Disclaimer

This EMP report has been prepared by third party; E Guard Environmental Services Co., Ltd. for 20 MW Ground Mounted Solar Power Plant Project Connected to Taungdawgwin Substation, proposed by Green Power Energy Co., Ltd, which is formed by Gold Energy Co., Ltd. The project is located at Taysoe Village Tract, Myitthar Township, Kyaukse District, Mandalay Region, Myanmar. The report preparation was done inside the framework of Myanmar EIA Procedure (2015).

The analysis works had been done based on the provided data of the proposed plan of project from the project proponent and onsite observation of environmental parameters guided by Myanmar Government Environmental Authority, Environmental Conservation Department, hereinafter ECD.

The impact assessment and mitigation measures are prepared based on the facts and figures of detail plan/ process of the project obtained from the project proponent.

Moreover, this report has been prepared in line with the prevailing active Laws, Rules, Procedure, Guidelines, and Standards etc. of Myanmar legal system.

The drawings, sketches, maps and other illustrative figures in this report are for the demonstrative/ descriptive purposes only and not to be considered as approved boundary nor accepted territory nor recognized properties extend of any kind.

In case of dual or multiple meanings of the wordings, those wordings should be interpreted as relevant meaning to the concerned areas of discussed in this report.

The individual/ personal, organizational and commercial data and information found in this report are included based on the concerned authority's requirement. The privacy and trade secrets concerned are to be addressed to the concerned authority ECD.

Report Review Form

Report Title: Environmental Management Plan (EMP) Report For 20 MW Ground Mounted Solar Power Plant Project Connected to Taungdawgwin Substation
Report Version: Version 00

Proponent:	**Prepared by;**
Green Power Energy Co., Ltd. Corner of Pyay Road and Heldan Road, No. (511-B), 5th Floor, Hledan Center, Kamayut Township, Yangon Region, Myanmar. Mobile: +959 444805511, +959 2000950 Email: greenpowerenergycoltd@gmail.com	**E Guard Environmental Services Co., Ltd.** No. (145, A2-3), Thiri Mingalar Street, Ward No. (4), 8th Mile, Mayangone Township, 11062, Yangon Region, Myanmar. Tel: +951 9667757, Fax: +951 9667757 Mobile +959 797005160 Email: info@eguardservices.com

Prepared by: U Aung Si Thu Thein	**Position: Assistant Consultant**
Submitted Date: 18/05/2022	**Signature:**
Checked by: U Aung Myint Myat	**Position: Associate Consultant**
Checked Date: 01/06/2022	**Signature:**
Summary: EMP Report This document presents the EMP report as required for construction and operation of 20 MW Ground Mounted Solar Power Plant Project Connected to Taungdawgwin Substation.	**Approved by:**

Distribution:

- ☐ Internal
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GREEN POWER ENERGY COMPANY LIMITED.
511-B, 5th Floor, Corner of Pyay Road & Hledan Road, Hledan Centre, Kamayut Township, Yangon, Myanmar.
Ph; +95 9 444805511 Email; greenpowerenergycoltd@gmail.com

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

၇၇။ ဧရိယာနိုင်းအဆိုပြုသူသည် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်ကို အပိုဒ် ၆၃(ခ) ပါဝန်ကြီးဌာနက သတ်မှတ်သည့်ပုံစံဖြင့် ဆောက်ပါးချက်အလင်းများ မှန်ကန်ကြောင်း အတည်ပြုဝန်ခံချက်နှင့်အတူ မြန်မာဘာသာဖြင့်ဖြစ်စေ၊ အင်္ဂလိပ်ဘာသာဖြင့်ဖြစ်စေ မြန်မာဘာသာနှင့် အင်္ဂလိပ်ဘာသာဖြင့်ဖြစ်စေ ဦးစီးဌာနသို့တင်ပြရမည်။ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်ကို စာရွက်စာတမ်းအပြည့်အစုံဖြင့်လည်းကောင်း၊ ဒီဂျီတယ်စုဖြင့်လည်းကောင်း ဦးစီးဌာနကသတ်မှတ်သည့် ဝန်ဆောင်ပေးသွင်းစေ၍ ဦးစီးဌာနသို့ တင်သွင်းရမည်-

(က) ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်သည် တိကျမှိုင်မောကြောင်းနှင့် ပြည့်စုံကြောင်း၊

(ခ) ဤလုပ်ထုံးလုပ်နည်းအပါအဝင် သက်ဆိုင်ရာ ဥပဒေများကို တိကျစွာလိုက်နာ၍ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်ကို ရေးဆွဲထားကြောင်း၊

(ဂ) ဧရိယာနိုင်းသည်ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်ပါကတိကဝတ်ပတ်ဝန်းကျင်ထိခိုက်မှုလျော့ချရေးလုပ်ငန်းများနှင့်အစီအစဉ်များကိုအပြည့်အဝအစဉ်အမြဲလိုက်နာဆောင်ရွက်မည်ဖြစ်ကြောင်း။

With regards to the above matter, we, Green Power Energy Co., Ltd. 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 Plans (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.

Yours Sincerely,

(Zaw Win)
Managing Director
Green Power Energy Co., Ltd

GREEN POWER ENERGY CO., LTD.
No. .....
Date .....

E GUARD ENVIRONMENTAL SERVICES
No. 145 (A2-3), Thiri Mingalar Street (သီရိမင်္ဂလာ လမ်းသွယ်),
Ward No. (4), 8 Mile-Pyay Road, Mayangone Township, 11062, Yangon,
the Republic of the Union of Myanmar
Ph: (+95) 1 9667757, (+95) 9 797005151
www.eguardservices.com; info@eguardservices.com

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 regard to the above matter, we, E Guard Environmental Services Co., Ltd. has prepared the Environmental Management Plan (EMP) Report for 20 MW Ground Mounted Solar Power Plant Project Connected to Taungdawgwin Substation, proposed by Green Power Energy 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

Environmental Management Plan (EMP) Report for

20 MW Ground Mounted Solar Power Plant Project Connected to Taungdawgwin Substation

Proposed by;

Green Power Energy Co., Ltd.

Prepared by;

E Guard Environmental Services Co., Ltd.

June, 2022

Contents

List of Tables

List of Figures

List of Abbreviations

%	: Percentage
µg/m^3	: Micro Gram per Cubic meter
BOD	: Biochemical Oxygen Demand
CO	: Carbon Monoxide
CO_2	: Carbon Dioxide
COD	: Chemical Oxygen Demand
CSR	: Corporate Social Responsibility
dB (A)	: Decibel unit
ECD	: Environmental Conservation Department
EMoP	: Environmental Monitoring Plan
EMP	: Environmental Management Plan
EPGE	: Electric Power Generation Enterprise
HSE	: Health, Safety and Environment
km	: Kilometer
kV	: Kilovolt
kWh	: Kilo Watt Hour
mg/l	: Milligram per Liter
MOEE	: Ministry of Electricity and Energy
MONREC	: Ministry of Natural Resources and Environmental Conservation
MWh	: Mega Watt Hour
NO_2	: Nitrogen Dioxide
ºC	: Degrees Celsius
pH	: Pond us Hydrogenium
PM	: Particulate Matter
ppm	: Part Per Million
PV	: Photovoltaic
SO_2	: Sulfur Dioxide
TSP	: Total Suspended Particulates
WHO	: World Health Organization

အစီရင်ခံစာအကျဉ်းချုပ်

ဤပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်သည် Gold Energy Co., Ltd. အမည်ဖြင့် လျှပ်စစ်ဓာတ်အား ထုတ်လုပ်ရေးလုပ်ငန်းမှ ခေါ်ယူသောတင်ဒါအမှတ် RFP EPGE PV 02/2021-2022 အား ဝင်ရောက်ယှဉ်ပြိုင်အောင်မြင်ခဲ့ပြီး စီမံကိန်းအား အဆင်ပြေချောမွေ့စွာတည်ဆောက်ပြီး လုပ်ငန်းလည်ပတ်နိုင်ရန်အတွက် အသစ်ဖွဲ့စည်းလိုက်သည့် Green Power Energy Co., Ltd. မှ အကောင်အထည်ဖော် ဆောင်ရွက်နေသည့် တောင်တော်ကွင်းဓာတ်အားခွဲရုံနှင့်ချိတ်ဆက်၍ လျှပ်စစ်ဓာတ်အား ဖြန့်ဖြူးမည့် ၂၀ မဂ္ဂါဝပ် နေရောင်ခြည်စွမ်းအင်သုံး လျှပ်စစ်ဓာတ်အား ထုတ်လုပ်ခြင်းစီမံကိန်းအတွက် E Guard Environmental Services Co., Ltd. မှတာဝန်ယူ ပြင်ဆင်ရေးဆွဲထားခြင်းဖြစ်သည်။ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန၏ သဘောထား မှတ်ချက်များအရ အဆိုပြုစီမံကိန်းသည် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်တင်ပြရန် လိုအပ်ပြီး E Guard Environmental Services Co., Ltd. သည် အဆိုပြုစီမံကိန်းအတွက် အစီရင်ခံစာ ပြင်ဆင်ရေးဆွဲကာ ပတ်ဝန်းကျင်ဆိုင်ရာ လေ့လာမှုများပြုလုပ်ခဲ့သည်။ ဤအစီရင်ခံစာတွင် လေ့လာမှုများသည် နေရောင်ခြည်စွမ်းအင်သုံးလျှပ်စစ်ဓာတ်အား ထုတ်လုပ်ခြင်းစီမံကိန်း တည်ဆောက်ခြင်းနှင့် ဓာတ်အားဖြန့်ဖြူးရန် ကောင်းကင်ဓာတ်အားလိုင်းသွယ်တန်းခြင်း၊ စီမံကိန်းမှ နေရောင်ခြည်စွမ်းအင် အသုံးပြု၍ လျှပ်စစ်ဓာတ်အားထုတ်လုပ်ခြင်းနှင့် တောင်တော်ကွင်းဓာတ်အားခွဲရုံသို့ ၃၃ ကေဗွီ ကောင်းကင်ဓာတ်အားလိုင်းဖြင့် လျှပ်စစ်ဓာတ်အားဖြန့်ဖြူးခြင်း လုပ်ငန်းများအတွက် ပြုလုပ်ခဲ့ခြင်း ဖြစ်သည်။ လေ့လာမှုနယ်ပယ်အား စီမံကိန်းဇုံမှ ၁ ကီလိုမီတာ အချင်းဝက်ရှိသောဧရိယာ အတွင်းအဖြစ် သတ်မှတ်လေ့လာခဲ့ခြင်းဖြစ်ပြီး ထိုဧရိယာသည် စီမံကိန်းကြောင့်ဖြစ်ပေါ်လာနိုင်သည့် ပတ်ဝန်းကျင်နှင့် လူမှုစီးပွားဆိုင်ရာသက်ရောက်မှုများအတွက် လုံလောက်မှုရှိသည်။

အဆိုပြုစီမံကိန်းသည် တောစိုးကျေးရွာအုပ်စု၊ မြစ်သားမြို့နယ်၊ ကျောက်ဆည်ခရိုင်၊ မန္တလေးတိုင်းဒေသကြီး၊ မြန်မာနိုင်ငံတွင်တည်ရှိသည်။ စီမံကိန်း၏ တည်နေရာမှာ မြောက်လတ္တီကျူ ၂၁ ဒီဂရီ ၂၆ မိနစ် ၃၁.၆၂ စက္ကန့်နှင့် အရှေ့လောင်ဂျီကျူ ၉၆ ဒီဂရီ ၁၇ မိနစ် ၁၀.၆၃ စက္ကန့်ဖြစ်ကာ ပင်လယ်ရေမျက်နှာပြင်အမြင့် ၀ မီတာတွင်တည်ရှိသည်။ အဆိုပြုစီမံကိန်း၏ တည်ဆောက်ခြင်း လုပ်ငန်းများတွင် box transformer များ၊ string inverter များ၊ ဆိုလာပြားများ တပ်ဆင်ရန် ဒေါက်တိုင်များ တပ်ဆင်ခြင်း၊ solar power station တည်ဆောက်ခြင်း၊ ဘက်စုံသုံးအဆောက်အဦ၊ ဝန်ထမ်းအဆောင်များ၊ အစည်းအဝေးခန်းမ၊ မီးဖိုဆောင်၊ ထမင်းစားဆောင်များတည်ဆောက်ခြင်း၊ လျှပ်စစ်ဓာတ်အား ထုတ်လုပ်ရန်နှင့် ဖြန့်ဖြူးရန် စက်ကိရိယာများ တပ်ဆင်ခြင်းနှင့် လျှပ်စစ်ဓာတ်အားဖြန့်ဖြူးရန် ၃၃ ကေဗွီ ကောင်းကင်ဓာတ်အား လိုင်းသွယ်တန်းခြင်း လုပ်ငန်းများ

ပါဝင်သည်။ အဆိုပြုစီမံကိန်း၏ ပြန်လှန်လျှပ်စီး စွမ်းရည်မှာ ၂၀.၁၅ မဂ္ဂါဝပ်ဖြစ်ပြီး တိုက်ရိုက်လျှပ်စီး စွမ်းရည်မှာ ၂၂.၈၃၈ မဂ္ဂါဝပ်ဖြစ်ကာ box-type transformer ၄ လုံးဖြင့် လျှပ်စစ်ဓာတ်အား ထုတ်လုပ်သွားမည်ဖြစ်သည်။ စီမံကိန်းအဆိုပြုသူသည် စီမံကိန်းအတွက် မြေနေရာအား ပိုင်ဆိုင်ထားပြီး စီမံကိန်းအတွက် စုစုပေါင်းမြေဧရိယာ ဧက ၂၀၀ (၈၀.၉၄ ဟက်တာ) လိုအပ်သည်။ မြေနေရာနှင့်ပတ်သက်၍ မိခင်ကုမ္ပဏီဖြစ်သော အေးရှားဝေါလ်ကုမ္ပဏီပိုင် ယာမြေဧရိယာ (၂၀၀) ဧကကို Gold Energy Co., Ltd. သို့ စီမံကိန်းအား အကောင်အထည်ဖော်ဆောင်ရွက်ရန် အသုံးပြုခွင့်ပေးထားပြီး ညီနောင်ကုမ္ပဏီအချင်းချင်းလွှဲပြောင်း အသုံးပြုခြင်းဖြစ်၍ Gold Energy Co., Ltd. ပိုင်အနေဖြင့် အသုံးပြုသွားမည်ဖြစ်သည်။ စီမံကိန်းအဆိုပြုသူသည် စီမံကိန်းတွင် ဆိုလာပြား ၄၅၉၈၀ ခု၊ string inverter ၉၁ လုံး၊ box-type transformer ၄ လုံး၊ ဆိုလာပြားများ တပ်ဆင်ရန်ဒေါက်တိုင် ၆၀၅ ခုအား နေရောင်ခြည်စွမ်းအင်မှ လျှပ်စစ်ဓာတ်အားထုတ်လုပ်ရန် တပ်ဆင်သွားမည်ဖြစ်သည်။ တည်ဆောက်ခြင်း လုပ်ငန်းများအား မတ်လ ၂၀၂၂ ခုနှစ်တွင် စတင်ခဲ့ပြီး ဩဂုတ်လ ၂၀၂၂ တွင် ပြီးဆုံးမည်ဖြစ်ကာ ဆောင်ရွက်ရန် ၆ လ ကြာမြင့်မည်ဖြစ်သည်။ ***(အသေးစိတ်အား အခန်း ၂ တွင် ဖတ်ရှုပါရန်)***

အဆိုပြုစီမံကိန်းအား Asia World Group of Companies ၏ အဖွဲ့ဝင်ကုမ္ပဏီတစ်ခုဖြစ်သော Gold Energy Co., Ltd. ၏ လက်အောက်ခံကုမ္ပဏီဖြစ်သည့် Green Power Energy Co., Ltd. မှ အကောင်အထည်ဖော်ဆောင်ရွက်မည်ဖြစ်သည်။ တည်ဆောက်ခြင်း လုပ်ငန်းများပြီးစီးပါက အဆိုပြုစီမံကိန်းသည် နေရောင်ခြည်စွမ်းအင်ကိုအသုံးပြု၍ လျှပ်စစ်ဓာတ်အား ထုတ်လုပ်မည်ဖြစ်ပြီး တောင်တော်ကွင်းဓာတ်အားခွဲရုံသို့ ၃၃ ကေဗွီ ကောင်းကင်ဓာတ်အားလိုင်းဖြင့် လျှပ်စစ်ဓာတ်အား ဖြန့်ဖြူးသွားမည်ဖြစ်ကာ လုပ်ငန်းလည်ပတ်ရန် ကာလမှာ နှစ် ၂၀ ဖြစ်သည်။ အဆိုပြုစီမံကိန်းသည် Build, Own and Operate (BOO) စနစ်ကို အခြေခံဆောင်ရွက်သောကြောင့် နှစ် ၂၀ ပြီးဆုံးပါက စီမံကိန်းအကောင်အထည်ဖော်သူသည် လုပ်ငန်းလည်ပတ်ရန်ကာလအား သက်ဆိုင်ရာထံတွင် သက်တမ်းတိုးမြှင့်ပြီး စီမံကိန်းလုပ်ငန်းများ ဆက်လက်ဆောင်ရွက် သွားမည်ဖြစ်သည်။ စီမံကိန်း အကောင်အထည်ဖော်သူ၏ ဒါရိုက်တာအဖွဲ့ဝင်များနှင့် ဖွဲ့စည်းပုံများ၊ အဆိုပြုစီမံကိန်း၏ ဖွဲ့စည်းပုံနှင့် ရင်းနှီးမြှုပ်နှံမှုအစီအစဉ်များအား ဖော်ပြထားသည်။ ***(အသေးစိတ်အား အခန်း ၃ တွင် ဖတ်ရှုပါရန်)***

ဤပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ် ပြင်ဆင်ရာတွင် ပါဝင်သော ကျွမ်းကျင်ပညာရှင်များနှင့် ၎င်းတို့၏ တာဝန်များနှင့်ကျွမ်းကျင်မှုများအား ***အခန်း ၄*** တွင် ဖော်ပြထားသည်။ အဆိုပြုစီမံကိန်း တည်ဆောက်ခြင်းနှင့် လုပ်ငန်းလည်ပတ်ခြင်းတို့တွင် ပတ်ဝန်းကျင်အား ထိခိုက်မှု ကာကွယ်ရန်

လိုက်နာရမည့် နိုင်ငံတော်၏တည်ဆဲဥပဒေနှင့် စည်းမျဉ်းစည်းကမ်းများအား ဖော်ပြထားသည်။ ***(အသေးစိတ်အား အခန်း ၅ တွင် ဖတ်ရှုပါရန်)***

