (၂) ရက်

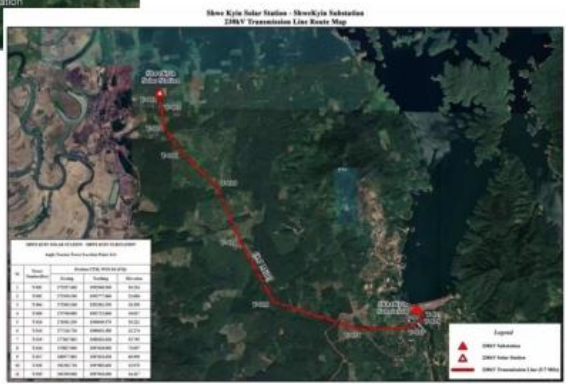
စီမံကိန်းအကောင်အထည်ဖော်သူ	- Myanmar Shwekyin Solar Power Company Limited
ရင်းနှီးမြှုပ်နှံမှုပုံစံ	- ပြည်ပရင်းနှီးမြှုပ်နှံမှု
လုပ်ငန်းအမျိုးအစား	- နေရောင်ခြည်စွမ်းအင်သုံး လျှပ်စစ်ဓာတ်အား ထုတ်လုပ်ခြင်းလုပ်ငန်း
စီမံကိန်း၏အဓိကရည်ရွယ်ချက်	- နေရောင်ခြည်စွမ်းအင်မှ လျှပ်စစ်ဓာတ်အား ထုတ်လုပ်ပြီး ရွှေကျင်ဓာတ်အားခွဲရုံသို့ ပို့လွှတ်ရန်
စီမံကိန်းတည်နေရာ	- ပဲခူးတိုင်းဒေသကြီး၊ ပဲခူးခရိုင်၊ ရွှေကျင်မြို့နယ်၊ အင်္ဂနီကျေးရွာအုပ်စု

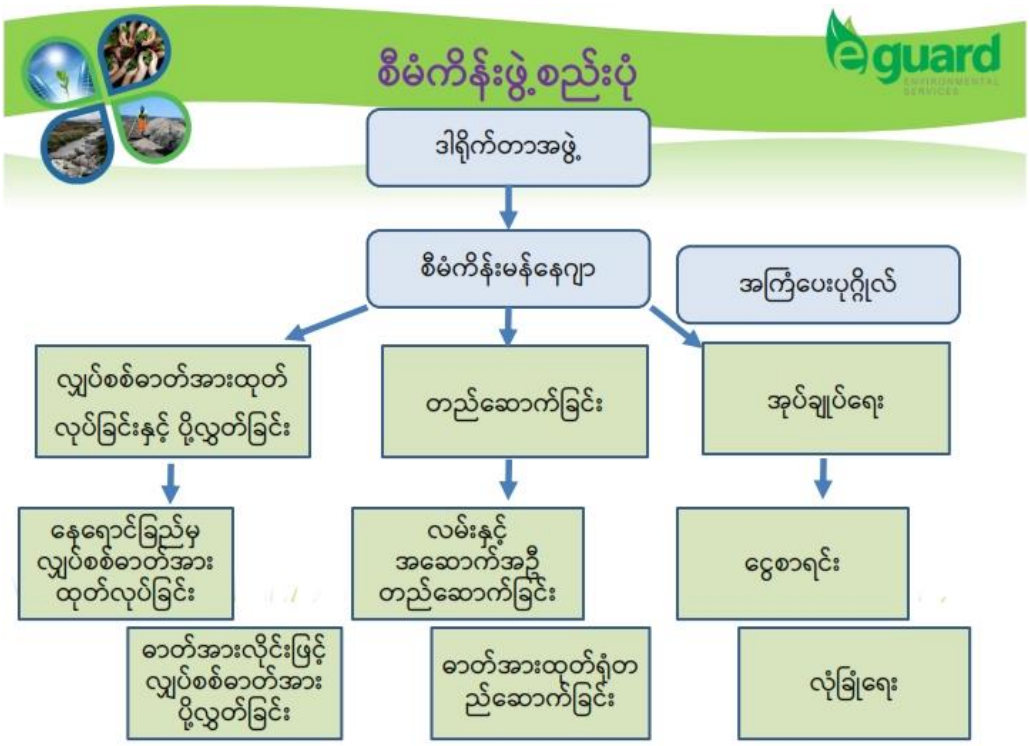
စီမံကိန်းအတွက်ရင်းနှီးမြှုပ်နှံမှုပုံစံ

Myanmar Shwekyin Solar Power Company Limited

- ကွင်းဆင်းဆောင်ရွက်ခြင်းနှင့် ဒီဇိုင်းရေးဆွဲခြင်း
- တည်ဆောက်ရေးလုပ်ငန်းများ ဆောင်ရွက်ခြင်း
- ဓာတ်အားလိုင်းသွယ်တန်းခြင်း
- ကွန်ပျူတာစနစ်ဖြင့်ဓာတ်အားထုတ်လုပ်မှု၊ ပို့လွှတ်မှုများအား ထိန်းချုပ်ခြင်း