လက်ရှိစီမံကိန်းအခြေအနေကို ကွင်းဆင်းလေ့လာခြင်းနှင့် ယခင်လေ့လာပြီးသော အချက်အလက်များအား မှီငြမ်းလေ့လာခြင်းသည် ပတ်ဝန်းကျင်ထိခိုက်မှုများ ဆန်းစစ်ခြင်းအတွက် အလွန်အရေးပါသည်။ ထို့ကြောင့် လက်ရှိစီမံကိန်း၏ ပတ်ဝန်းကျင်ဆိုင်ရာအခြေအနေများအား ကွင်းဆင်းလေ့လာခြင်းသည် ပတ်ဝန်းကျင်ဆိုင်ရာ လေ့လာမှုများပြုလုပ်ရာတွင် အရေးပါသော နေရာတွင်ပါဝင်သည်။ ထို့ကြောင့် E Guard Environmental Services Co., Ltd. သည် စီမံကိန်း၏ လေအရည်အသွေး၊ ရေအရည်အသွေးနှင့် ဆူညံသံပမာဏတို့အား ၂၀၂၂ ခုနှစ်၊ မတ်လ ၂၈ ရက်နှင့် ၂၉ ရက်တို့တွင် ၂၄ နာရီဆက်တိုက် စောင့်ကြပ်ကြည့်ရှုသည့်နည်းဖြင့် တိုင်းတာခဲ့သည်။ တိုင်းတာရရှိသော ရလဒ်များအား အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များနှင့် အခြားသက်ဆိုင်ရာလမ်းညွှန်ချက်များဖြင့် နှိုင်းယှဉ်လေ့လာခဲ့သည်။ လေထုအတွင်း ဓာတ်ငွေ့ပါဝင်မှုရလဒ်များအား နှိုင်းယှဉ်လေ့လာခြင်းအရ ဆာလဖာဒိုင်အောက်ဆိုဒ် (၀.၁၄ $\mu g/m^3$)၊ နိုက်ထရိုဂျင်ဒိုင်အောက်ဆိုဒ် (၂၈.၉၇ $\mu g/m^3$)၊ ကာဗွန်မိုနောက်ဆိုဒ် (၀.၀၁ ppm)နှင့် ကာဗွန်ဒိုင်အောက်ဆိုဒ် (၄၅၁.၇၂ ppm) တို့သည် သက်ဆိုင်ရာ လမ်းညွှန်ချက်တန်ဖိုးများအတွင်း ရှိကြောင်းလေ့လာတွေ့ရှိရသည်။ လေထုအတွင်းအမှုန်ပါဝင်မှုလေ့လာခြင်း ရလဒ်များအရ PM_{10} (၂၅.၁၃ $\mu g/m^3$) နှင့် $PM_{2.5}$ (၁၀.၈၄ $\mu g/m^3$) တို့သည် အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်တန်ဖိုးများအတွင်းရှိကြောင်း လေ့လာတွေ့ရှိရသည်။ မြေအောက်ရေအရည်အသွေးနှင့် မြို့ကြီးဆည်၏မြောင်းအတွင်းမှ မြေပေါ်ရေအရည်အသွေးတို့အား တိုင်းတာရန် ကိရိယာဖြင့်တိုင်းတာခြင်းနှင့် ရေနမူနာကောက်ယူခြင်း တို့ဖြင့်ဆောင်ရွက်ခဲ့သည်။ ရေအရည်အသွေး တိုင်းတာမှုရလဒ်များအရ တိုင်းတာသောမြေအောက်ရေနှင့် မြေပေါ်ရေတို့၏ Parameters အားလုံးသည် အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာအရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်တန်ဖိုးများ အတွင်းရှိပါသည်။ ဆူညံသံပမာဏတိုင်းတာမှုအား နေရာ (၁) နှင့် နေရာ (၂) တို့တွင်တိုင်းတာခဲ့ပြီး နေရာ (၁)တွင် နေ့အချိန်တိုင်းတာရရှိမှု ရလဒ်များ (၅၂.၉၂ dBA) နှင့် ညအချိန်တိုင်းတာရရှိမှု ရလဒ်များ (၄၁.၅၅ dBA) သည် လမ်းညွှန်ချက်တန်ဖိုးများအတွင်း ရှိကြောင်း လေ့လာတွေ့ရှိရသည်။ နေရာ (၂) တွင် နေ့အချိန်တိုင်းတာရရှိမှု ရလဒ်များ (၅၄.၂၂ dBA) နှင့် ညအချိန်တိုင်းတာရရှိမှု ရလဒ်များ (၄၀.၆၄ dBA) သည်လည်း လမ်းညွှန်ချက် တန်ဖိုးများအတွင်း ရှိကြောင်း လေ့လာတွေ့ရှိရသည်။ ထို့ကြောင့် စီမံကိန်းဝန်းကျင် ပတ်ဝန်းကျင်အရည်အသွေး (လေအရည်အသွေး၊ ရေအရည်အသွေးနှင့် ဆူညံသံပမာဏ) များသည် စီမံကိန်းတည်ဆောက်ခြင်းကာလတွင် သက်ဆိုင်ရာ လမ်းညွှန်ချက်တန်ဖိုးများအတွင်းရှိကြောင်း လေ့လာတွေ့ရှိရသည်။

စီမံကိန်းအကောင်အထည်ဖော်သူသည် စီမံကိန်းဝန်းကျင် လက်ရှိပတ်ဝန်းကျင် အရည်အသွေးများအား ရေရှည်ကောင်းမွန်စေရန် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်များနှင့် လျှော့ချရန်နည်းလမ်းများကို မဖြစ်မနေလိုက်နာဆောင်ရွက်ရမည်။ ထို့ပြင် ယခင်လေ့လာပြီးသော အချက်အလက်များဖြစ်သည့် ရာသီဥတုဆိုင်ရာ အချက်အလက်များ၊ စီမံအုပ်ချုပ်မှုဆိုင်ရာ အချက်အလက်များ၊ လူမှုစီးပွားဆိုင်ရာအချက်အလက်များ၊ မြေအသုံးချမှုနှင့် အခြားလေ့လာပြီးသော အချက်အလက်များအား ဤအစီရင်ခံစာတွင် ဖော်ပြထားသည်။ ***(အသေးစိတ်အား အခန်း ၆ တွင် ဖတ်ရှုပါရန်)***

စီမံကိန်းတည်ဆောက်ခြင်းနှင့် လုပ်ငန်းလည်ပတ်ခြင်းတို့ကြောင့် ပတ်ဝန်းကျင်ဆိုင်ရာ အရင်းအမြစ်များ၊ ဂေဟစနစ်များ၊ လူသားများနှင့် စွန့်ပစ်ပစ္စည်းစွန့်ပစ်မှုတို့အပေါ် ထိခိုက်နိုင်သော ဖြစ်နိုင်ခြေရှိသည့် သက်ရောက်မှုများအား ခွဲခြားလေ့လာခဲ့ပြီး ထိုသက်ရောက်မှုများအား International Association for Impact Assessment (IAIA) ၏ သက်ရောက်မှုဆန်းစစ်ခြင်းနည်းလမ်းကို အသုံးပြု၍ဆန်းစစ်ခဲ့သည်။ သက်ရောက်မှုများဆန်းစစ်လေ့လာရာတွင် အဆိုပြု စီမံကိန်းအတွက် တည်ဆောက်ခြင်းကာလနှင့် လုပ်ငန်းလည်ပတ်သည့်ကာလဟူ၍ ကာလနှစ်ခု ခွဲခြားလေ့လာခဲ့သည်။

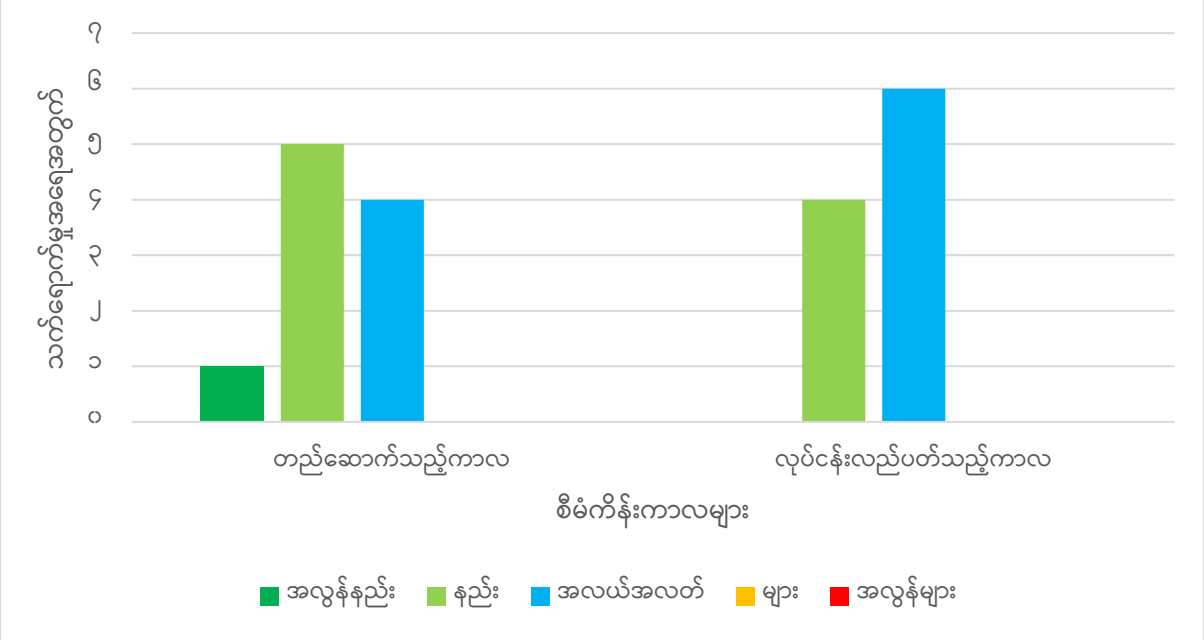
တည်ဆောက်ခြင်းကာလတွင် လျှပ်စစ်ဓာတ်အား စတင်ဖြန့်ဖြူးရန်နေရာနှင့် ဘက်စုံသုံး အဆောက်အဦ၊ ဝန်ထမ်းအဆောင်များ၊ အစည်းအဝေးခန်းမ၊ မီးဖိုဆောင်၊ ထမင်းစားဆောင်များ တည်ဆောက်ခြင်း၊ ဆိုလာပြားများ၊ ဆိုလာပြားများတပ်ဆင်ရန် ဒေါက်တိုင်များ၊ string inverter များ၊ transformer များတပ်ဆင်ခြင်း၊ တောင်တော်ကွင်းဓာတ်အားခွဲရုံသို့ လျှပ်စစ်ဓာတ်အား ဖြန့်ဖြူးရန် ကောင်းကင်ဓာတ်အားလိုင်း၏ ဓာတ်တိုင်များစိုက်ထူခြင်းနှင့် ဓာတ်အားလိုင်းသွယ်တန်းခြင်းတို့ ပါဝင်သည်။ တည်ဆောက်ခြင်းလုပ်ငန်းများအား မတ်လ ၂၀၂၂ ခုနှစ်တွင် စတင်ခဲ့ပြီး ဩဂုတ်လ ၂၀၂၂ တွင် ပြီးဆုံးမည်ဖြစ်ကာ တည်ဆောက်ခြင်းကာလကြာမြင့်ချိန်မှာ ၆ လ ဖြစ်သည်။

လုပ်ငန်းလည်ပတ်သည့်ကာလတွင် နေရောင်ခြည်စွမ်းအင်မှ လျှပ်စစ်ဓာတ်အားထုတ်လုပ်ပြီး တောင်တော်ကွင်းဓာတ်အားခွဲရုံသို့ ၁၀.၁၃၉ ကီလိုမီတာ (၆.၃ မိုင်) အရှည်ရှိသော ၃၃ ကေဗွီ ကောင်းကင်ဓာတ်အားလိုင်းဖြင့် လျှပ်စစ်ဓာတ်အား ဖြန့်ဖြူးခြင်းတို့ ပါဝင်ပြီး လုပ်ငန်းလည်ပတ်သည့် ကာလမှာ နှစ် ၂၀ ဖြစ်သည်။

လုပ်ငန်းဖျက်သိမ်းသည့်ကာလတွင် လုပ်ငန်းလည်ပတ်သည့်ကာလပြီးဆုံးပါက အဆိုပြုစီမံကိန်းသည် Build, Own and Operate (BOO) စနစ်ကိုအခြေခံဆောင်ရွက်သောကြောင့် စီမံကိန်းအကောင်အထည်ဖော်သူအနေဖြင့် လုပ်ငန်းလည်ပတ်ရန်ကာလအား သက်ဆိုင်ရာ၏ခွင့်ပြုချက်ဖြင့် သက်တမ်းတိုးမြှင့်ပြီး နေရောင်ခြည်စွမ်းအင်မှ လျှပ်စစ်ဓာတ်အား ထုတ်လုပ်ခြင်းလုပ်ငန်းများ

ဆက်လက်ဆောင်ရွက်သွားမည်ဖြစ်သည်။ သို့သော် စီမံကိန်းအား အပြီးသတ်ဖျက်သိမ်းမည်ဆိုပါက စီမံကိန်းအကောင်အထည်ဖော်သူသည် လုပ်ငန်းဖျက်သိမ်းမည့်ကာလအတွက် အစီအစဉ်များကို တင်ပြသွားရမည်ဖြစ်သည်။ ထို့ကြောင့် အဆိုပြုစီမံကိန်း၏ လုပ်ငန်းဖျက်သိမ်းသည့်ကာလနှင့် သက်ဆိုင်သော သက်ရောက်မှုများအား ခွဲခြမ်းလေ့လာခြင်း၊ ဆန်းစစ်လေ့လာခြင်းနှင့် မကောင်းသော သက်ရောက်မှုများအား လျှော့ချရန်နည်းလမ်းများ ရေးဆွဲခြင်းတို့အား ဤအစီရင်ခံစာတွင် ထည့်သွင်းထားခြင်းမရှိပါ။

တည်ဆောက်ခြင်းကာလတွင် လေအရည်အသွေးအပေါ် သက်ရောက်မှု၊ မြေအရည်အသွေးအပေါ် သက်ရောက်မှု၊ ဆူညံသံနှင့် တုန်ခါမှုသက်ရောက်မှု နှင့် အစိုင်အခဲစွန့်ပစ်ပစ္စည်းကြောင့် သက်ရောက်မှုများသည် **အလယ်အလတ်အဆင့် သက်ရောက်မှုများ**အဖြစ် ဆန်းစစ်လေ့လာတွေ့ရှိရသည်။ အခြားသက်ရောက်မှုများဖြစ်သည့် ရေအရည်အသွေးအပေါ် သက်ရောက်မှု၊ လုပ်ငန်းခွင်ကျန်းမာရေးနှင့် ဘေးအန္တရာယ်ကင်းရှင်းရေးဆိုင်ရာ သက်ရောက်မှု၊ လူထုကျန်းမာရေးနှင့် ဘေးအန္တရာယ် ကင်းရှင်းရေးဆိုင်ရာ သက်ရောက်မှု၊ မီးဘေးအန္တရာယ်သက်ရောက်မှုနှင့် အန္တရာယ်ရှိ စွန့်ပစ်ပစ္စည်းကြောင့် သက်ရောက်မှုများ သည် **နည်းသည့်အဆင့်သက်ရောက်မှုများ** အဖြစ်တွေ့ရှိရပြီး စွန့်ပစ်ရေကြောင့် သက်ရောက်မှုသည် **အလွန်နည်းသည့်အဆင့် သက်ရောက်မှု**အဖြစ် ဆန်းစစ်တွေ့ရှိရသည်။ **လုပ်ငန်းလည်ပတ်သည့်ကာလ**တွင် ရေအရည်အသွေးအပေါ် သက်ရောက်မှု၊ လုပ်ငန်းခွင်ကျန်းမာရေးနှင့် ဘေးအန္တရာယ်ကင်းရှင်းရေးဆိုင်ရာ သက်ရောက်မှု၊ လူထုကျန်းမာရေးနှင့် ဘေးအန္တရာယ် ကင်းရှင်းရေးဆိုင်ရာ သက်ရောက်မှု၊ မီးဘေးအန္တရာယ်သက်ရောက်မှု၊ စွန့်ပစ်ရေနှင့် အန္တရာယ်ရှိ စွန့်ပစ်ပစ္စည်းကြောင့် သက်ရောက်မှုများသည် **အလယ်အလတ်အဆင့် သက်ရောက်မှုများ**အဖြစ် ဆန်းစစ်တွေ့ရှိရသည်။ အခြားသက်ရောက်မှုများ ဖြစ်သည့် လေအရည်အသွေးအပေါ် သက်ရောက်မှု၊ မြေအရည်အသွေးအပေါ် သက်ရောက်မှု၊ ဆူညံသံသက်ရောက်မှုနှင့် အစိုင်အခဲစွန့်ပစ်ပစ္စည်းကြောင့်သက်ရောက်မှုများသည် **နည်းသည့်အဆင့် သက်ရောက်မှုများ**အဖြစ် ဆန်းစစ်လေ့လာခြင်းရလဒ်များအရ ဆန်းစစ်တွေ့ရှိရသည်။ အောက်ဖော်ပြပါပုံတွင် စီမံကိန်းကြောင့် ဖြစ်ပေါ်လာနိုင်သော မကောင်းသောသက်ရောက်မှုများ၏ အသေးစိတ်အဆင့်များအား ဖော်ပြထားသည်။



မကောင်းသောသက်ရောက်မှုများအား သက်ရောက်မှုလျှော့ချရန်အတွက် လျှော့ချရန်နည်းလမ်းများသည် အရေးကြီးသည်။ ထိုလျှော့ချရန်နည်းလမ်းများအား ဆောင်ရွက်ရန်လိုအပ်သော ဆောင်ရွက်ချက်များနှင့် နည်းပညာများအား သက်ရောက်မှုအမျိုးအစားပေါ် မူတည်ပြီး ဖော်ပြထားသည်။ အဆိုပြုစီမံကိန်းသည် အလုပ်အကိုင်အခွင့်အလမ်းများ ဖန်တီးပေးနိုင်ခြင်း၊ စီးပွားရေးအခွင့်အလမ်းများ ဖန်တီးပေးနိုင်ခြင်း၊ ကာဗွန်ထုတ်လုပ်မှု လျှော့ချခြင်း၊ သယံဇာတများ ထိန်းသိမ်းခြင်းနှင့် ပတ်ဝန်းကျင်နှင့်လိုက်လျောညီထွေသော စီးပွားရေးများ အစပြုနိုင်ခြင်း၊ အခွန်ငွေ ရရှိနိုင်ခြင်း၊ လူမှုစီးပွားတာဝန်ယူမှု အစီအစဉ်များကြောင့် ဒေသတွင်း ဖွံ့ဖြိုးတိုးတက်ခြင်းစသည့် ကောင်းသောသက်ရောက်မှုများကိုလည်း ဖြစ်ပေါ်စေနိုင်သည်။ ***(အသေးစိတ်အား အခန်း ၇ တွင် ဖတ်ရှုပါရန်)***

လျှော့ချရန်နည်းလမ်းများနှင့် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်များအား အကောင်အထည်ဖော် ဆောင်ရွက်ရာတွင် လိုအပ်သော အခြေခံလိုအပ်ချက်များနှင့် တာဝန်ရှိသူများအား ဤအစီရင်ခံစာတွင် ဖော်ပြထားသည်။ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်အား သက်ရောက်မှုများ လေ့လာဆန်းစစ်ချက် များနှင့် သက်ရောက်မှုအဆင့်များကို အခြေခံ၍ စီမံကိန်း၏ တည်ဆောက်ခြင်းကာလနှင့် လုပ်ငန်းလည်ပတ်သည့်ကာလတို့အတွက် ကျန်းမာရေးနှင့် ဘေးအန္တရာယ်ကင်းရှင်းရေး မူဘောင်များ နှင့် ရေးဆွဲထားခြင်းဖြစ်သည်။ စီမံကိန်းအကောင်အထည်ဖော်သူသည် အဆိုပြုစီမံကိန်းအား အောက်ဖော်ပြပါအစီအစဉ်များ ပါဝင်သော ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအစဉ်နှင့်အညီ အကောင် အထည်ဖော်ဆောင်ရွက်ရမည်။

- ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်
- ပတ်ဝန်းကျင်စောင့်ကြပ်ကြည့်ရှုမှုအစီအစဉ်

- လူမှုစီးပွားတာဝန်ယူမှုအစီအစဉ်
- မီးဘေးအန္တရာယ်ကင်းရှင်းရေးအစီအစဉ်
- အရေးပေါ်ကိစ္စများအတွက်တုံ့ပြန်ရေးနှင့် ကြိုတင်ပြင်ဆင်ရေးအစီအစဉ်
- မကျေလည်မှုများကိုဖြေရှင်းပေးမည့်အစီအစဉ်