စီမံကိန်းတည်နေရာ





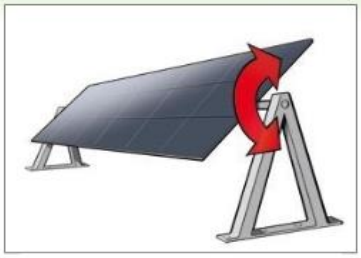
စီမံကိန်းတည်ဆောက်မည့်ကာလ	- (၆) လ
စီမံကိန်းလည်ပတ်မည့်ကာလ	- နှစ် (၂၀)
စီမံကိန်းအကျယ်အဝန်း	- (၁၆၄) ဧက
ဓာတ်အားလိုင်းမှပို့လွှတ်နိုင်သည့်ပမာဏ	- (၂၃၀) ကေဗီအေ
ဓာတ်အားလိုင်းအရှည်	- (၈) ကီလိုမီတာခန့် (၅.၇ မိုင်)

စီမံကိန်းဆိုင်ရာအချက်အလက်များ

ဆိုလာပြားအမျိုးအစားနှင့် အရေအတွက်	- ၅၄၀ Wp ရှိ မျက်နှာပြင်နှစ်ဖက်ပါသော မိုနိုခရစ်စတယ်လိုင်း ဆီလီကွန် ဆိုလာပြား (၈၉၆၀၀ ခု)
ဆိုလာပြားအောက်ရှိထောက်တိုင်အမျိုးအစားနှင့် အရေအတွက်	- အရှေ့အရပ်မှအနောက်အရပ်သို့ ရေပြင်ညီအတိုင်းလှည့်နိုင်သော ထောက်တိုင် (၆၀၅ ခု)
အင်ဗာတာအမျိုးအစားနှင့် အရေအတွက်	- String inverter (24 in and 1 out, 250 kW) (၂၀ လုံး)
ထရန်စဖော်မာအမျိုးအစားနှင့် အရေအတွက်	- Box type double split transformer (၈ လုံး) နှင့် double winding transformer (၁ လုံး)

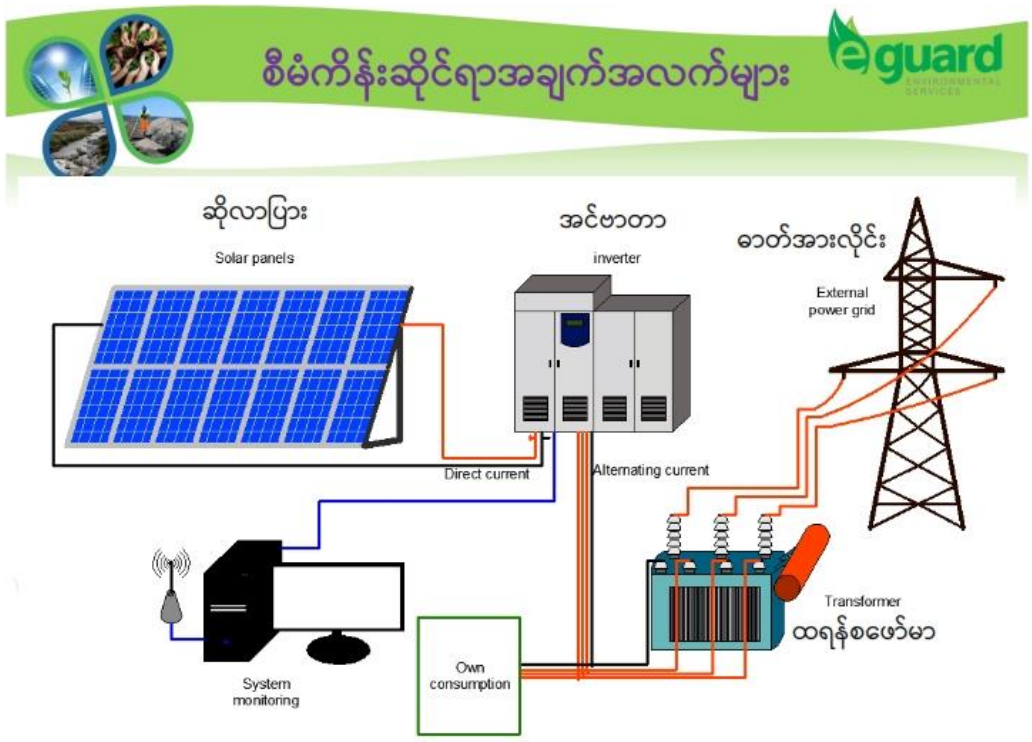
စီမံကိန်းဆိုင်ရာအချက်အလက်များ

ဆိုလာပြား



အင်ဗာတာ

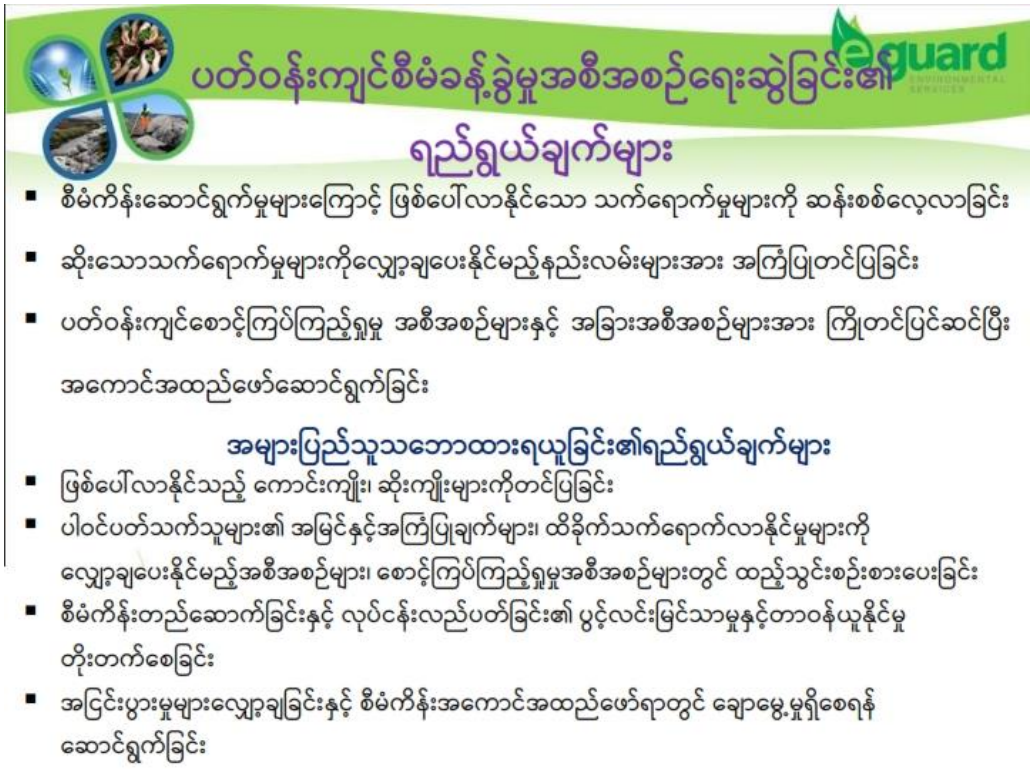
ထရန်စဖော်မာ


စီမံကိန်းဆိုင်ရာအချက်အလက်များ
eguard
ဆိုလာပြား
Solar panels
အင်ဗာတာ
inverter
ဓာတ်အားလိုင်း
External power grid
Direct current
Alternating current
Transformer
ထရန်စဖော်မာ
System monitoring
Own consumption


ာတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်ရေးဆွဲခြင်း
(Environmental Management Plan)
E Guard Environmental Services

2


ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်ရေးဆွဲခြင်း
eguard
စီမံကိန်း၏ဖြစ်နိုင်ခြေရှိသော သက်ရောက်မှုများ
စစ်ဆေးခြင်း
✓ သိသာထင်ရှားမှုရှိမရှိ
✓ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း ဆောင်ရွက်ရန် လိုအပ်ခြင်းရှိ/မရှိ
✓ သတ်မှတ်ထားသော အထောက်အထားများ ပြုစုတင်ပြရန်လိုအပ်ခြင်းရှိ/မရှိ
ဆောင်ရွက်သည့်အဖွဲ့အစည်း - E Guard Environmental Services Co., Ltd.
စိစစ်ခွင့်ပြုမည့်အဖွဲ့အစည်း - သယံဇာတနှင့်သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာန၊ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန
လိုက်နာရမည့်ဥပဒေ၊ နည်းဥပဒေနှင့် စည်းမျဉ်းစည်းကမ်းများ
ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော် ဖွဲ့စည်းပုံအခြေခံဥပဒေ (၂၀၀၈)
ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဥပဒေ၊ နည်းဥပဒေနှင့် စည်းမျဉ်းစည်းကမ်းများ၊
ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း၊
အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များ
3


ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်ရေးဆွဲခြင်း၏
eguard
ရည်ရွယ်ချက်များ
■ စီမံကိန်းဆောင်ရွက်မှုများကြောင့် ဖြစ်ပေါ်လာနိုင်သော သက်ရောက်မှုများကို ဆန်းစစ်လေ့လာခြင်း
■ ဆိုးသောသက်ရောက်မှုများကိုလျှော့ချပေးနိုင်မည့်နည်းလမ်းများအား အကြံပြုတင်ပြခြင်း
■ ပတ်ဝန်းကျင်စောင့်ကြပ်ကြည့်ရှုမှု အစီအစဉ်များနှင့် အခြားအစီအစဉ်များအား ကြိုတင်ပြင်ဆင်ပြီး အကောင်အထည်ဖော်ဆောင်ရွက်ခြင်း
အများပြည်သူသဘောထားရယူခြင်း၏ရည်ရွယ်ချက်များ
■ ဖြစ်ပေါ်လာနိုင်သည့် ကောင်းကျိုး၊ ဆိုးကျိုးများကိုတင်ပြခြင်း
■ ပါဝင်ပတ်သက်သူများ၏ အမြင်နှင့်အကြံပြုချက်များ၊ ထိခိုက်သက်ရောက်လာနိုင်မှုများကို လျှော့ချပေးနိုင်မည့်အစီအစဉ်များ၊ စောင့်ကြပ်ကြည့်ရှုမှုအစီအစဉ်များတွင် ထည့်သွင်းစဉ်းစားပေးခြင်း
■ စီမံကိန်းတည်ဆောက်ခြင်းနှင့် လုပ်ငန်းလည်ပတ်ခြင်း၏ ပွင့်လင်းမြင်သာမှုနှင့်တာဝန်ယူနိုင်မှု တိုးတက်စေခြင်း
■ အငြင်းပွားမှုများလျှော့ချခြင်းနှင့် စီမံကိန်းအကောင်အထည်ဖော်ရာတွင် ချောမွေ့မှုရှိစေရန် ဆောင်ရွက်ခြင်း