ထို့အပြင် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်နှင့် ပတ်ဝန်းကျင်စောင့်ကြပ်ကြည့်ရှုမှု အစီအစဉ်များ ဆောင်ရွက်ရန် ခန့်မှန်းကုန်ကျစရိတ်ကိုလည်း ထည့်သွင်းဖော်ပြထားသည်။ ပတ်ဝန်းကျင် စီမံခန့်ခွဲမှုအစီအစဉ်သည် စီမံကိန်း၏မကောင်းသောသက်ရောက်မှုများ၊ သက်ရောက်မှုရင်းမြစ်များ၊ လျှော့ချရန်နည်းလမ်းများ၊ ကျန်ရှိသောသက်ရောက်မှုများနှင့် တာဝန်ယူဆောင်ရွက်မည့်ပုဂ္ဂိုလ်တို့အား တည်ဆောက်ခြင်းကာလနှင့် လုပ်ငန်းလည်ပတ်သည့်ကာလတို့အတွက် ဖော်ပြထားခြင်းဖြစ်သည်။ ပတ်ဝန်းကျင်စောင့်ကြပ်ကြည့်ရှုမှု အစီအစဉ်သည် လေနှင့်ရေအရည်အသွေး၊ ဆူညံသံပမာဏ၊ စွန့်ပစ်ပစ္စည်းထွက်ရှိမှုနှင့် ပတ်ဝန်းကျင်ဆိုင်ရာစစ်ဆေးခြင်းများအား စောင့်ကြပ်ကြည့်ရှုရန်အမျိုးအစား၊ အကြိမ်အရေအတွက်နှင့် တာဝန်ယူဆောင်ရွက်မည့် ပုဂ္ဂိုလ်တို့အား ဖော်ပြထားခြင်းဖြစ်သည်။ လူမှုစီးပွားတာဝန်ယူမှုအစီအစဉ်သည် ဒေသခံပြည်သူ များတွက် ဖွံ့ဖြိုးမှုလုပ်ငန်းများ ဆောင်ရွက်ပေးရန်နှင့် အဆိုပြုစီမံကိန်းသည် စီမံကိန်း အကောင်အထည် ဖော်သူကိုသာမက ဒေသခံပြည်သူများအတွက်လည်း အကျိုးရှိကြောင်း ဖော်ပြရန်ဖြစ်သည်။ မီးဘေးအန္တရာယ် ကင်းရှင်းရေးအစီအစဉ်သည် အဆိုပြုစီမံကိန်း၏ မီးဘေးအန္တရာယ်များ လျှော့ချရန် အတွက် ဖော်ပြထားခြင်းဖြစ်သည်။ အရေးပေါ်ကိစ္စများအတွက် တုံ့ပြန်ရေးနှင့် ကြိုတင်ပြင်ဆင် ရေးအစီအစဉ်သည် အရေးပေါ်ကိစ္စရပ်များဖြစ်ပေါ်ပါက မည်သို့ဆောင်ရွက်ရမည်ကို ဖော်ပြထား ခြင်းဖြစ်သည်။ မကျေလည်မှုများကိုဖြေရှင်းပေးမည့် အစီအစဉ်သည် အဆိုပြုစီမံကိန်းနှင့် ပတ်သက်သော မကျေလည်မှုများကို မည်သို့ဖြေရှင်း ပေးမည်ဖြစ်ကြောင်း ဖော်ပြထားခြင်းဖြစ်သည်။ ***(အသေးစိတ်အား အခန်း ၈ တွင် ဖတ်ရှုပါရန်)***

ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ် ပြင်ဆင်ရေးဆွဲရာတွင် စီမံကိန်းအကြောင်းအရာများကို ရှင်းလင်းတင်ပြခြင်းသည် အရေးကြီးပြီး သက်ဆိုင်သူများ၏ အကြံဉာဏ်နှင့်အမြင်များကို အစီရင်ခံစာတွင် ထည့်သွင်းစဉ်းစားရေးဆွဲရမည်ဖြစ်သည်။ ထို့ကြောင့် အဆိုပြုစီမံကိန်းအတွက် အများပြည်သူသဘောထား ရယူခြင်းအခမ်းအနားကို ၂၀၂၂ ခုနှစ်၊ မတ်လ (၂၉) ရက်နေ့တွင် ရေဆင်းစိုက်ပျိုးရေးတက္ကသိုလ် (ကျောက်ဆည်ကျောင်းခွဲ)၊ တောစိုးကျေးရွာအုပ်စု၊ မြစ်သားမြို့နယ်တွင် ကျင်းပခဲ့သည်။ အခမ်းအနားကို ညနေ ၄ နာရီတွင် စတင်ခဲ့ပြီး ညနေ ၅ နာရီ ၃၀ မိနစ်တွင် ပြီးဆုံးခဲ့သည်။ အများပြည်သူသဘောထား ရယူခြင်းအခမ်းအနား၏ ရည်ရွယ်ချက်မှာ စီမံကိန်းအကြောင်းအရာများ၊ စီမံကိန်းကြောင့်ဖြစ်ပေါ်လာနိုင်သော သက်ရောက်မှုများ၊ လျှော့ချရန်

နည်းလမ်းများဖော်ပြရန်နှင့် ဒေသခံပြည်သူများ၏ အကြံဉာဏ်နှင့်သုံးသပ်ချက်များ ရယူရန်ဖြစ်သည်။ စီမံကိန်းအကောင်အထည်ဖော်သူသည် အခမ်းအနားသို့တက်ရောက်ရန် ဒေသခံပြည်သူများအား ကျေးရွာအုပ်ချုပ်ရေးမှူးများမှ တင်ဆင့်ဖိတ်ကြားခဲ့သည်။ တောစိုးကျေးရွာ၊ အမှတ် (၃) ကျေးရွာနှင့် ပဒုမ္မာကျေးရွာမှ ဒေသခံပြည်သူများ၊ စီမံကိန်းအကောင်အထည်ဖော်သူ၏ ကိုယ်စားလှယ်များနှင့် E Guard Environmental Services Co., Ltd. မှ ကိုယ်စားလှယ်များ ပါဝင်သည့် တက်ရောက်သူ စုစုပေါင်း ၂၇ ယောက် ရှိခဲ့ပြီး အချို့တက်ရောက်သူများသည် သိရှိလိုသည်များကို မေးမြန်းဆွေးနွေးအကြံပြုခဲ့ကြသည်။ စီမံကိန်းဆိုင်ရာ အချက်အလက်များနှင့် ဤပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီရင်ခံစာကို အဆိုပြုစီမံကိန်း၊ စီမံကိန်းအကောင်အထည်ဖော်သူ၏ရုံး၊ E Guard Environmental Services Co., Ltd. ၏ရုံး နှင့် အောက်ပါ website link https://www.mediafire.com/folder/lf3cev20r65jh/Taungdawgwin_20_MW_Ground_Mounted_Solar_Power_Plant_Project_(EMP) တွင် အများပြည်သူများနှင့် စီမံကိန်းနှင့် သက်ဆိုင်သူများ ဖတ်ရှုလေ့လာနိုင်ရန် ဖော်ပြထားပါသည်။ ***(အသေးစိတ်အား အခန်း ၉ တွင် ဖတ်ရှုပါရန်)***

နိဂုံးချုပ်အားဖြင့် အဆိုပြုစီမံကိန်းသည် အလုပ်အကိုင်အခွင့်အလမ်းများ ဖန်တီးပေးနိုင်ခြင်း၊ စီးပွားရေးအခွင့်အလမ်းများ ဖန်တီးပေးနိုင်ခြင်း၊ ကာဗွန်ထုတ်လုပ်မှု လျှော့ချခြင်း၊ သယံဇာတများထိန်းသိမ်းခြင်းနှင့် ပတ်ဝန်းကျင်နှင့်လိုက်လျောညီထွေသော စီးပွားရေးများ အစပြုနိုင်ခြင်း၊ အခွန်ငွေရရှိနိုင်ခြင်း၊ လူမှုစီးပွားတာဝန်ယူမှု အစီအစဉ်များကြောင့် ဒေသတွင်း ဖွံ့ဖြိုးတိုးတက်ခြင်းစသည့် ကောင်းသောသက်ရောက်မှုများကို ဖြစ်ပေါ်စေသည်။ တည်ဆောက်ခြင်းကာလနှင့် လုပ်ငန်းလည်ပတ်သည့်ကာလ တို့တွင် ဖြစ်ပေါ်နိုင်သော မကောင်းသောသက်ရောက်မှုများကိုလည်း လျှော့ချရန်နည်းလမ်းများနှင့် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှု အစီအစဉ်များကို အသုံးပြု၍ လျှော့ချနိုင်သည်။ ပတ်ဝန်းကျင်စောင့်ကြပ်ကြည့်ရှုမှု အစီအစဉ်အား စီမံကိန်းပတ်ဝန်းကျင် အရည်အသွေးများအား စောင့်ကြပ်ကြည့်ရှုရန် အကောင်အထည်ဖော် ဆောင်ရွက်ရမည်။ စီမံကိန်းအကောင်အထည်ဖော်သူသည် ဤအစီရင်ခံစာအား ပတ်ဝန်းကျင် ထိန်းသိမ်းရေးဦးစီးဌာနမှ စိစစ်သုံးသပ်ပြီးပါက ပေးပို့လာမည့် သဘောထားမှတ်ချက်များ နှင့် အကြံပြုချက်များကို လိုက်နာရမည်။ ဤအစီရင်ခံစာကို သက်ဆိုင်ရာမှ အတည်ပြုပြီးပါက စီမံကိန်းအကောင်အထည်ဖော်သူမှ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်များအား အကောင်အထည်ဖော် ဆောင်ရွက်ခြင်းသည် စီမံကိန်းအား ပတ်ဝန်းကျင်အပေါ်ထိခိုက်မှု အနည်းဆုံးဖြစ်အောင် ဆောင်ရွက်ခြင်းအတွက် အလွန်အရေးပါသည်။ စီမံကိန်းအကောင်အထည်ဖော်သူသည် ပြည်ထောင်စုသမ္မတ မြန်မာနိုင်ငံတော်၏ ပတ်ဝန်းကျင်ဆိုင်ရာတည်ဆဲ ဥပဒေ၊ နည်းဥပဒေ၊ မူဝါဒများနှင့် လမ်းညွှန်ချက်များကို စီမံကိန်းလည်ပတ်စဉ်ကာလတစ်လျှောက်လုံး လိုက်နာ ဆောင်ရွက်ရမည်ဖြစ်သည်။ ***(အသေးစိတ်အား အခန်း ၁၀ တွင် ဖတ်ရှုပါရန်)***

1. Executive Summary

This Environmental Management Plan (EMP) report is prepared by E Guard Environmental Services Co., Ltd. for 20 MW ground mounted solar power plant project connected to Taungdawgwin Substation, proposed by Green Power Energy Co., Ltd, which is formed by Gold Energy Co., Ltd. for successful construction and operation of the project. Gold Energy Co., Ltd. achieved Tender No. RFP EPGE PV 02/2021-2022, invited for bid by the Electric Power Generation Enterprise (EPGE) for the project. According to the instructions 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 Taungdawgwin Substation with 33 kV overhead transmission line. The scope of the study area for the proposed project is roughly defined to be the area within 1 km radius from the center of the project and this area would be large enough to cover for most environmental and socio-economic impacts of the project.

The proposed project is located at Taysoe Village Tract, Myitthar Township, Kyaukse District, Mandalay Region, Myanmar. Its coordinate points are 21° 26' 31.62" N, 96° 17' 10.63" E and the average altitude of the site is 0 m. The construction of the proposed project includes box transformers, string inverters, supporting brackets, construction of solar power station, multiple-use building, staff quarters, briefing hall, kitchen, dining hall and outdoor equipment foundation construction as well as construction and stringing of 33 kV overhead transmission line. The total capacity of capacity of AC side of the proposed project is 20.15 MW and DC side is 22.838 MW, including four photovoltaic power generation units. The project proponent possesses the land slot to construct the solar power plant and total land requirement for the project is 200 acres (80.94 hectares). The land (dry land area of 200 acres) is owned by Asia World Co., Ltd. and transfer to execute the proposed project to Gold Energy Co., Ltd., which is the mother company of Green Power Energy Co., Ltd. The proposed project will install 45,980 PV modules, 91 string inverters, 4 box-type transformers and 605 horizontal single-axis tracking brackets to generate electricity from solar energy and construction phase of the project will take six months, which started in March, 2022 and will be finished in August, 2022. ***(See details in Chapter 2).***

The project is proposed by Green Power Energy Co., Ltd., which is the subsidiaries of the Gold Energy Co., Ltd., one of the Asia World Group of Companies. After construction period, the proposed project will generate electricity from solar energy and distribute to the Taungdawgwin Substation via 33 kV overhead transmission line and proposed operation period is 20 years. As the proposed project is of a Build, Own and Operate (BOO) basis, project proponent will submit the application to the relevant authorities to extend the operation period and continue operation activities after 20 years. List of directors and organization chart of the project proponent, organizational structure and detail investment plan of the proposed project are also described. ***(See details in Chapter 3).***

The responsible persons of 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 compiled and presented. ***(See details in Chapter 5).***

Primary data and secondary data collections are very important to assess 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 at project site on 28th and 29th March, 2022 (24 hours continuous monitoring system). The observed values are compared with National Emissions Quality (Emission) Guidelines and other guideline values. According to the comparison results of gaseous emissions, the observed values of SO_2 (0.14 µg/m^3), NO_2 (28.97 µg/m^3), CO (0.01 ppm) and CO_2 (451.72 ppm) are lower than the respective guideline values. For dust emissions, the observed values of PM_{10} (25.13 µg/m^3) and $PM_{2.5}$ (10.84 µg/m^3) are also within the guideline values of NEQEG. The existing groundwater quality and surface water quality of Myo Gyi Dam Channel were measured by two methods: on-site measurement and sampling water. All of the parameters are within the reference values of NEQEG for not only groundwater but also surface water. For noise level, monitoring was done at two points: Point 1 and Point 2, results of Point 1 are lower than standard value not only at day time (52.92 dBA) but also at night time (41.55 dBA). For Point 2, the results are also lower than standard value not only at day time (54.22 dBA) but also at night time (40.64 dBA). Therefore, it can be considered that the baseline environmental quality (air quality, water quality and noise level) at the proposed project are within the respective guideline values during construction phase of the project. The project proponent must follow EMPs and mitigation measures in order to sustain baseline environmental quality of the project. In addition, secondary data like climate data, administrative structure, socio-economic data, land use and other secondary data are described in this report. ***(See details in Chapter 6).***

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 for Impact Assessment (IAIA)'s impact assessment methodology. Potential impacts for the proposed projects are differentiated into two main phases namely; Construction phase and Operation phase.

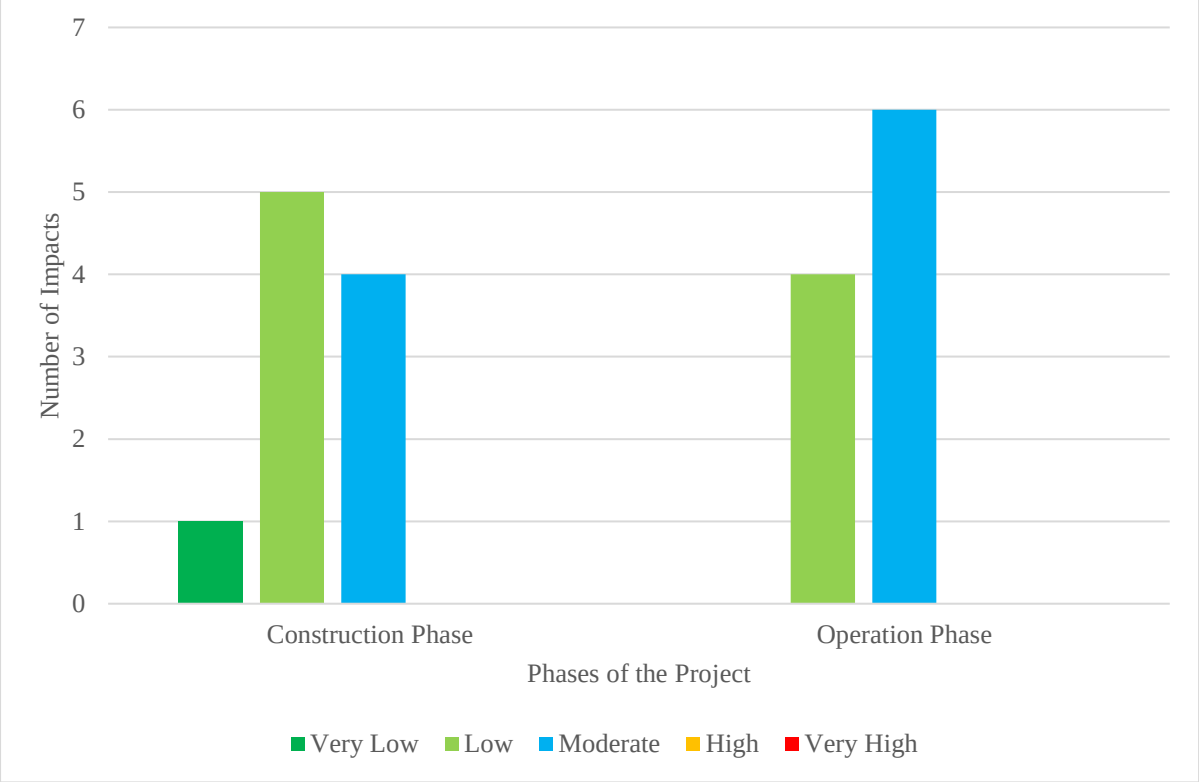
Construction Phase: includes construction of switchyard and multiple-use building, staff quarter, briefing room, dining room and kitchen, installation of PV modules, tracking brackets, inverters, transformers, poles of overhead transmission line and stringing cables of overhead transmission line, which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

Operation Phase: includes electric power generation from solar energy and distributing to the Taungdawgwin Substation through 33 kV overhead transmission line, which length is almost 10.139 km (6.3 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 as per Build, Own, Operate (BOO) basis. 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.

During the ***construction phase***, impacts on air, soil, noise and vibration impacts and solid waste generation impacts are assessed as **Moderate Impacts** and other impacts such as impacts on water, occupational health and safety, community health and safety, fire hazards impacts and hazardous waste generation impacts are categorized as **Low Impacts** as well as liquid waste generation impact is considered as **Very Low Impact** as per the results of assessments. During the ***operation phase***, impacts on water, occupational health and safety, community health and safety, fire hazard impacts, liquid waste generation and hazardous waste generation impacts are assessed as **Moderate Impacts** and other impacts like impacts on air, soil, noise impacts and solid waste generation impacts are categorized as **Low Impacts** according to the results of assessments. The following figure illustrates detail impact significances of potential adverse impacts of the proposed project.



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, carbon emission reduction, resources conservation and green economy, revenue to government and CSR development. ***(See details in Chapter 7).***

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, waste quantity 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. ***(See details in Chapter 8).***

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 29th March, 2022 at Yezin Agricultural University (Kyaukse Branch), Taysoe Village Tract, Myitthar Township. The staring time was 4:00 pm and finished at 5:30 pm. 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. A total of 27 persons including local people from Taysoe Village, No. (3) Village and Padonma 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 EMP report can be accessible via the link of https://www.mediafire.com/folder/lf3cev20r65jh/Taungdawgwin_20_MW_Ground_Mounted_Solar_Power_Plant_Project_(EMP) and at the project site, project proponent's office and E Guard Environmental Service Co., Ltd.'s office for disclosure to public and stakeholders. ***(See details in Chapter 9).***

In conclusion, the proposed project can ensure some positive impacts such as providing job opportunities, business opportunities, carbon emission reduction, resources conservation and green economy, revenue to government and CSR development. 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. ***(See details in Chapter 10).***

2. Project Description

This Environmental Management Plan (EMP) report is prepared by E Guard Environmental Services Co., Ltd. for 20 MW ground mounted solar power plant project connected to Taungdawgwin Substation, proposed by Green Power Energy Co., Ltd, which is formed by Gold Energy Co., Ltd. for successful construction and operation of the project. Gold Energy Co., Ltd. achieved Tender No. RFP EPGE PV 02/2021-2022, invited for bid by the Electric Power Generation Enterprise (EPGE) for the project. The project proponent is the subsidiaries of the Gold Energy Co., Ltd., one of the Asia World Group of Companies and mainly responsible for electric power generation and distribution. The proposed project will contribute to fulfill a goal for achieving nationwide electricity access by 2030 as per Myanmar National Electrification Plan (NEP). Myanmar is one of the lowest rates of electrification country in Southeast Asia, in which almost 61.60% of households in Myanmar have access to electricity as of December, 2021 and electricity consumption per capita is among the lowest in the world, therefore, development of electricity generation projects, especially for electricity generation from renewable energy projects are urgently required in Myanmar. The objective of the project is to generate electricity from solar energy and distribute to Taungdawgwin Substation.

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). The proposed project requires to submit Environmental Management Plan (EMP) report to meet the environmental assessment requirements of the Environmental Policy, Environmental Conservation Law and other environmental related rules and procedures, according to the instructions from Environmental Conservation Department (ECD). Therefore, E Guard Environmental Services Co., Ltd. and Green Power Energy Co., Ltd. agreed 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,
(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 role for the improvement of the social welfare of community as well as development of the region.

2.1 Scope of the Study

The scope of the study for EMP will vary on the scale and type of the development project. In this EMP, construction of solar power plant, overhead transmission line and operation of solar power plant to generate electricity from solar energy and distribute to the Taungdawgwin Substation with 33 kV overhead transmission line are included for the study. This EMP is based on consideration of terrestrial and aquatic resources conservation, pollutant abatement on air quality, water quality and 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 experiences in conducting assessments on environmental concerns for various kinds of development projects in Myanmar.

A study team from E Guard Environmental Services conducted site survey on 28th and 29th March, 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 made based on those collected data for the current and future conditions. In this EMP report, recommended mitigation measures and monitoring plans were also included to mitigate adverse environmental impacts due to the activities of the proposed project during construction and operation phase. It is estimated that there will be not much significant impacts on the environmental and socio-economic environment due to implementation of the proposed project because the proposed project will utilize renewable energy to generate electricity and distributing to Taungdawgwin Substation. Therefore, the scope of the study area for the proposed project is roughly defined to be the area within 1 km radius from the center of the project and this area would be considered sufficient to cover for most environmental and socio-economic impacts of the project. Within this defined area, available secondary information and primary information collected from site survey were used for the consideration of impacts and if any other anticipated impacts occur, this study area is not limited and beyond the scope of study area will be considered. The following figure illustrates the scope of the study area for the proposed project.

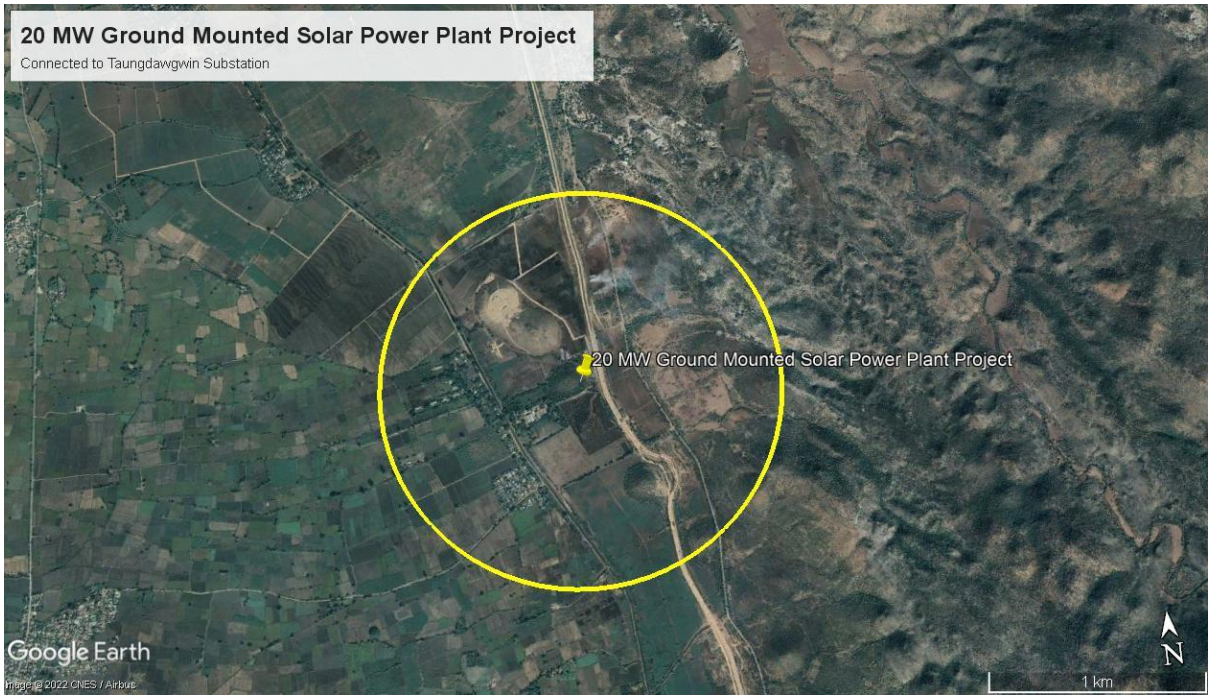


Figure 2. 1 Scope of the Study Area

2.2 Project Size and Location of the Project

The proposed project is located at Taysoe Village Tract, Myitthar Township, Kyaukse District, Mandalay Region, Myanmar. Its coordinate points are 21° 26' 31.62" N, 96° 17' 10.63" E and the average altitude of the site is 0 m. The construction of the proposed project includes box transformers, string inverters, supporting brackets, construction of solar power station, multiple-use building, staff quarters, briefing hall, kitchen, dining hall and outdoor equipment foundation construction as well as construction and stringing of 33 kV overhead transmission line. The total capacity of capacity of AC side of the proposed project is 20.15 MW and DC side is 22.838 MW, including four photovoltaic power generation units. The photovoltaic power station is connected to the 33 kV bus side of the Taungdawgwin Substation. Total land area of solar power plant is 200 acres (80.94 hectares) and annual total solar radiation level of the project site is huge due to the annual average horizontal global radiation and diffuse radiation of the project (1,786 kWh/m^2 and 823.4 kWh/m^2). The direct radiation amount takes a large proportion of the total radiation and the project site has a good development prospect, where is suitable for the construction of large-scale grid connected PV power station. The following table describes annual total solar radiation level of the project site.

Table 2. 1 Annual Total Solar Radiation Level of the Project Site

Months	Global Horizontal (kWh/m2)	Diffuse Horizontal (kWh/m2)	Ambient Temperature (°C)
January	142.8	42.51	22.88
February	149.1	49.12	26.00
March	168.0	80.10	30.18
April	182.8	83.14	31.93
May	179.2	85.02	32.06

Months	Global Horizontal (kWh/m2)	Diffuse Horizontal (kWh/m2)	Ambient Temperature (°C)
June	150.2	84.99	31.05
July	127.0	86.76	31.37
August	142.0	88.53	30.48
September	145.4	65.92	29.80
October	133.1	68.96	29.23
November	131.0	48.88	26.43
December	135.1	39.48	23.40
Annual Total	**1,786.0**	**823.40**	**28.74**

The following figures illustrate the loaction of the proposed project, layout of PV field and overhead transmission line which will connect to Taungdawgwin Substation.

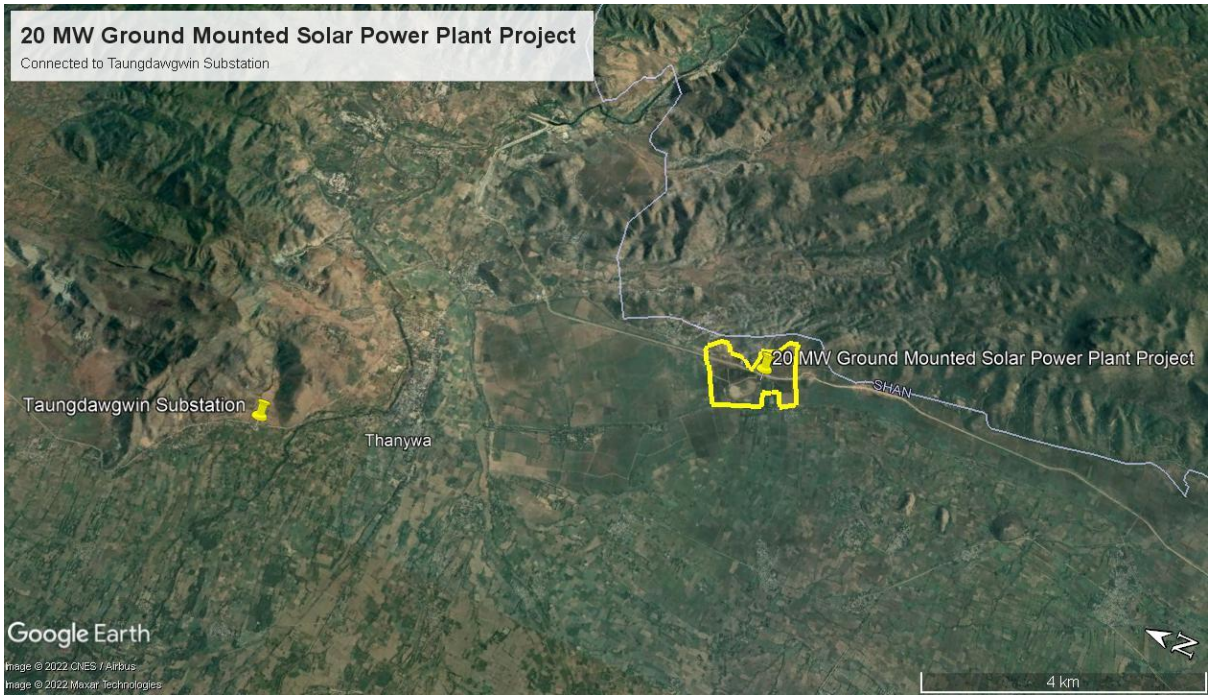


Figure 2. 2 Location of the Project

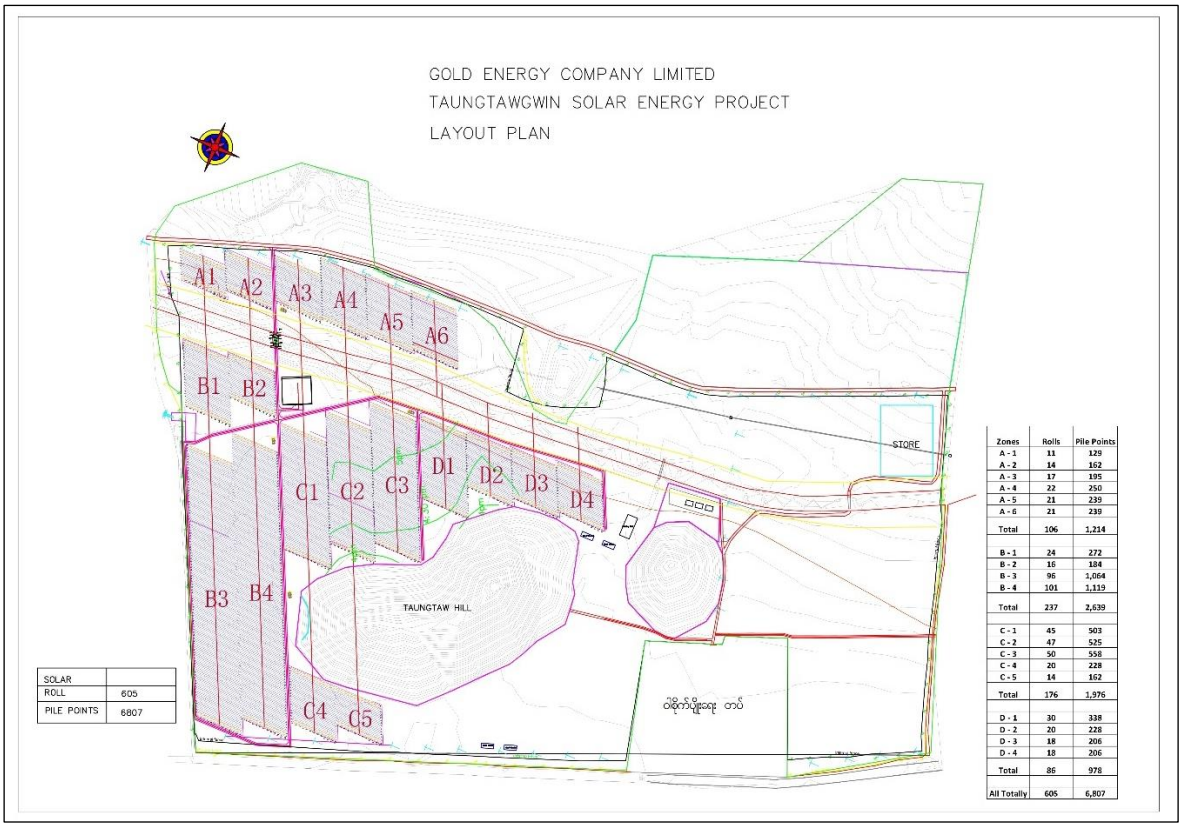


Figure 2. 3 Layout of PV Field

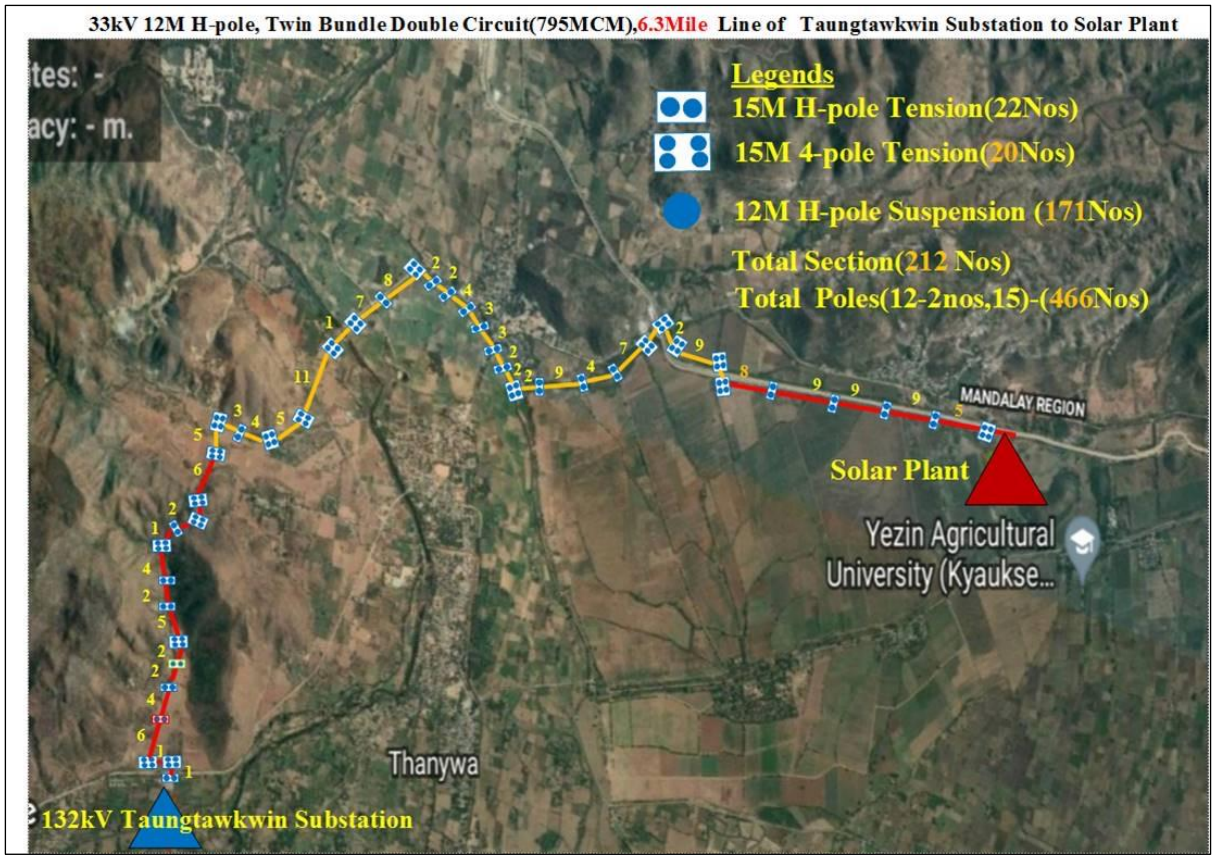


Figure 2. 4 Route of Overhead Transmission Line

2.3 History of Land

The project proponent possesses the land slot to construct the Solar Power Plant and total land requirement for the project is 200 acres (80.94 hectares). The land (dry land area of 200 acres) is owned by Asia World Co., Ltd. and transfer to execute the proposed project to Gold Energy Co., Ltd., which is the mother company of Green Power Energy Co., Ltd. The land of the project is covered with small trees and bushes, which is plainland and unrich biodiversity. However, some hills can also be found in the project site and Myo Gyi Dam Channel passes through the project for agricultural purposes.

2.4 Project Description

2.4.1 PV System Overall Design

The following table describes the overall design of PV system of the proposed project.

Table 2. 2 Overall Design of PV System

No.	Name	Specification	Unit	Number	Remarks
1.	PV module	Bifacial monocrystalline silicon PV module (545 Wp)	Set	45,980	Longi Solar with connector and 1 meter cable, supplied in compete set by PV

No.	Name	Specification	Unit	Number	Remarks
					manufacturer (tentative)
2.	String inverter	24 in and 1 out, 250 kW	Set	91	Sungrow (tentative)
3.	Box-type transformer (double split)	Including step-up box transformer, internal cables, containers, measurement and control cabinets, communication cabinets etc. S11-6300 kVA/ 33 33±8×1.25%/ 0.8/ 0.8 kV D, y11, y11, Ud= 7.5%	Set	3	Oil-immersed
4.	Box-type transformer (double split)	Including step-up box transformer, internal cables, containers, measurement and control cabinets, communication cabinets etc. S11-1250 kVA/ 33 33±8×1.25%/ 0.8 kV D, y11, Ud= 6.5%	Set	1	Oil-immersed
5.	Horizontal single-axis tracking bracket	Size: 66.91m × 4.65 m (Horizontal projection)	Set	605	The spacing between East and West sides of the bracket is generally 9.26 m.

2.4.2 PV Module

The proposed project will use bifacial monocrystalline silicon solar PV modules of 535 Wp peak power. The following table shows the details specification of PV modules.

Table 2. 3 Details Specification of PV Module

Manufacturer	Longi Solar Co., Ltd. in China (tentative)
Electrical performance parameters (STC)	
Peak power (Pmax)	535 Wp
Peak working voltage (Vmpp)	41.5 V
Peak working current (Impp)	12.9 A
Open circuit voltage (Voc)	49.35 V
Short circuit current (Isc)	13.78 A
Component efficiency	20.9%
Standard test conditions (STC)	Solar radiation flux 1,000 W/ m^2, atmospheric parameters 1.5, module temperature 25 °C
Temperature characteristics	
Operating temperature	-40 ~ 85 °C

Temperature coefficient (Pmax)	-0.35% / °C
Temperature coefficient (Voc)	-0.284%/ °C
Temperature coefficient (Isc)	0.05%/ °C
System integration parameters	
System voltage	1,500 V
Fuse rated current	30 A
Physical parameter	
Component size (height/ width/ thickness)	2,256 × 1,133 × 35 mm
Weight	32.3 kg
Cell orientation	144 cells (6 ×24)
Front glass thickness	2.00 mm
Protection level of junction box	IP 68
Photovoltaic technology cable	4.0 mm^2 300/ 300 mm: Wire length can be customized

2.4.3 String Inverter

The proposed project will use string inverter type and the following table shows the details specification of string inverter.