• ကောင်းသောသက်ရောက်မှုများ

• ဆိုးသောသက်ရောက်မှုများ

ကောင်းသောသက်ရောက်မှုများ

- တည်ဆောက်သည့်ကာလ
- အလုပ်အကိုင်အခွင့်အလမ်းများဖန်တီးပေးနိုင်ခြင်း
- စီးပွားရေးအခွင့်အလမ်းများဖန်တီးပေးနိုင်ခြင်း

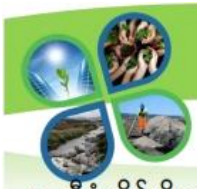
- လုပ်ငန်းလည်ပတ်သည့်ကာလ
- အလုပ်အကိုင်အခွင့်အလမ်းများဖန်တီးပေးနိုင်ခြင်း
- ပြန်လည်ပြည့်ဖြိုးမြဲစွမ်းအင်မှလျှပ်စစ်ဓာတ်အားထုတ်လုပ်ခြင်း
- ဖန်လုံအိမ်ဓာတ်ငွေ့ထုတ်လုပ်မှုလျော့ချနိုင်ခြင်း
- နိုင်ငံတော်၏စီးပွားရေးဖွံ့ဖြိုးတိုးတက်ခြင်း

- စီမံကိန်းဖျက်သိမ်းသည့်ကာလ
- အလုပ်အကိုင်အခွင့်အလမ်းများဖန်တီးပေးနိုင်ခြင်း
- စီးပွားရေးအခွင့်အလမ်းများဖန်တီးပေးနိုင်ခြင်း
- ဖျက်သိမ်းပြီးလျှပ်စစ်ပစ္စည်းများအားပြန်လည်အသုံးပြုနိုင်ခြင်း

ဆိုးသောသက်ရောက်မှုများ

- တည်ဆောက်သည့်ကာလ/ လုပ်ငန်းလည်ပတ်သည့်ကာလ/ စီမံကိန်းဖျက်သိမ်းသည့်ကာလ

- လေအရည်အသွေး
- ရေအရည်အသွေး
- မြေအရည်အသွေး
- ဆူညံသံနှင့်တုန်ခါမှု
- ဧဝမျိုးစုံမျိုးကွဲများအပေါ်သက်ရောက်မှု
- လုပ်ငန်းခွင်ကျန်းမာရေးနှင့်ဘေးအန္တရာယ်ကင်းရှင်းရေး
- ရပ်ရွာလူထုကျန်းမာရေးနှင့်ဘေးအန္တရာယ်ကင်းရှင်းရေး
- အစိုင်အခဲစွန့်ပစ်ပစ္စည်းထွက်ရှိမှု
- စွန့်ပစ်ရေထွက်ရှိမှု
- အန္တရာယ်ရှိစွန့်ပစ်ပစ္စည်းထွက်ရှိမှု



လျော့ချရန်နည်းလမ်းများ

- စီမံကိန်းရှိလမ်းများအား ရေဖြန်းခြင်း၊ လမ်းခင်းခြင်း
- လုပ်ငန်းသုံးယာဉ်များအား စနစ်တကျမောင်းနှင်စေခြင်းနှင့် ပုံမှန်ပြုပြင် ထိန်းသိမ်း ခြင်း
- ညအချိန်တွင် ဆူညံသံနှင့်တုန်ခါမှုများသော စီမံကိန်းလုပ်ငန်းများ ဆောင်ရွက်ခြင်း အားရှောင်ရှားခြင်း
- ဆိုလာပြားများ၊ အင်ဗာတာများ၊ ထရန်စဖော်မာများအား စနစ်တကျတပ်ဆင်၊ ပြုပြင်ထိန်းသိမ်း၊ ဖြုတ်သိမ်းခြင်း
- ဓာတ်အားလိုင်းသွယ်တန်းရာတွင်စနစ်တကျဆောင်ရွက်ခြင်း
- ရေဆိုးသန့်စင်စက်တပ်ဆင်ခြင်းနှင့် ရေမြောင်းများစနစ်တကျဖောက်လုပ်ခြင်း
- လုပ်သားများအား လုပ်ငန်းခွင်ကာကွယ်ရေးပစ္စည်းများအသုံးပြုစေခြင်း၊ အမှန်တကယ် အသုံးပြုမပြုစစ်ဆေးခြင်း။