Table 2. 4 Details Specification of String Inverter

Manufacturer	Sungrow Co., Ltd. in China (tentative)
Type	String inverter
Rated AC output power	250 kW
MPPT voltage range	500 V – 1,500 V
AC output rated current	180.4 A
AC output rated voltage	800 V
Grid frequency	50 Hz
Power factor	0.8 (lagging) to 0.8 (leading)

2.4.4 PV Module String Design

The number of PV module components connected in series is determined by the highest input voltage and minimum operating voltage of the inverter and the maximum system voltage allowed by the PV module. According to the calculation, the number of PV strings in series is taken as 29. At the same time, according to the capacity calculation of each power generating unit, each power generation unit contains about 460/92 strings of photovoltaic string modules.

2.4.5 Box-type Transformer Design

The proposed project will use four box-type transformers and the following tables shows the details specification of box-type transformer.

Table 2. 5 Details Specification of Box-type Transformer

Three-phase non-excitation voltage regulation double-split oil-immersed transformer type	
Model	S11-6,300 kVA/ 33/ 0.8-0.8 kV

Rated capacity	6,300 kVA/ 3,150 kVA-3,150kVA
Rated frequency	50 Hz
Rated transformer ratio	33±8×1.25%/ 0.8 kV-0.8 kV
Impedance voltage	~ 7.5%
Cooling method	ONAN
Connection group	D, y11, y11
Enclosure protection class	IP54
Three-phase non-excitation voltage regulation double-winding oil-immersed transformer type	
Model	S11-1,250 kVA/ 33/ 0.8 kV
Rated capacity	1,250 kVA/ 1,250 kVA
Rated frequency	50 Hz
Rated transformer ratio	33±8×1.25%/ 0.8 kV
Impedance voltage	~ 6.5%
Cooling method	ONAN
Connection group	D, y11
Enclosure protection class	IP54

The box transformer foundation adopts cast-in-situ reinforced concrete foundation with oil gathering pits at the bottom, which is based on natural soil bed.

2.4.6 Bracket Type Selection of PV Array

Types of PV module bracket will influence the construction land of solar cell array, it has a large influence over the construction land index and construction scale of the project. Commonly used solar cell module brackets in ground PV power stations are fixed bracket, horizontal single-axis tracking bracket, tilt single-axis tracking bracket and dual axis tracking bracket. Among them, horizontal single-axis tracking bracket is recommended to adopt for the proposed project. It rotates in the east-west direction for ensuring the minimum angle between the sun and the solar cell panel at each moment to obtain large amount of power generation. The tracking range of the support is ± 45° using backtracking technology, no shadow blocking throughout the year, which greatly improves the power generation. Each PV bracket is designed to have 2 rows in the horizontal direction and 58 components in each row, total capacity 62.06 kW, therefore, 116 sets of PV modules are installed on each single bracket and divided into 4 strings. The plane size of each bracket is about 66.91 m × 4.65 m (horizontal projection). The design principle of array spacing design is stated that the solar cell array should not be blocked from 9:00 to 15:00 at the winter solstice. All brackets have an east-west spacing of 9.6 m and south-north spacing of 1.5 m.

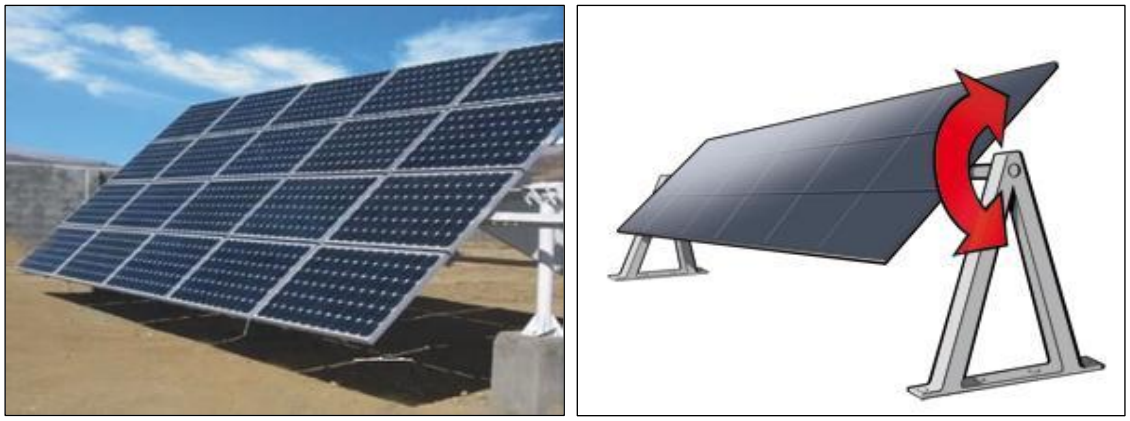


Figure 2. 5 Horizontal Single-axis Bracket Type

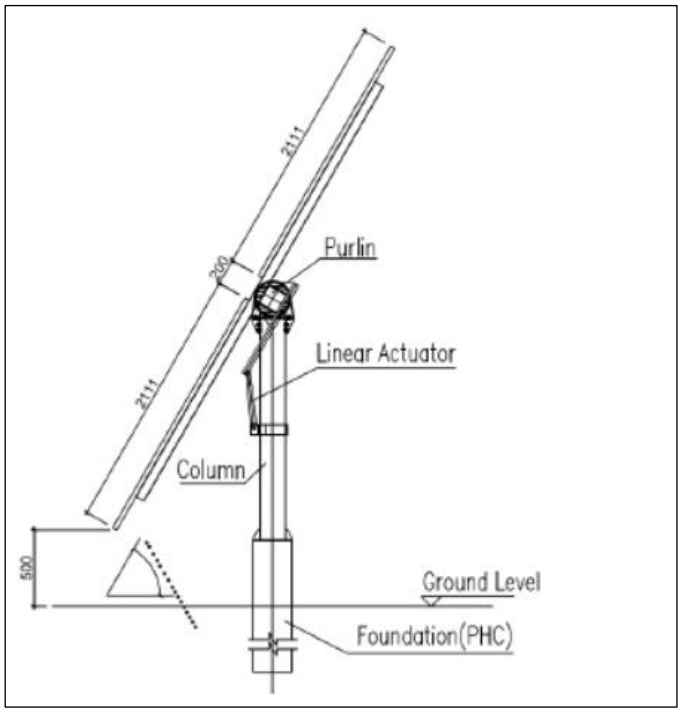


Figure 2. 6 Layout of Horizontal Single-axis Bracket

The PV module assembly bracket foundation can adopt independent foundation, strip foundation or pile foundation. According to the PV modules and site geological conditions, it is tentatively determined as cast-in-place pile. The support members are connected by bolts. The bolt connection can release the stress caused by the deformation of the support and the bolt connection construction and installation are fast and convenient. Cold-formed thin-walled steel, its material should have the quality certificate or inspection report issued by the steel plant, its chemical composition, mechanical properties and other quality requirement must comply with the current national standards. All steel structures should be treated with hot-dip galvanizing.

2.4.7 Switchyard

A new switchyard will also be constructed in the proposed project and a new access road will be built in the switchyard, which will connect the roads in the PV solar power station and the

original roads outside the station. The multiple-use building, station transformer, sewage treatment facilities and cable trench are also included in switchyard. The size multiple-use building is 25 m × 14.6 m, which is a two-storied cast-in-place concrete frame structure with a building area of almost 762 m^2. Floor and roof of multiple-use building are made of cast-in-place reinforced concrete. The restaurant, kitchen, bathroom, bedroom, foyer and laundry room for staffs as well as conference rooms, activity room, secondary equipment room and main control room are included in multiple-use building. The exterior walls thickness is 200 mm and inner wall is 200 mm. All floors are made of 600 × 600 floor tiles (except for special purpose rooms), the secondary equipment room and main control room are made of anti-static flooring. Exterior walls are painted with exterior wall coating and the roof is constructed with flexible waterproof materials.

Air conditioning system will be installed in the office, conference room, bedroom, exhibition room, reading room, dining room, secondary equipment room and main control room to meet the indoor temperature and humidity requirements. The 33 kV switch room uses a natural air supply and mechanical exhaust scheme. The outdoor air enters the room through double-layered rainproof aluminum shutters on the outer wall and is discharged to the outside by an exhaust fan installed on the outer wall. The axial flow fan is linked with the fire alarm signal. When the fire occurs, the fan is automatically power off to prevent the fire from spreading. The following figures show the layout of switchyard, multiple-use building's first floor plan and second floor plan.

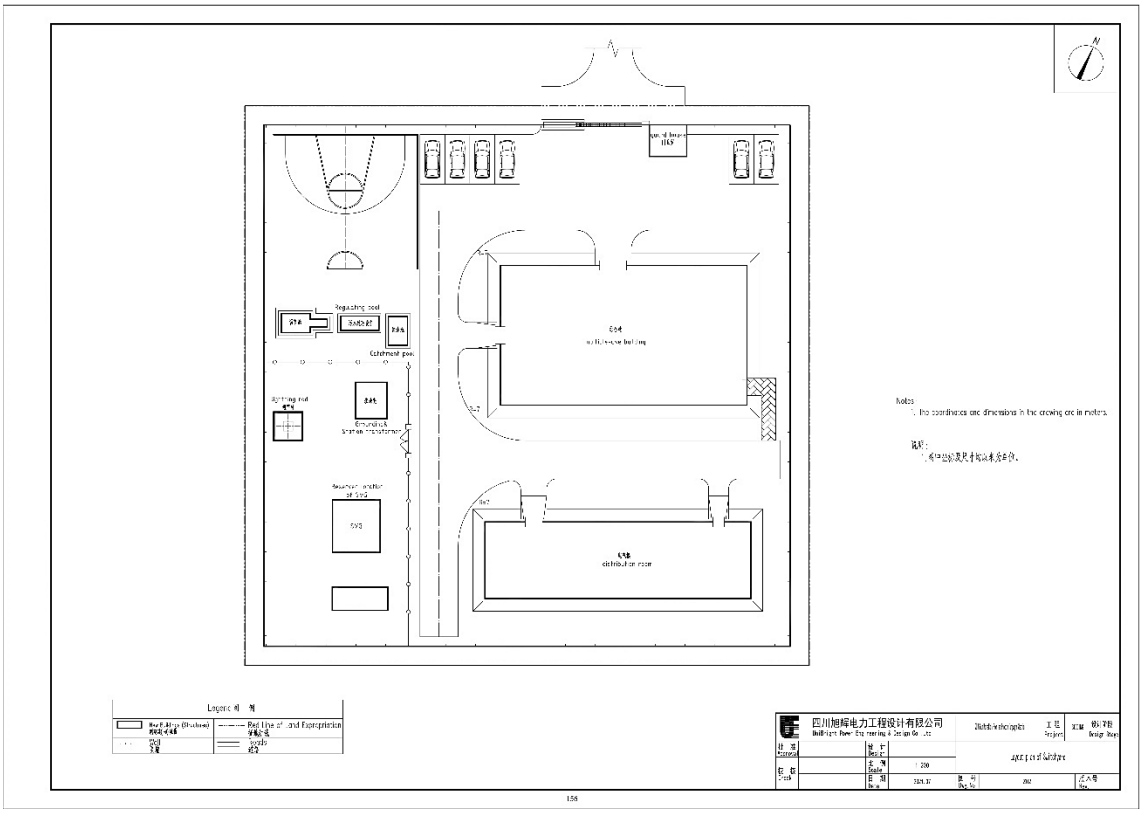


Figure 2. 7 Layout of Switchyard

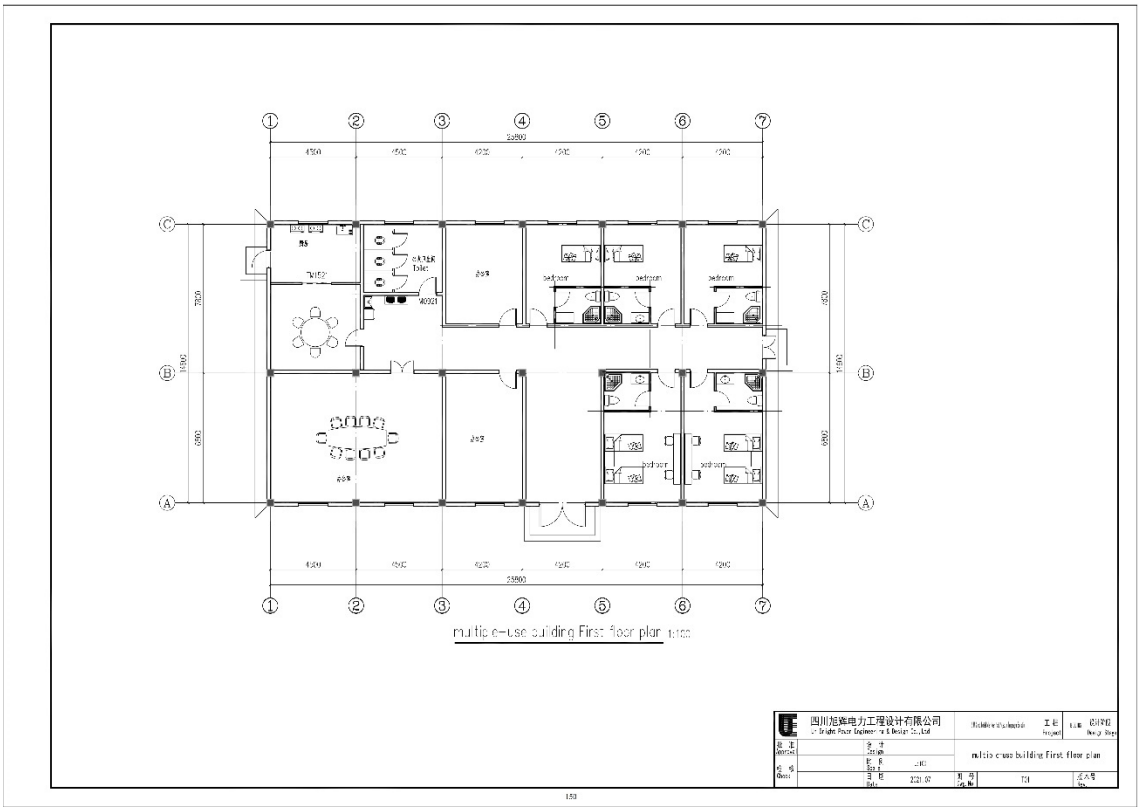


Figure 2. 8 Multiple-use Building's First Floor Plan

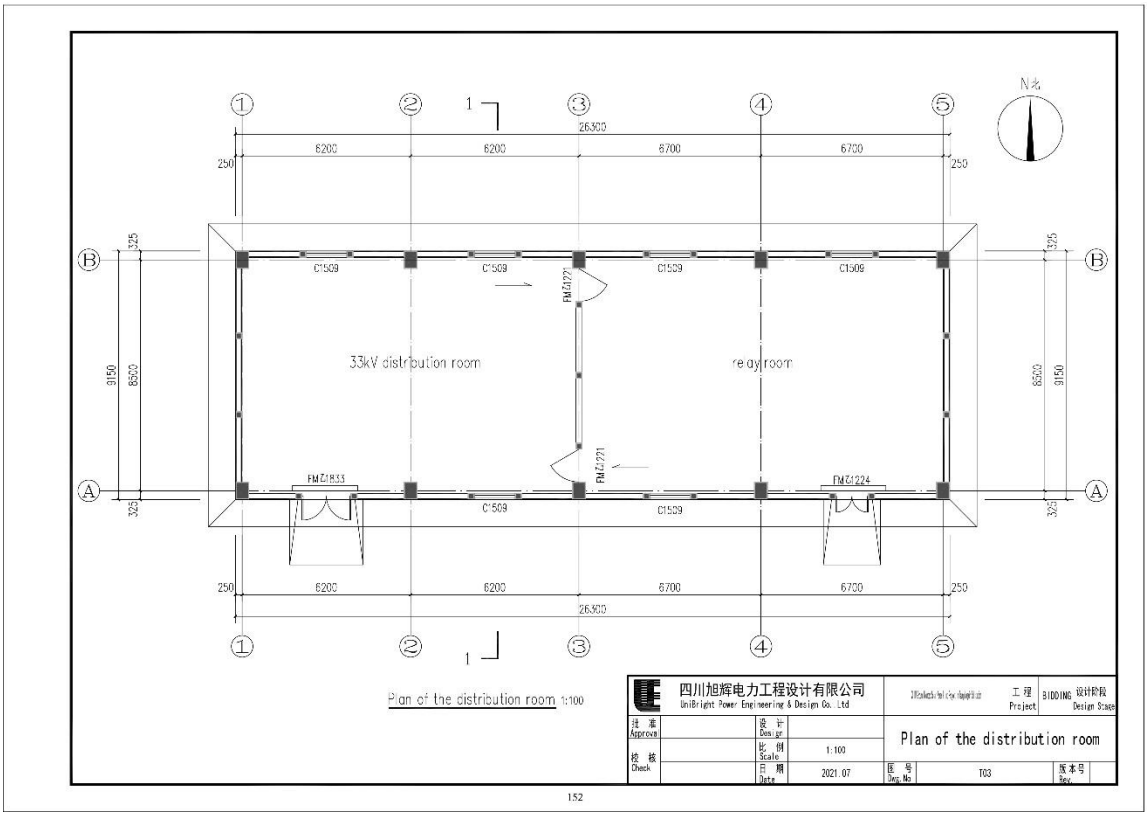


Figure 2. 9 Plan of Distribution Room

Moreover, staff quarters, briefing hall, kitchen and dining hall will be constructed in the project. The followings are floor plan of these buildings.