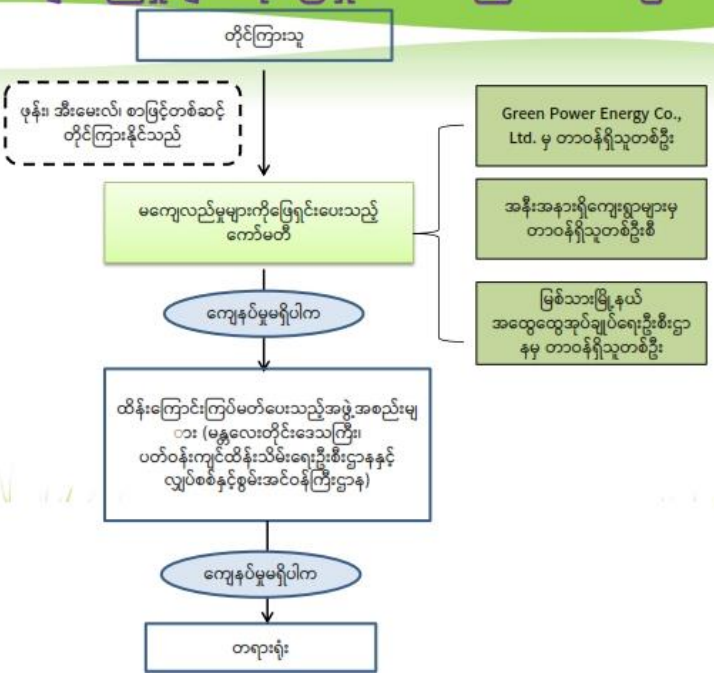
လျော့ချရန်နည်းလမ်းများ

- ရုပ်ရှာလူထုအား ဆူညံသံနှင့်တုန်ခါမှုမြင့်မားသော လုပ်ငန်းများဆောင်ရွက်ပါက ကြိုတင်အသိပေးခြင်း
- စီမံကိန်းခြံစည်းရိုးနှင့် ဓာတ်အားလိုင်းများတွင် သတိပေးဆိုင်းဘုတ်များ တပ်ဆင်ခြင်း
- စီမံကိန်းအတွင်းလုံလောက်သောအိမ်သာများ၊ လက်ဆေးကန်များထားပေးခြင်း
- မီးသတ်ဆေးဗူးများ၊ မီးသတ်ပိုက်များ၊ မီးသတ်ရေကန်များတပ်ဆင်ထားရှိခြင်း
- အရေးပေါ်ဆက်သွယ်ရန်ဖုန်းနံပါတ်များအား မြင်သာသည့်နေရာတွင်ထားရှိခြင်း
- အစိုင်အခဲစွန့်ပစ်ပစ္စည်းများနှင့် အန္တရာယ်ရှိစွန့်ပစ်ပစ္စည်းများအား မြို့နယ် စည်ပင်သာယာရေးကော်မတီရေးနှင့် ချိတ်ဆက်စွန့်ပစ်ခြင်း
- ကိုဗစ်-၁၉ ရောဂါကာကွယ်ရန် သက်ဆိုင်ရာမှ ချမှတ်ထားသော လမ်းညွှန်ချက်များ အား လုပ်သားများကို အတိအကျလိုက်နာစေခြင်း

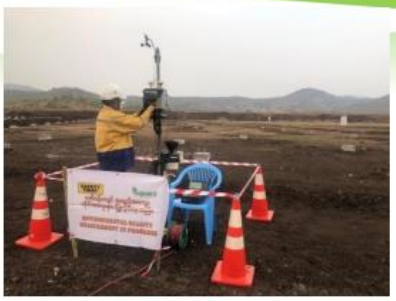
အခြားအစီအစဉ်များ

- ပတ်ဝန်းကျင်စောင့်ကြပ်ကြည့်ရှုမှုအစီအစဉ် (ဖြလတစ်ကြိမ်)
  - လေအရည်အသွေး
  - ရေအရည်အသွေး
  - ဆူညံသံပမာဏ
- မီးဘေးအန္တရာယ်ကင်းရှင်းရေးအစီအစဉ်
- အရေးပေါ်ကိစ္စရပ်များအတွက်ကြိုတင်ပြင်ဆင်မှုနှင့်တုန့်ပြန်မှုအစီအစဉ်
- လုပ်ငန်းခွင်ကျန်းမာရေးနှင့်ဘေးအန္တရာယ်ကင်းရှင်းရေးအစီအစဉ်
- လူမှုစီးပွားတာဝန်ယူမှုအစီအစဉ်
- မကျေလည်မှုများကိုဖြေရှင်းပေးမည့်အစီအစဉ်

မကျေလည်မှုများကိုဖြေရှင်းပေးမည့်အစီအစဉ်



ပတ်ဝန်းကျင်အရည်အသွေးတိုင်းတာမှုများ



လေအရည်အသွေးတိုင်းတာခြင်း

ဆူညံသံပမာဏတိုင်းတာခြင်း

ဤတွင် Scan ဖတ်၍ Power Point File အားဖတ်ရှုနိုင်ပါသည်။

(8) Water Quality Laboratory Results

ISO TECH LABORATORY

Laboratory Technical Consultant: U Saw Christopher Maung
B.Sc Engg: (Civil), Dip S.E(Delft) Lecturer of YIT (Retd), Consultant (Y.C.D.C), LWSE 001
Former Member (UNICEF, Water quality monitoring & Surveillance Myanmar)

WTL-RE-001
Issue Date - 01-1-2016
Effective Date - 01-1-2016
Issue No - 1.0/Page 1 of 1

M0622 007

WATER QUALITY TEST (MICROBIOLOGY) RESULTS FORM

Client	Myanmar Shwe Kyin Solar Power Plant Project
Nature of Water	Ground Water
Location	Shwe Kyin Township, Bago Region.
Date and Time of collection	2.6.2022
Date and Time of arrival at Laboratory	3.6.2022
Date and Time of commencing examination	3.6.2022
Date and Time of completing	4.6.2022

Results of Water Analysis			WHO Drinking Water Guideline (Geneva - 1993)
Total Coliform Count	8	CFU/100ml	Not detected
Thermotolerant (fecal) Coliform Count	Not detected (<1)	CFU/100ml	Not detected
pH	7.3		6.5 - 8.5
Turbidity	13	NTU	5 NTU
Colour (True)	5	TCU	15 TCU
Free Chlorine	Nil	mg/l	
Total Chlorine	Nil	mg/l	

Remark : Unsatisfactory for drinking purpose.

: This certificate is issued only for the receipt of the test sample.

: < - Less than

Tested by

Signature:

Name: Zaw Hein
B.Sc (Chemistry)
Sr.Chemist
ISO Tech Laboratory

Approved by

Signature:

Name: Soe Thit
B.E (Civil) 1980,
Technical Officer
ISO TECH Laboratory

(a division of WEG Co.,Ltd.)

No.18. Lanthit Road, Nanthargone Quarter, Insein Township, Yangon, Myanmar.
Ph: 01-640955, 09-880100172, 09-880100173, 01-644506, E-mail: isotechlaboratory@gmail.com, Website: weg-myanmar.com

ISO TECH LABORATORY

Laboratory Technical Consultant: U Saw Christopher Maung
B.Sc Engg: (Civil), Dip S.E(Delft) Lecturer of YIT (Retd). Consultant (Y.C.D.C), LWSE 001
Former Member (UNICEF, Water quality monitoring & Surveillance Myanmar)

WTL-RE-001
Issue Date - 01-12-2012
Effective Date - 01-12-2012
Issue No - 1.0/Page 2 of 2

W0622 073

WATER QUALITY TEST RESULTS FORM

Client	Myanmar Shwe Kyin Solar Power Plant Project
Nature of Water	Ground Water
Location	Shwe Kyin Township, Bago Region.
Date and Time of collection	2.6.2022
Date and Time of arrival at Laboratory	3.6.2022
Date and Time of commencing examination	4.6.2022
Date and Time of completing	9.6.2022

Results of Water Analysis

			WHO Drinking Water Guideline (Geneva - 1993)
Temperature (°C)		°C	
Fluoride (F)		mg/l	1.5 mg/l
Lead (as Pb)		mg/l	0.01 mg/l
Arsenic (As)		mg/l	0.01 mg/l
Nitrate ($N.NO_3$)		mg/l	50 mg/l
Chlorine (Residual)		mg/l	
Ammonia Nitrogen (NH_3)		mg/l	
Ammonium Nitrogen (NH_4)		mg/l	
Dissolved Oxygen (DO)	5.6	mg/l	
Chemical Oxygen Demand (COD)	32	mg/l	
Biochemical Oxygen Demand (BOD) (5 days at 20 °C)	4	mg/l	
Cyanide (CN)		mg/l	0.07 mg/l
Zinc (Zn)		mg/l	3 mg/l
Copper (Cu)		mg/l	2 mg/l
Silica (SiO_2)		mg/l	

Remark: This certificate is issued only for the receipt of the test sample.