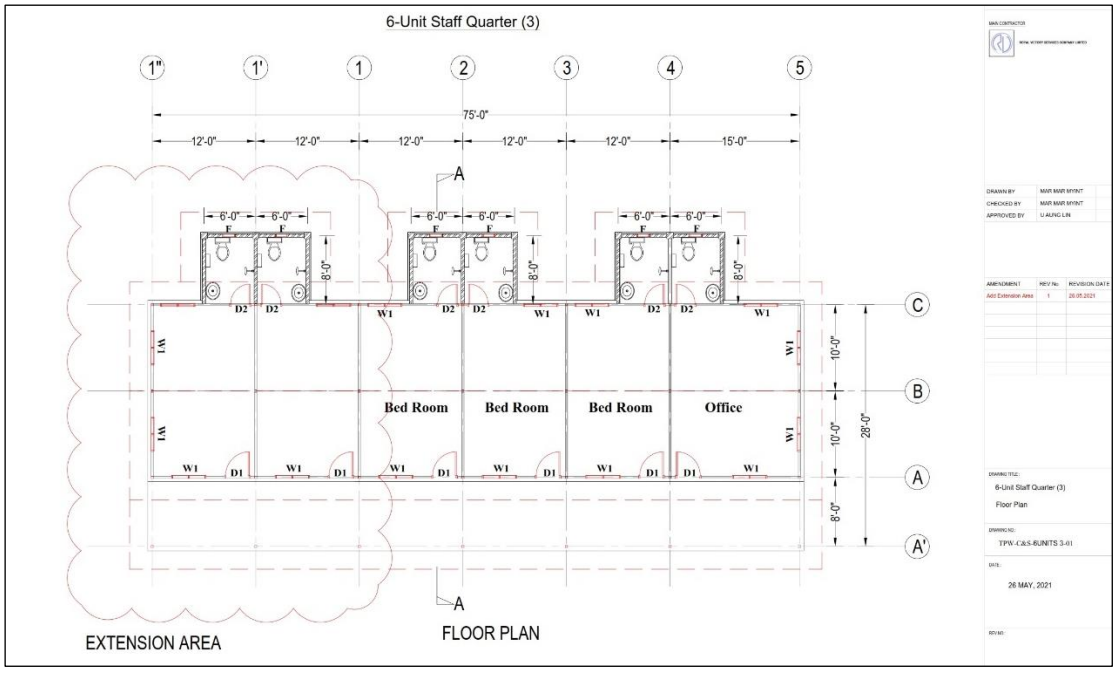


Figure 2. 10 Staff Quarter's Floor Plan

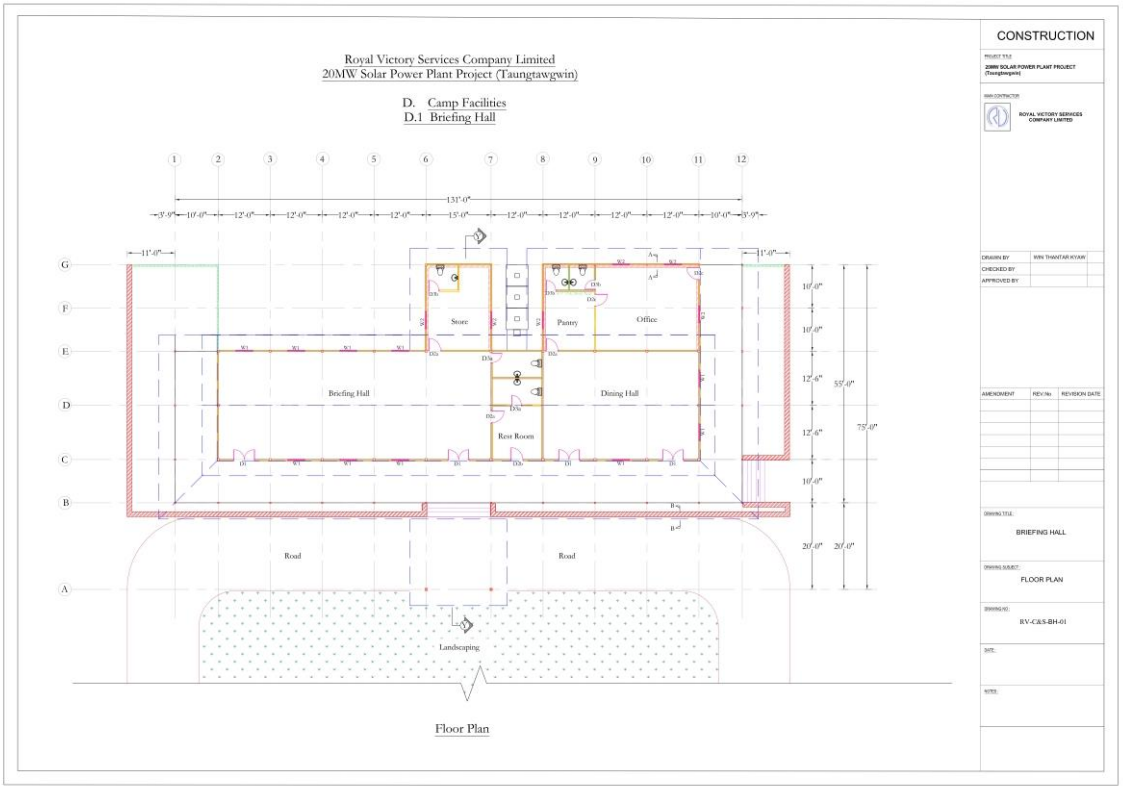


Figure 2. 11 Briefing Hall's Floor Plan

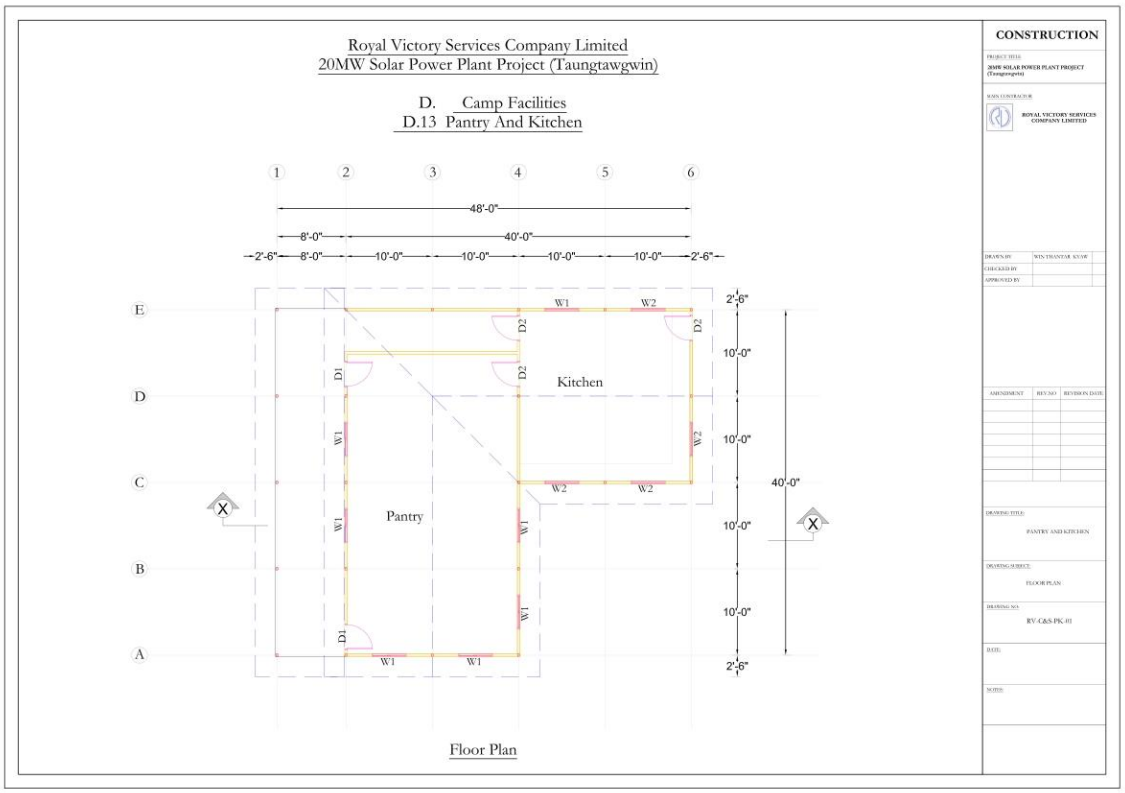


Figure 2. 12 Pantry and Kitchen's Floor Plan

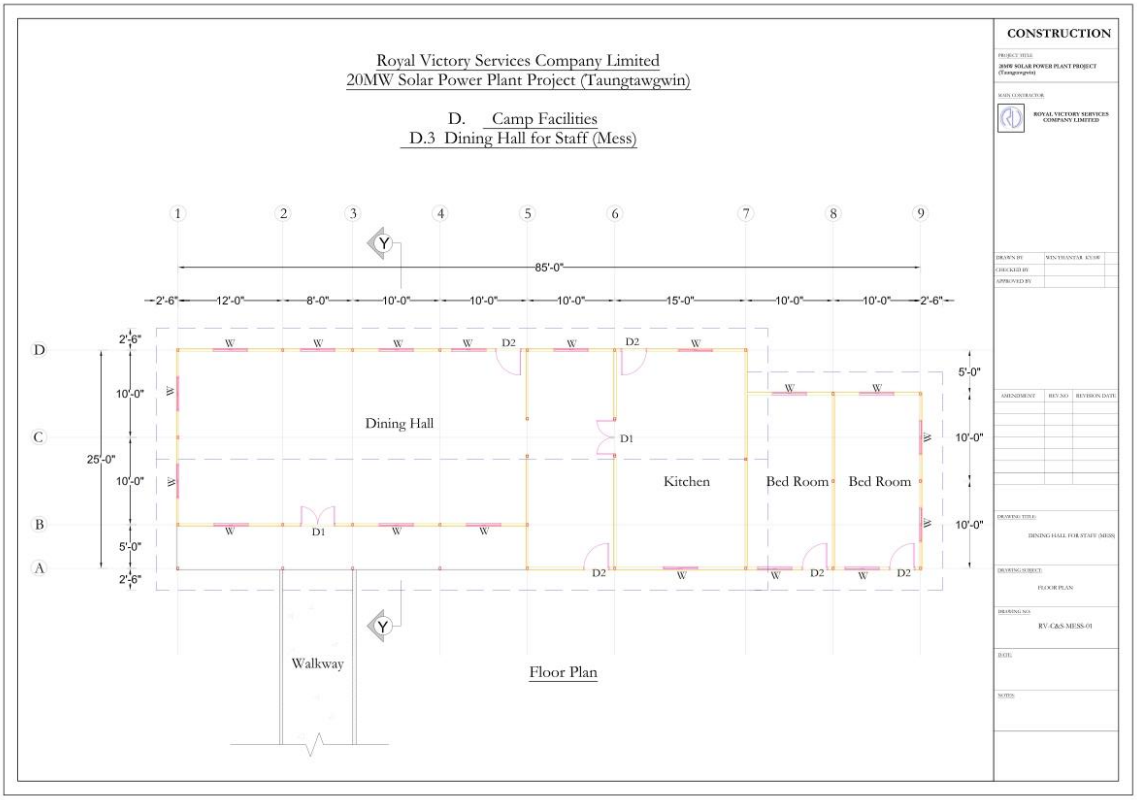


Figure 2. 13 Dining Hall's Floor Plan

2.4.8 Overhead Transmission Line Design

The proposed project will use the 33 KV single-circuit overhead transmission line to connect the PV solar power station and the Taungdawgwin Substation. The newly constructed 33 kV overhead transmission line starts from the 33 kV power distribution device of the 33 kV booster station of PV solar power station and ends at the existing Taungdawgwin Substation power distribution device, which total length is about 10.139 km (6.3 miles). The path selection of the overhead transmission line is based on comprehensive consideration of factors such as operation, construction, traffic conditions, special terrain, micro-meteorological conditions, ability to withstand natural disasters, path length, comprehensive arrangements, economically reasonable, safe and applicable. Minimize crossovers between lines and avoid depressions, erosion zones, unfavorable geological areas, primary forest areas and other area that affect the safe operation of overhead transmission line.

The design meteorological conditions of the overhead transmission line are determined according to the meteorological data along the line and the operation experience of the existing lines nearby. The 30-year recurrence period is determined and the maximum design wind speed should be selected as per maximum wind speed statistical value, which should not be less than 25 m/s. With regards to the calculation of the tension sag of the wire, the maximum operating tension and the average operating tension are used as control conditions under various meteorological conditions. The calculation of the tension sag of the ground wire can use the maximum use tension, the average running tension and the distance between the wire and the ground wire as the control conditions. The insulation coordination of the overhead transmission line can meet the safe and reliable operation of the line under various conditions such as power frequency voltage, operating overvoltage and lightning overvoltage. Moreover, the proposed project will install three types of poles for 33 kV overhead transmission line including; 15-meter H-pole, 15-meter 4-pole and 12-meter H-pole. The following table describes the details numbers of poles used for 33 kV overhead transmission line of the proposed project.

Table 2. 6 Details Numbers of Poles Used for Overhead Transmission Line

No.	Name	Unit	Pole Number
1.	15-meter H-pole	Nos	22
2.	15-meter 4-pole	Nos	20
3.	12-meter H-pole	Nos	171
Total			**213**

The following figures illustrate the details plan of poles for overhead transmission line and details design of poles.

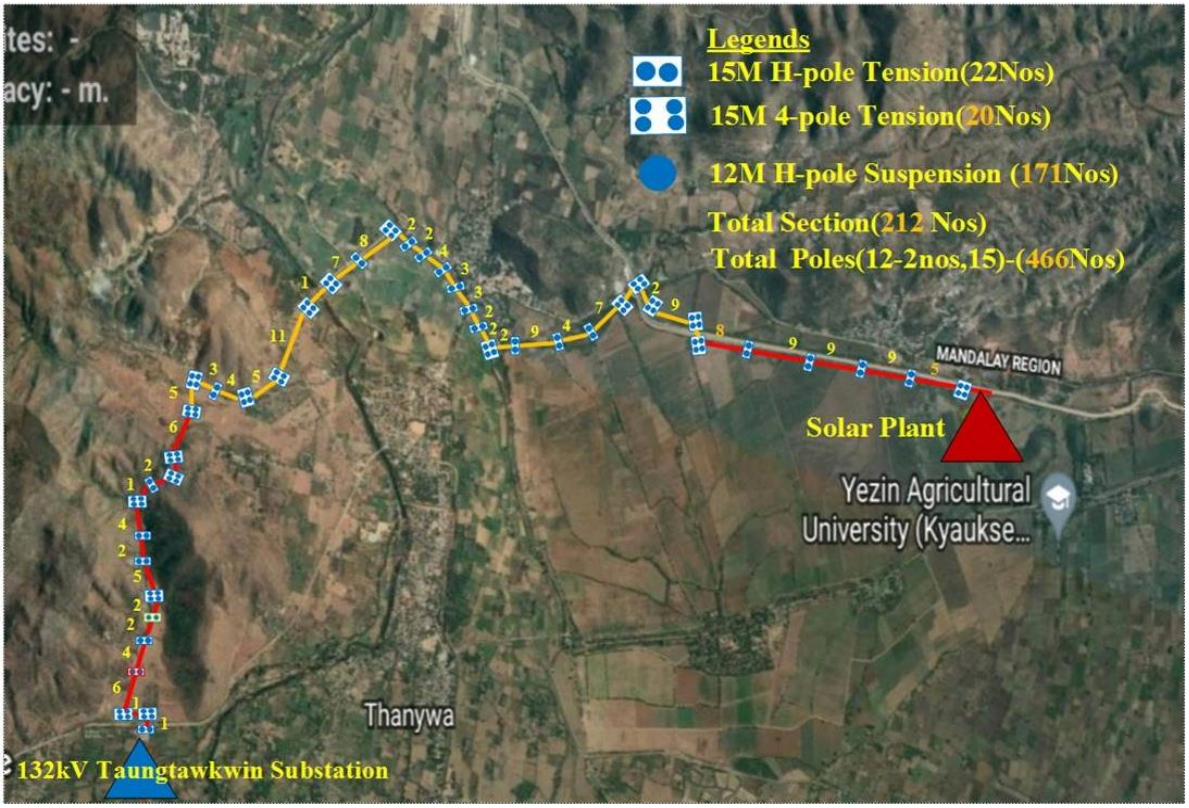
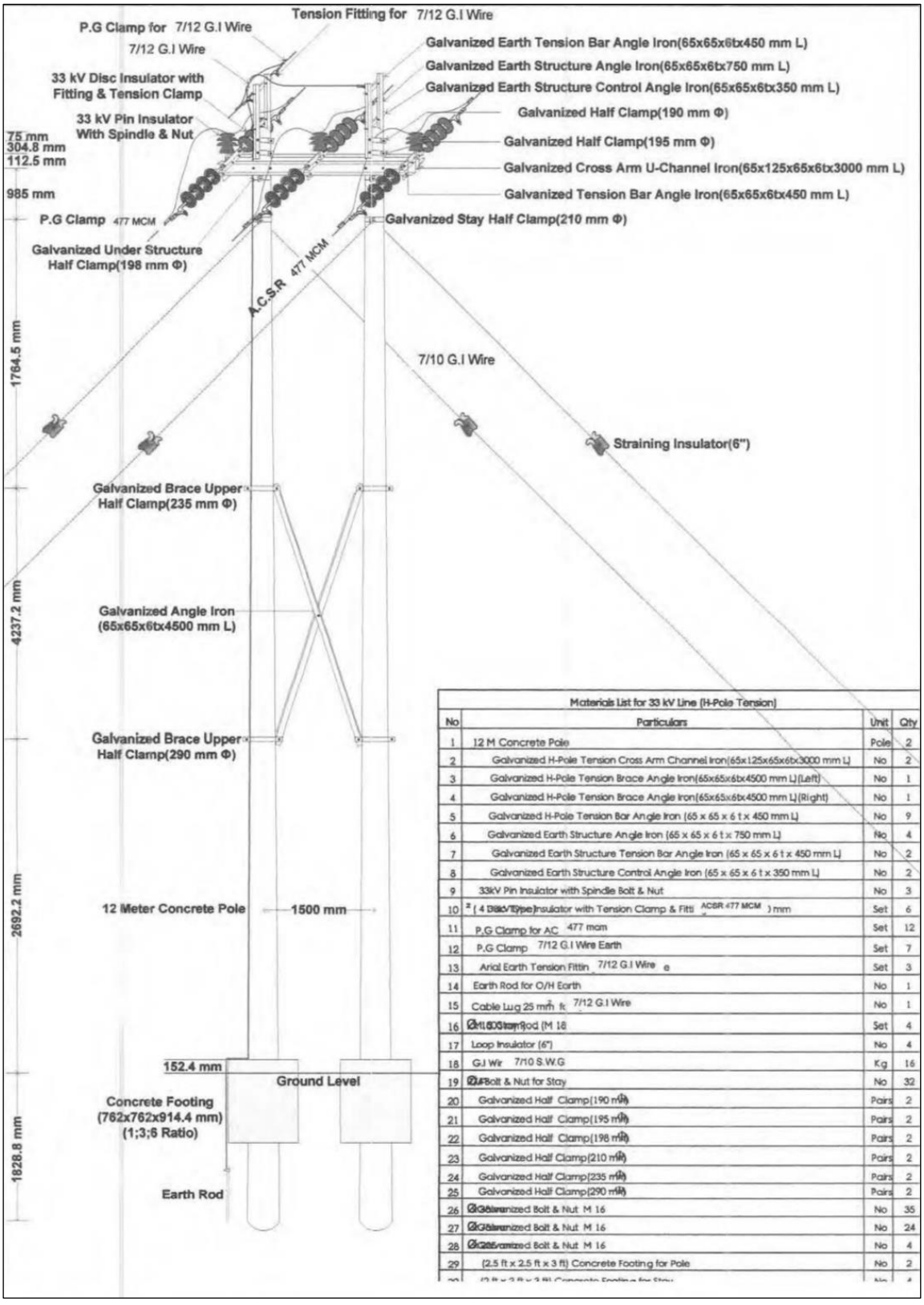