Tested by
Signature:
Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr.Chemist
ISO Tech Laboratory

Approved by
Signature:
Name: Soe Thit
B.E (Civil) 1980,
Technical Officer
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WTL-RE-001
Issue Date - 01-12-2012
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Issue No - 1.0/Page 1 of 2

W0622 073

WATER QUALITY TEST RESULTS FORM

Client	Myanmar Shwe Kyin Solar Power Plant Project
Nature of Water	Ground Water
Location	Shwe Kyin Township, Bago Region.
Date and Time of collection	2.6.2022
Date and Time of arrival at Laboratory	3.6.2022
Date and Time of commencing examination	4.6.2022
Date and Time of completing	9.6.2022

Results of Water Analysis			WHO Drinking Water Guideline (Geneva - 1993)
pH	7.3		6.5 - 8.5
Colour (True)		TCU	15 TCU
Turbidity	13	NTU	5 NTU
Conductivity	146	micro S/cm	
Total Hardness		mg/l as $CaCO_3$	500 mg/l as $CaCO_3$
Calcium Hardness		mg/l as $CaCO_3$	
Magnesium Hardness		mg/l as $CaCO_3$	
Total Alkalinity		mg/l as $CaCO_3$	
Phenolphthalein Alkalinity		mg/l as $CaCO_3$	
Carbonate ($CaCO_3$)		mg/l as $CaCO_3$	
Bicarbonate (HCO_3)		mg/l as $CaCO_3$	
Iron		mg/l	0.3 mg/l
Chloride (as CL)		mg/l	250 mg/l
Sodium Chloride (as NaCL)		mg/l	
Sulphate (as SO_4)		mg/l	500 mg/l
Total Solids		mg/l	1500 mg/l
Total Suspended Solids	20	mg/l	
Total Dissolved Solids	73	mg/l	1000 mg/l
Manganese		mg/l	0.05 mg/l
Phosphate		mg/l	
Phenolphthalein Acidity		mg/l	
Methyl Orange Acidity		mg/l	
Salinity	0.1	ppt	

Remark: This certificate is issued only for the receipt of the test sample.

Tested by
Signature:
Name: Zaw Hein Oo
B.Sc (Chemistry)
Sr.Chemist
ISO Tech Laboratory

Approved by
Signature:
Name: Soe Thit
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SGS

ORIGINAL

Report No. : 22520-00067
Job Ref. : 5000134
Date : 08-Jun-22
Page 1 of 2

TEST REPORT

CLIENT NAME : E GUARD ENVIRONMENTAL SERVICES COMPANY LIMITED

ADDRESS : NO.145,(A2-A3), THIRI MINGALAR STREET, 8 MILE, PYAY ROAD, MAYANGONE TOWNSHIP, YANGON

The following sample was submitted and identified by client and analysed at our lab with the following results.

Sample Description : Myanmar Shwekyin Solar Power Project (Ground Water)

Sampling Date & Time : 02-Jun-22 & 11:00

Sample Condition : Glass and Plastic Bottle at Chilled

Lab Code : W-069

Date Sample(s) Received : 03-Jun-22

Testing Period : 03-Jun-22 TO 07-Jun-22

No.	Test Items	Methods	Results	Units
1	Potassium	APHA 3500-K B (Flame Photometric Method) (23rd Edition)	1.30	mg/L
2	Nitrogen(Kjeldahl)	APHA 4500-NorgB (Macro Kjeldahl Method) (23rd Edition) (In-house Method)	<1	mg/L
3	Phosphorus	APHA 4500-P E (Ascorbic Acid Method) (23rd Edition)	0.028	mg/L

********** End of Report **********

M.C.Z

SGS (MYANMAR) LIMITED Oil, Gas & Chemicals

SGS

Report No. : 22520-00067
Job Ref. : 5000134
Date : 08-Jun-22
Page 2 of 2

TEST REPORT

CLIENT NAME : E GUARD ENVIRONMENTAL SERVICES COMPANY LIMITED

ADDRESS : NO.145,(A2-A3), THIRI MINGALAR STREET, 8 MILE, PYAY ROAD, MAYANGONE TOWNSHIP, YANGON

The following sample was submitted and identified by client and analysed at our lab with the following results.

Sample Description : Myanmar Shwekyin Solar Power Project (Ground Water)
Sampling Date & Time : 02-Jun-22 & 11:00

Sample Condition : Glass and Plastic Bottle at Chilled

Lab Code : W-069

Date Sample(s) Received : 03-Jun-22

Testing Period : 03-Jun-22 TO 07-Jun-22

No.	Test Items	Methods	Results	Units
4	Oil & Grease	APHA 5520 B (Partition-Gravimetric Method) (23rd Edition)	<5	mg/L
5	Chromium	APHA 3030 &3111B (Direct Air Acetylene Flame Method) (23rd Edition)	<0.1	mg/L

********** End of Report **********

M.C.Z

SGS (Myanmar) Limited
(Thin Thin Maw)
Laboratory Manager

(9) Equipment and Materials Supply (Offshore Portion) for the Project

MYANMAR SHWEKYIN SOLAR POWER COMPANY LIMITED
EQUIPMENT AND MATERIAL SUPPLY (OFFSHORE) PORTION

ITEM M/L	HS CODE	NAME & SPECIFICATION	Unit	Qty	Estimated Price USD	Origin of Country	Preliminary Shipping Plan	Remark
1	8541.4022.00	PV module	U	128106	17449030	China		
2	7308.9099.00	PV support bracket	kg	1632000	2695429	China		
3	8504.4040.00	String inverters	U	250	998071	China		
4	8504.3429.00	Packaged Transformer	U	12	1230358	China		
5	8537.1092.00	Communications cabinets (Including switch, anti PID control device, data management device, etc)	KG	3600	82945	China		
6	8544.4929.00	PV cable (including accessories)	KG	30000	1296819	China		
7	8544.6012.00	Power cable (including accessories)	KG	162600	477362	China		
8	8544.6012.00	Control cable (including accessories)	KG	4800	463235	China		
9	8504.2329.00	Main transformer(including Accessories)	U	1	447657	China		
10	8535.9010.00	Neutral point equipment (including neutral isolating switch, current transformer, lightning arrester, etc.)	KG	2400	260457	China		
11	8535.9010.00	230kV line - transformer group interval	KG	72000	333724	China		