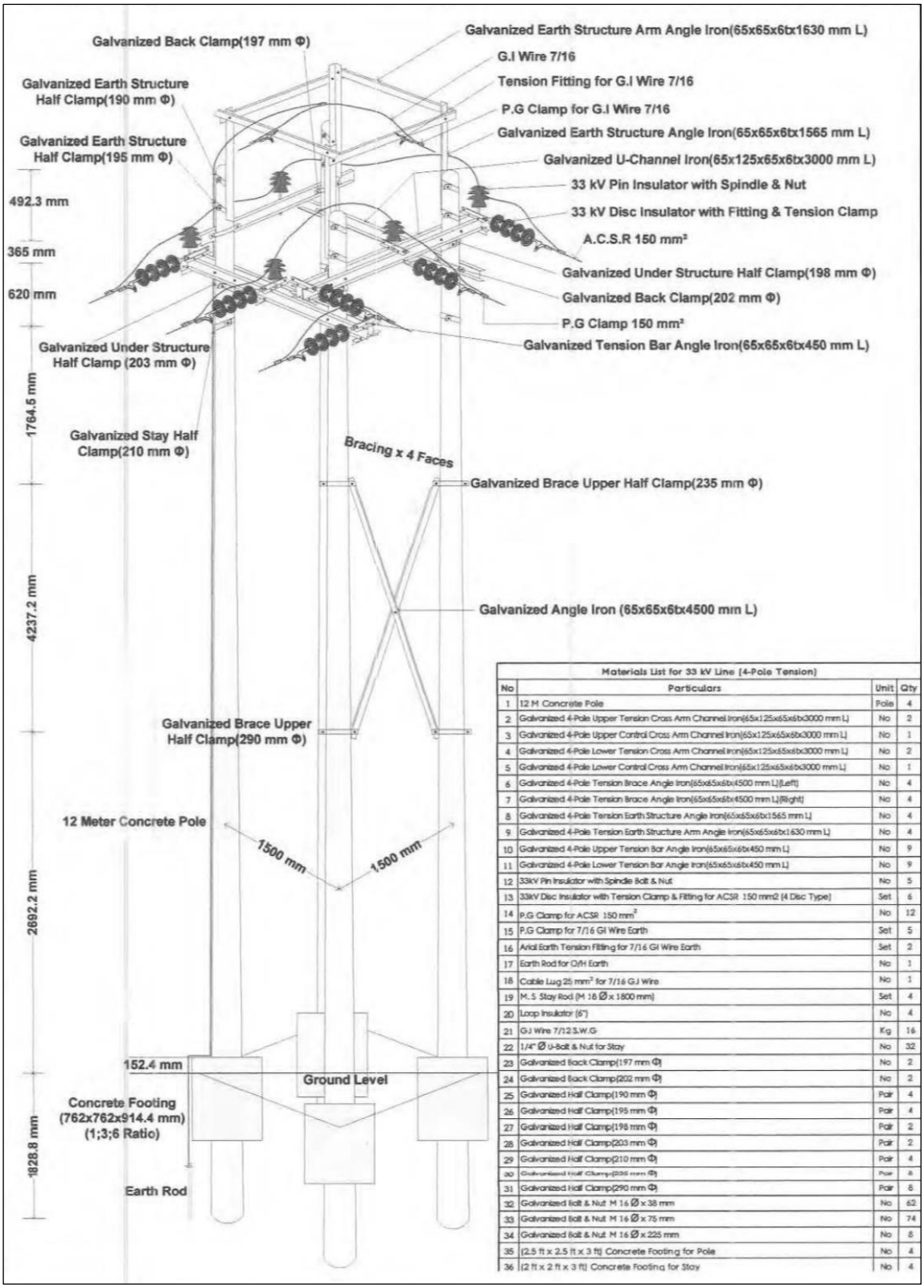
Figure 2. 14 Details Plan of Poles for Overhead Transmission Line



Materials List for 33 kV Line (H-Pole Tension)

No	Particulars	Unit	Qty
1	12 M Concrete Pole	Pole	2
2	Galvanized H-Pole Tension Cross Arm Channel Iron(65x125x65x6tx3000 mm L)	No	2
3	Galvanized H-Pole Tension Brace Angle Iron(65x65x6tx4500 mm L)(Left)	No	1
4	Galvanized H-Pole Tension Brace Angle Iron(65x65x6tx4500 mm L)(Right)	No	1
5	Galvanized H-Pole Tension Bar Angle Iron (65 x 65 x 6 t x 450 mm L)	No	9
6	Galvanized Earth Structure Angle Iron (65 x 65 x 6 t x 750 mm L)	No	4
7	Galvanized Earth Structure Tension Bar Angle Iron (65 x 65 x 6 t x 450 mm L)	No	2
8	Galvanized Earth Structure Control Angle Iron (65 x 65 x 6 t x 350 mm L)	No	2
9	33kV Pin Insulator with Spindle Bolt & Nut	No	3
10	[illegible] Insulator with Tension Clamp & Fitti ACSR 477 MCM) mm	Set	6
11	P.G Clamp for AC 477 mcm	Set	12
12	P.G Clamp 7/12 G.I Wire Earth	Set	7
13	Arial Earth Tension Fittin 7/12 G.I Wire e	Set	3
14	Earth Rod for O/H Earth	No	1
15	Cable Lug 25 mm fc 7/12 G.I Wire	No	1
16	[illegible] Rod (M 18	Set	4
17	Loop Insulator (6")	No	4
18	G.I Wir 7/10 S.W.G	K.g	16
19	[illegible] Bolt & Nut for Stay	No	32
20	Galvanized Half Clamp(190 mm)	Pairs	2
21	Galvanized Half Clamp(195 mm)	Pairs	2
22	Galvanized Half Clamp(198 mm)	Pairs	2
23	Galvanized Half Clamp(210 mm)	Pairs	2
24	Galvanized Half Clamp(235 mm)	Pairs	2
25	Galvanized Half Clamp(290 mm)	Pairs	2
26	[illegible] Galvanized Bolt & Nut M 16	No	35
27	[illegible] Galvanized Bolt & Nut M 16	No	24
28	[illegible] Galvanized Bolt & Nut M 16	No	4
29	(2.5 ft x 2.5 ft x 3 ft) Concrete Footing for Pole	No	2

Figure 2. 15 Pole Design of 12-meter and 15-meter H-Pole



Materials List for 33 kV Line (4-Pole Tension)

No	Particulars	Unit	Qty
1	12 M Concrete Pole	Pole	4
2	Galvanized 4-Pole Upper Tension Cross Arm Channel Iron(65x125x65x6tx3000 mm L)	No	2
3	Galvanized 4-Pole Upper Control Cross Arm Channel Iron(65x125x65x6tx3000 mm L)	No	1
4	Galvanized 4-Pole Lower Tension Cross Arm Channel Iron(65x125x65x6tx3000 mm L)	No	2
5	Galvanized 4-Pole Lower Control Cross Arm Channel Iron(65x125x65x6tx3000 mm L)	No	1
6	Galvanized 4-Pole Tension Brace Angle Iron(65x65x6tx4500 mm L)[Left]	No	4
7	Galvanized 4-Pole Tension Brace Angle Iron(65x65x6tx4500 mm L)[Right]	No	4
8	Galvanized 4-Pole Tension Earth Structure Angle Iron(65x65x6tx1565 mm L)	No	4
9	Galvanized 4-Pole Tension Earth Structure Arm Angle Iron(65x65x6tx1630 mm L)	No	4
10	Galvanized 4-Pole Upper Tension Bar Angle Iron(65x65x6tx450 mm L)	No	9
11	Galvanized 4-Pole Lower Tension Bar Angle Iron(65x65x6tx450 mm L)	No	9
12	33kV Pin Insulator with Spindle Bolt & Nut	No	5
13	33kV Disc Insulator with Tension Clamp & Fitting for ACSR 150 mm2 (4 Disc Type)	Set	6
14	P.G Clamp for ACSR 150 mm²	No	12
15	P.G Clamp for 7/16 GI Wire Earth	Set	5
16	Arial Earth Tension Fitting for 7/16 GI Wire Earth	Set	2
17	Earth Rod for O/H Earth	No	1
18	Cable Lug 25 mm² for 7/16 G.I Wire	No	1
19	M. S Stay Rod (M 16 Ø x 1800 mm)	Set	4
20	Loop Insulator (6")	No	4
21	G.I Wire 7/12 S.W.G	Kg	16
22	1/4" Ø U-Bolt & Nut for Stay	No	32
23	Galvanized Back Clamp(197 mm Φ)	No	2
24	Galvanized Back Clamp(202 mm Φ)	No	2
25	Galvanized Half Clamp(190 mm Φ)	Pair	4
26	Galvanized Half Clamp(195 mm Φ)	Pair	4
27	Galvanized Half Clamp(198 mm Φ)	Pair	2
28	Galvanized Half Clamp(203 mm Φ)	Pair	2
29	Galvanized Half Clamp(210 mm Φ)	Pair	4
30	Galvanized Half Clamp(235 mm Φ)	Pair	8
31	Galvanized Half Clamp(290 mm Φ)	Pair	8
32	Galvanized Bolt & Nut M 16 Ø x 38 mm	No	62
33	Galvanized Bolt & Nut M 16 Ø x 75 mm	No	74
34	Galvanized Bolt & Nut M 16 Ø x 225 mm	No	8
35	(2.5 ft x 2.5 ft x 3 ft) Concrete Footing for Pole	No	4
36	(2 ft x 2 ft x 3 ft) Concrete Footing for Stay	No	4

Figure 2. 16 Pole Design of Four-Pole

2.4.9 Electricity Power Generation Estimation

The total efficiency of the grid-connected PV electricity power generation system consists of three parts; the efficiency of the PV array, the efficiency of the inverter, and the efficiency of the AC grid connection. After comprehensive consideration of line loss, heat loss, inverter

mismatch loss, soiling loss, system unavailability rate (equipment failure, maintenance) and other losses, the overall efficiency of the project is about 85.08%. The outage rate of the project is about 1.5% (the equipment failure accounts for 1% and the equipment maintenance accounts for 0.5%) as per the results of calculation. Therefore, the system availability of power plant is almost 98.5% and details system losses can be seen in the following figure.

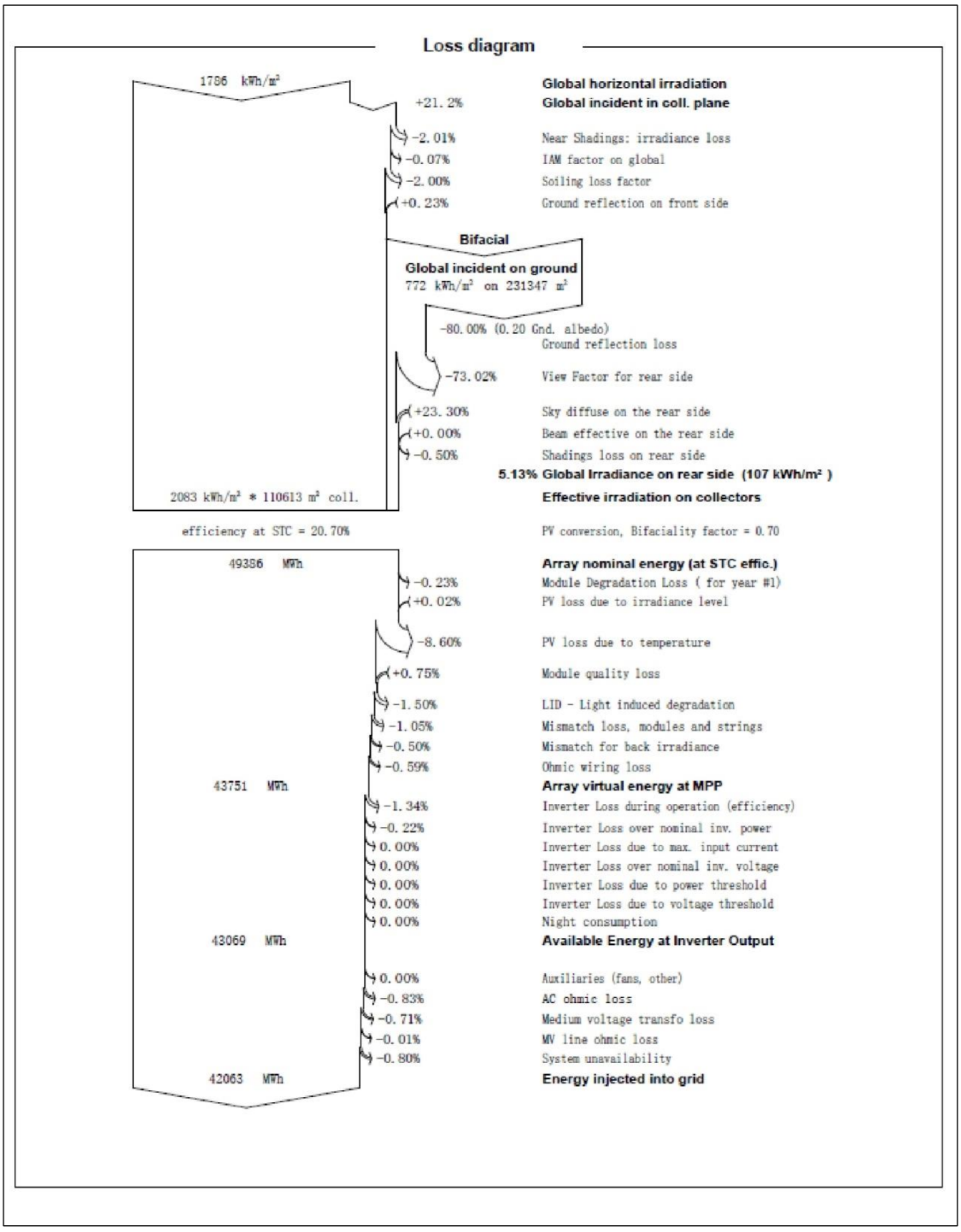


Figure 2. 17 Details System Loss of the Project

In order to estimate electricity power generation, the unit solar cell power generation and total annual power generation without attenuation should be calculated according to the solar

radiation data and number of solar power generation modules in the system and overall efficiency of the system, respectively. Moreover, PV modules will have attenuation when used in light and normal atmospheric environment. The attenuation rate of the first year is 2% and the annual attenuation rate is 0.45%. The following figure shows attenuation curve of PV modules used in the project.

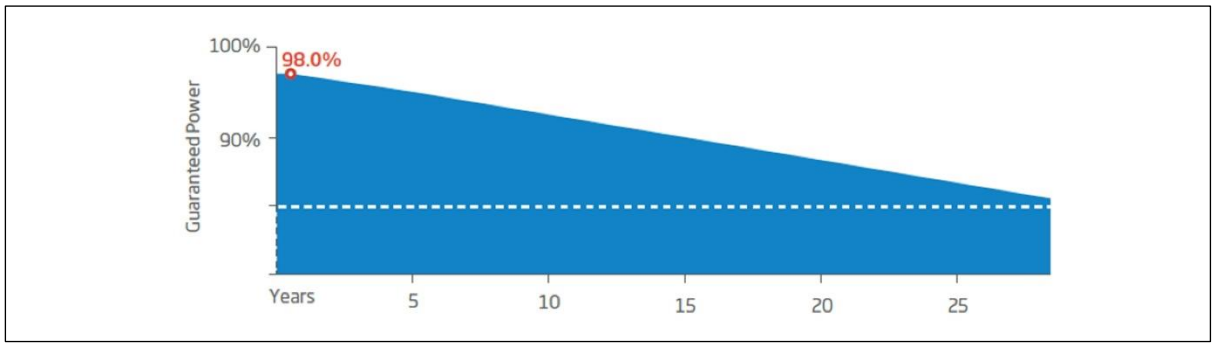


Figure 2. 18 Attenuation Curve of PV Modules

The following table shows the details estimated contracted capacity and estimated contracted energy of the proposed project.

Table 2. 7 Estimated Electricity Generation of the Project

Year	Estimated Contracted Capacity	Estimated Contracted Energy		
	Indicative MW_{AC}	Net Yearly Output (MWh)	Permissible Lower Limit of Annual Generation 80% (MWh)	Maximum Electricity Power Generation 110% (MWh)
1	20	47,420	37,936	52,162
2	20	47,188	37,751	51,907
3	20	46,973	37,578	51,670
4	20	46,757	37,406	51,433
5	20	46,541	37,233	51,196
6	20	46,326	37,061	50,958
7	20	46,110	36,888	50,721
8	20	45,895	36,716	50,484
9	20	45,679	36,543	50,274
10	20	45,463	36,371	50,010
11	20	45,248	36,198	49,773
12	20	45,032	36,026	49,535
13	20	44,817	35,853	49,298
14	20	44,601	35,681	49,061
15	20	44,385	35,508	48,824
16	20	44,170	35,336	48,587
17	20	43,954	35,163	48,349
18	20	43,738	34,991	48,112

Year	Estimated Contracted Capacity	Estimated Contracted Energy		
	Indicative MW_{AC}	Net Yearly Output (MWh)	Permissible Lower Limit of Annual Generation 80% (MWh)	Maximum Electricity Power Generation 110% (MWh)
19	20	43,523	34,818	47,875
20	20	43,307	34,646	47,638

2.4.10 Electrical Primary

The total installed capacity on the AC side of the project is 20.15 MW and the installed capacity on the DC side is 22.838 MWp as well as 1 group of 1.25 MW PV sub-arrays and 3 groups of 6.3 MW PV sub-arrays are included in the project. The voltage range is 33 kV ± 10% and it meets the requirements of Electric Power Generation Enterprise (EPGE) system voltage. String inverter is also selected for the proposed project with rated frequency of 50 Hz and power factor adjustment range is ± 0.8, with power factor meeting the range of 0.85 (lagging) to 0.9 (leading). System frequency is 50 Hz in normal condition and frequency variation meets the following range.

Frequency Range	Running Time
51 – 51.5 Hz	90 min
48.5 – 51 Hz	Continuity
47.5 – 48.5 Hz	25 min
47 – 47.5 Hz	30 min

Single Line Diagram

6.3 MW PV square single line diagram: 535 Wp bifacial monocrystalline silicon PV module will be used in each 6.3 MW PV sub-array of the proposed project. A string includes 29 blocks and totally 465 strings are converted from DC to AC through 25 inverters and connected to the 0.8 kV side of the 6,300 kVA box-type transformer and then boosted to 33 kV.

1.25 MW PV square single line diagram: 535 Wp bifacial monocrystalline silicon PV module will be used in each 1.25 MW PV sub-array of the proposed project. A string includes 29 blocks and totally 93 strings are converted from DC to AC through 5 inverters and connected to the 0.8 kV side of the 1,250 kVA box-type transformer and then boosted to 33 kV. Four box transformers of the project are connected in parallel through cables and finally connected to the 33 kV switchgear in the newly-constructed 33 kV switchyard through two 33 kV cable loops.

Single line diagram of switchyard: A 33 kV switchyard and its 33 kV switchgear will be constructed in the proposed project. Single bus connection is used in the 33 kV switchyard and the newly-constructed 33 kV switchgear includes two incoming lines, one outgoing line, one Pt and one earthing and station transformer. The following figure shows the details single line diagram of the proposed project.

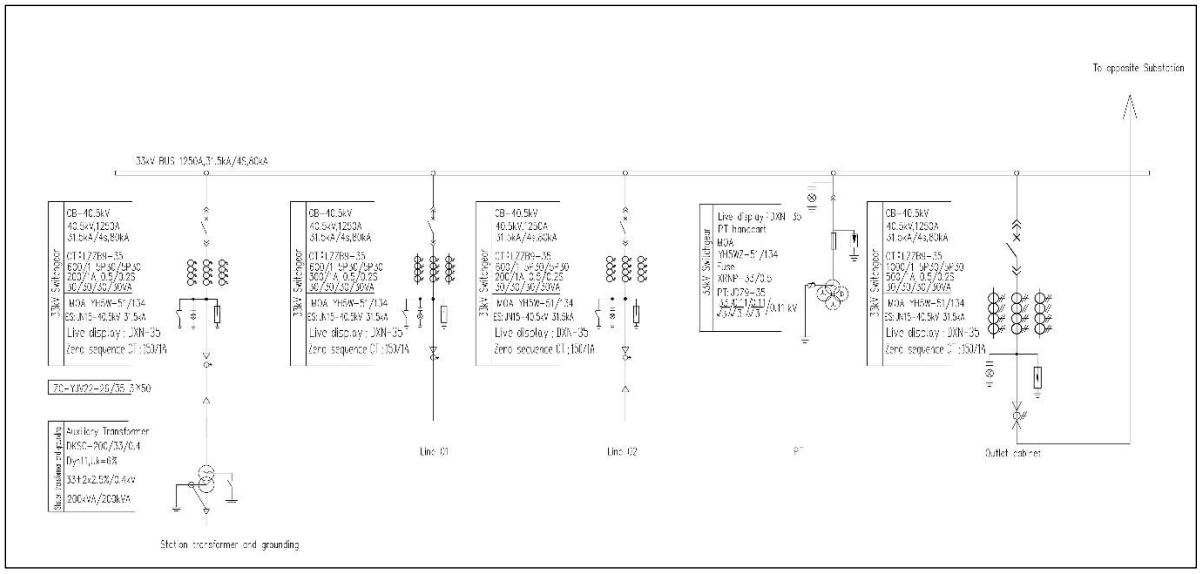


Figure 2. 19 Details Single Line Diagram

33 kV High Voltage Power Distribution Equipment

Indoor metal-clad withdrawable switchgear, model: KYN-40.5 high voltage power distribution equipment will be used in the proposed project. Its rated voltage is 40.5 kV, rated frequency is 50 Hz, rated current is 1,250 A, rated short-circuit breaking current is 31.5 kA and rated dynamic current (peak) is 80 kA.