12	8535.9010.00	230kV outdoor equipment (230kV lightning arrester, attached discharge recorder, outdoor voltage transformer)	KG	14400	61224	China		
13	8537.1099.00	Distribution Equipment	KG	9600	306310	China		
14	8543.7090.00	Reactive power compensation device	U	3	351016	China		
15	8504.2192.00	Station service electricity equipment	U	10	146861	China		
16	9015.8090.00	environmental monitoring instrument	U	2	32512	China		
17	8507.2099.00	Valve-controlled sealed lead-acid battery	U	3	28547	China		
18	9030.3390.00	Fault recording cabinet	U	2	18691	China		
19	8543.7090.00	Supervisory system	U	6	472668	China		
20	8535.9090.00	Protection system	KG	4800	279696	China		
21	8517.6230.00	Communication system	U	6	308693	China		
22	8504.4011.00	DC and uninterruptible power supply system	U	6	91977	China		
23	9015.8090.00	Power prediction system equipment	U	2	34134	China		
24	8415.1010.00	Heating and ventilation system equipment	U	3	54569	China		
25	8424.1090.00	Fire fighting equipment	U	3	77070	China		

26	8531.1020.00	Fire alarm system	U	3	134428	China		
27	8421.2122.00	sewage treatment equipment	U	2	89143	China		
28	8517.6230.00	Meeting system	U	24	276486	China		
29	8517.6230.00	Internet equipment	U	24	276486	China		
30	8537.2090.00	step-up substation equipment	KG	50000	344193	China		
31	3917.3999.00	Carbon threaded pipe	kg	7200	7740	China		
32		Hot-dip Galvanized steel pipe				China		
32.1	7306.3099.00	Hot-dip Galvanized steel pipe	kg	24000	19628	China		
32.2	7308.9099.00	Hot-dip Galvanized pipe pile	kg	96000	176653	China		
33	3816.0090.00	Cable Fire Retardant Coating	kg	2400	7588	China		
34	8544.4299.00	Panel ground wire	kg	960	6791	China		
35	3918.9019.00	Anti-static computer room floor	kg	7200	91348	China		
36	7228.7090.00	Galvanized Angle steel	kg	28800	48944	China		
37	3816.0090.00	Fire blocking material	kg	2400	9371	China		

38	3208.9090.00	Antirust paint	kg	36	303	China		
39	8535.4000.00	Framing lightning rod	kg	12000	31398	China		
40	8413.8119.00	Water supply and drainage equipment	U	2	25016	China		
41	8537.1099.00	Lighting distribution box	kg	960	7497	China		
42	8544.1900.00	Electric wire	kg	540	4999	China		
43	8502.2010.00	Diesel generator	U	2	53799	China		
44		230kV transmission line				China		
44.1	7318.1590.00	Anchor bolt	kg	30000	93564	China		
44.2	7308.2019.00	Transmission line tower	kg	1008000	1715333	China		
44.3	7614.1090.00	Steel core aluminum stranded wire	kg	48000	779697	China		
44.4	8538.9019.00	Connector clamp for transmission lines	kg	9600	218315	China		
44.5	8546.1000.00	Line insulator	kg	60000	311878	China		
Total					**32,729,653**			

(10) Equipment and Material Supply (Onshore Portion) for the Project

Shwekyin Power Plan Equipment and Material Supply (Onshore Supply) Portion						
ITEM M/L	NAME & SPECIFICATION	Qty	Unit	Estamated Price USD	Origin of Country	Remark
1	borehole pump	1	Unit	15245		
2	Electric shrinkage gate	1	Unit	19402		
3	crawl	1	Unit	386664		
4	Sand & stone&brick&concrete , etc	1	Unit	1540528		
5	Pile foundation reinforcement	1	Unit	372528		
6	concrete iron	1	Unit	65830		
7	Hot galvanized steel pipe	1	Unit	152448		
8	Ground flat steel	1	Unit	215506		
9	light distribution box	1	Unit	55436	Myanmar	
10	diesel generator	1	Unit	187095		
11	wire	1	Unit	41577		
12	Supply and drainage equipment	1	Unit	159378		
13	PVC PIPE	1	Unit	27759		
14	portable dwellings	1	Unit	138589		
15	Temporary facilities	1	Unit	179011		
16	Epidemic prevention materials	1	Unit	138691		
17	Other sporadic materials	1	Unit	346813		
				4,042,500		