Grounding Transformer and Station Transformer Complete Set

The 33 kV switchyard is a neutral-point solid ground system. The high-voltage side of the grounding transformer can be grounded or not grounded through the isolation switch and the low voltage side is also used as the power supply of the power station and the station power capacity is 200 kVA, the transformer is arranged outdoors.

Cable

All cables shall be XLPE, PVC inner sheathed, steel tape armored and PVC outer flame-retardant aluminum and copper core power cables. After considering temperature correction coefficient, soil thermal resistance coefficient and laying coefficient, H1Z2Z2-K-1×4 DC cable is selected from components to DC combiner box, ZC-YJLV22-1.0kV-3×120 (or 3×150) cable is selected from the string inverter to the box-type transformer and then ZC-YJLV22-26/ 35-3×70 (3×150 or 3×240) cable is selected for 33 kV collecting line.

PV Grid Collecting Line

Four box-type transformers are connected in parallel by cables and finally connected to the 33 kV switchgear of the newly-constructed switchyard by two 33 kV buried power cable lines.

Lightning Protection Grounding and Earthing

The frame of the PV module is made is aluminum alloy. The battery panels are fixed with steel materials such as angle steel, channel steel and so on. They are all metal materials with good connectivity and can be used as a good lightning connection device and they can be electrically connected reliably and grounded. Besides, there is lightning protection device in the inverter

already to separate lightning protection measures cannot be considered in PV area. In the proposed project, a general grounding grid device is used for protective grounding, working grounding and overvoltage protection grounding. The grounding grid is mainly composed of horizontal equalizing grid and part of vertical grounding electrode, which forms a composite annular closed grounding grid. The horizontal grounding wire is made of 50×5mm^2 hot-dip galvanized flat steel and the vertical grounding electrode is made of 150×50×5 hot-dip galvanized angle steel with L=2.5 m. The grounding resistance of the grounding grid is not more than 4Ω.

Cable Laying and Fire-Retardant Measures

The 1.5 kV DC part chooses H1Z2Z2-K-1×4mm^2 for PV system and the 1.0 kV power cable adopts flame retardant aluminum core cable, the 33 kV power cable adopts flame-retardant aluminum core cable and some directly buried cables use steel tape armor.

The internal wiring part of the PV component string on the bracket unit: the PV special cable that is provided by the component is directly connected by the plug-in connection and the cable is bound and fixed in the groove of bracket purlin.

Cable laying of PV module strings in the same string inverter: the overhead mode is used when the cable is laid horizontally along the North-South module bracket, the pipe protection is carried out when the adjacent bracket units are connected horizontally. When the cable is laid in the East-West direction, it is directly buried and it is protected by the pipe at the entrance and exit of the ground. PV modules in different columns with the inverter should be laid directly in the same path.

The outlet part of the inverter: combined with the distribution position of the invertor, the cable shall be directly buried in the same path with the same trunk cable trench, so as to minimize the amount of directly buried cables on the branch direction and avoid crossing with PV module string converging cable. All the road-crossing cables must be protected by a metal tube. All buried laying cables should be laid underground at 0.8 m. Moreover, fire-proof and flame-retardant separation measures should be set on the main passage of the cable such as fire-resistant partitions, fire-proof packages etc. Fire proof sealing shall be adopted at wall holes, openings at the bottom of cabinets and entrance of buildings at both ends of cable ducts. The following figures show the PV collection system and PV wire diagram of the proposed project.

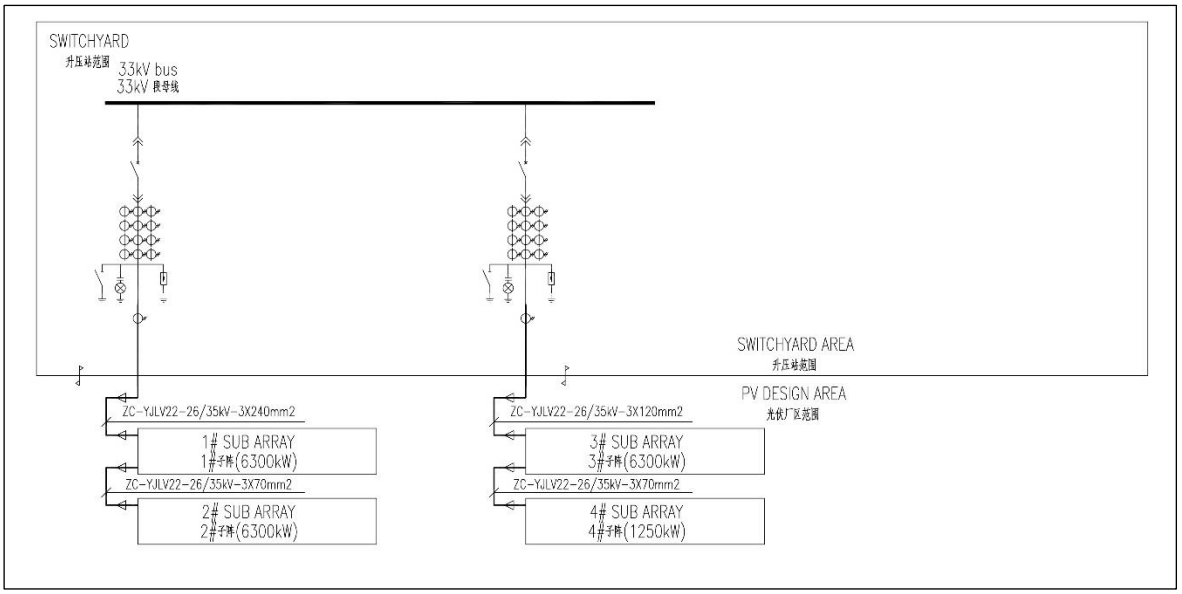


Figure 2. 20 PV Collection System

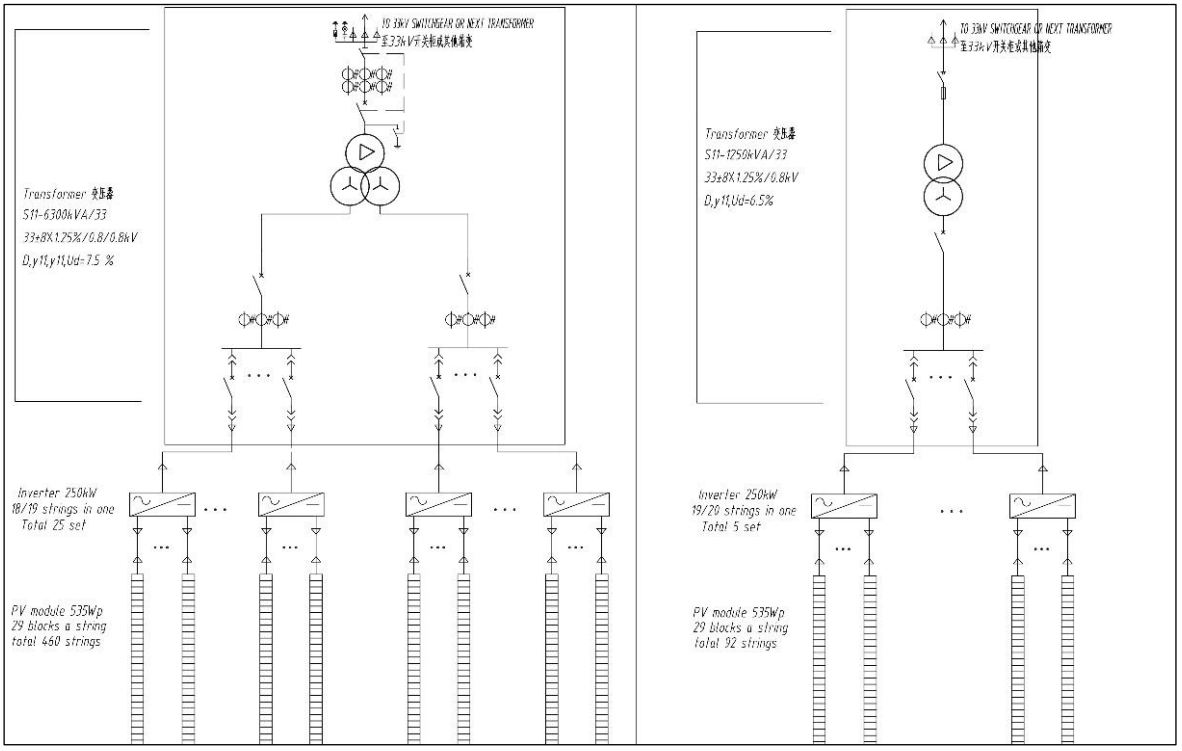


Figure 2. 21 PV Wire Diagram

2.4.11 Electric Secondary

Monitoring, protection and communication system are included in the prosed project. The proposed project will set up monitoring panels according to the final scale. The computer monitoring system of the switchyard is relatively independent from PV field computer monitoring system. The computer monitoring system of the switchyard is used to monitor grounding transformer, switchgear and other equipment in the switchyard. The computer monitoring system of the PV field is used to monitor PV sub-array devices such as inverters,

box-type transformers, etc. The two sets of computers monitoring system achieve information exchange by means of data communication.

The Functions of SCADA System

The SCADA system should implement functions such as real-time data collection, security monitoring and control, screen display and operation, operation records, tabulation printing and screen copying, local and remote operation control of the substation and it should also interface with microcomputer protection to achieve integrated automation of the whole station. The following are the details of the SCADA system.

(1) Data acquisition and security monitoring

- Substation main wiring diagram and flow diagram
- Real-time display of various switch states and dynamic data
- System cycle and system clock
- Main transformer and line load, temperature and current monitoring
- Remote signal status monitoring, sound and light information for displacement
- Display real-time and hourly data in a table
- Display analog quantities such as voltage and load in the form of bar graphs and curves
- Monitoring and alerting on voltage, current, power flow and the limits can be manually modified
- Alarm and push accident screen automatically
- Provide a variety of numerical calculation functions and the relevant quantity can be stored in full
- Abnormal alarm of telecontrol equipment
- Manually set the switch for maintenance
- Control operations include switching of capacitor banks
- Remote control of line switches may be prohibited/ opened by specially authorized personnel
- Provide accident signal return function

Moreover, the SCADA system can keep the following operating records.

- Power station accident records which include switch state change records, accident sequency records etc.
- Power system anomaly records which include various limit measurements of telemetry, time records of telemetry that is occurring or has been restored under various abnormal conditions etc.
- Power system normal records (retain historical records for one month and can be summoned for printing) which include various daily reports, monthly report records and hourly record tables.
- Automation system requirement operation status records which include monitoring equipment and channel abnormal records, monitoring device input and exit records etc.
- Remote operation record which records the name, time and operation content of the remote operator.

The following are the MMI of the SCADA system.

- Manually call out the screen and start report printing
- Non-telemetry, manual placement of remote signals
- Locking and operation of control
- Perform one or all telemetry and telemetry suppression reconstruction or restoration reconstruction operations
- Generate and modify various reports and screens
- Generate and modify database parameters
- Online screen copy
- With multi-level window, zoom in and zoom out of local area, screen roaming function
- Man-machine operation methods include mouse, keyboard commands, function keys
- Printing does not affect other work of the host

The following table shows the main technical indicators of the SCADA system.

Table 2. 8 Main Technical Indicators of SCADA System

Comprehensive error of analog measurement	±0.5%
Grid frequency measurement error	0.02 Hz
Analog updated in the database	3s
Switching updated in the database	1s
Event recording resolution	2ms
Incident correct recording rate	100%
MTBF of the monitoring system	30,000 Hours
Remote communication telemetry transmission time	5 seconds
Remote communication remote signal transmission time	3 seconds
Remote signal transportation local response time	1 second
Picture response time	2 seconds
Screen update time	2 to 255 seconds adjustable (less than 5 seconds)
System availability	99.8%

Interface with microcomputer protection device: the microcomputer monitoring system in the station can receive the relevant signals of the microcomputer protection device through I/0 unit and CAN network, check the protection setting value and put on/ off the protection device.

Interface with other intelligent devices: the microcomputer monitoring system in the station should provide enough RS232/ RS485/ RS422 ports to interface with other intelligent devices. The entire station uses an integrated platform and runs on the monitoring host, which consists of a basic platform, public services and a unified access interface. It can access third-party extension application modules through standardized interfaces to jointly complete power grid monitoring and equipment monitoring. Various operation management and maintenance

services have the characteristics of open platform, extensibility, easy maintenance and configuration on demand.

Anti-misoperation blocking: the anti-misoperation blocking function of the whole station is realized by the microcomputer five-proof system and the blocking circuit of this interval is connected in series in the operation circuit of the controlled equipment. The operation lock of this station is completed by the microcomputer-based anti-misoperation locking system. The station control layer realizes the comprehensive operation locking function for the whole station equipment, the bay layer realizes the operation locking function of each electrical unit equipment. The 33 kV circuit breakers, disconnecting switches, earthing switches and 33 kV switchgears are realized by their own electrical locking circuits and the rest of the sporadic equipment is implemented by computer keys and locks.

RTU Equipment Configuration Scheme

The substation automation system adopts an integrated monitoring system. The configuration of telecontrol equipment should be considered in conjunction with the integrated monitoring system of the substation and configured in active and standby redundancy. The RTU equipment is provided by the monitoring system.

Energy Metering System

The proposed project adopts the electric energy meter supporting IEC61850 interface to measure each outgoing line and configures one set of electrical energy information collection terminals to collect the entire station's electrical energy information. Electric energy information is transmitted via GPRS channel or dedicated line channel. The power information transmission method is mainly implemented by the power dispatch data network transmission method. The transmission protocol adopts the IEC60870 protocol and the transmission rate of the transmission channel is 2 Mbps. The configuration of the meter must meet the requirements of the Myanmar local power grid. For the system substation connection of 33 kV outgoing line of PV power station, it is a metering gateway for trade settlement to collect on-grid electricity; two main and auxiliary 0.2 s high-stable multi-function electronic energy meters are set. For the 33 kV current collecting line and the grounding transformer switch, as the energy assessment point, set up a multifunctional electronic energy meter with active power 0.5 and reactive power 2.0. The measurement points CT and PT use special secondary windings for measurement, the newly added CT accuracy level requires 0.2 s level and the PT accuracy level uses 0.2 level.

Relay Protection

33 kV overhead transmission line optical difference protection: a 33 kV overhead transmission line is newly constructed to connect to the Taungdawgwin Substation. The length of the line is about 10.139 km (6.3 miles). On both sides a set of optical fiber current differential protection is configured and the protection channel uses a dedicated fiber core. Line protection also has three-stage phase-to-phase, grounding distance, direction zero-sequence current protection, three-phase one-time reclosing, check same period and other functions and has a tripping operation circuit.

Digital disturbance recorder: the proposed project is equipped with a set of digital disturbance recorder to achieve the fault recording function of 33 kV electrical equipment. The device has the functions of recording for analog quantity and switching quantity, remote transmission function and satellite timing interface.

33 kV line protection: the station is equipped with a set of 33 kV three section phase to phase current protection and control device for each 33 kV line. The protection configuration is three-stage phase-to-phase current protection and three-phase one-time reclosing. The device has TV disconnection and overload alarm functions and has a tripping operation circuit.

33 kV grounding transformer protection: the 33 kV grounding transformer protection adopts an integrated protection, measurement and control device, equipped with current quick-break protection, over-current protection, zero-sequence over-current protection and ontology protection. The protection action trips the circuit breakers on all sides. The following figure shows the general diagram of protection of the proposed project.

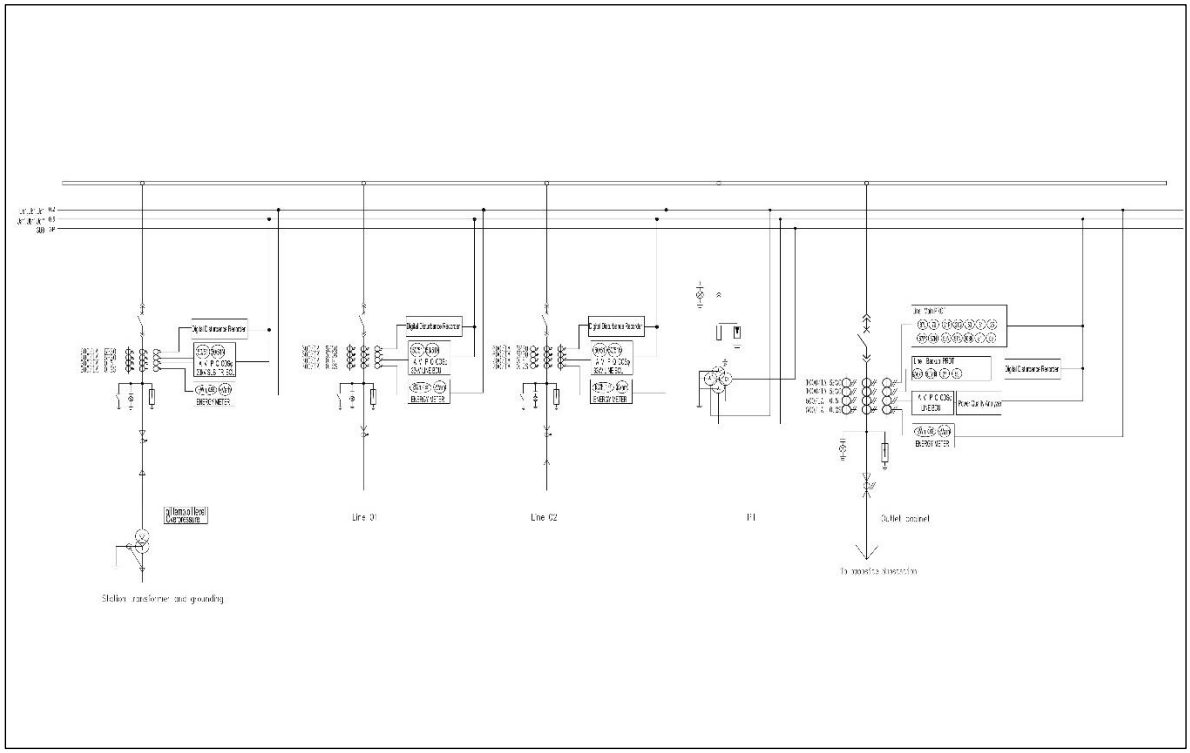


Figure 2. 22 General Diagram of Protection

AC/DC Integrated Power System

The AC/DC integrated power supply system is composed of station AC power supply, DC power supply, inverter power supply and battery pack. The system adopts integrated design, integrated configuration and integrated monitoring, its operating conditions and information data can be displayed through the integrated monitoring unit and connected to the substation automation system through the IEC61850 standard model data.

Video Surveillance and Security System

The equipment of image surveillance and security guard system equipment includes video servers, multi-screen splitters, video recording equipment's cameras, access control system, encoders and electronic fences around the substation fence. Set up electronic fences on the fence and set up a defense zone around 100 meters on each side of the fence. A host box can be set up every two to three zones and the host box is equipped with pulse host, transformer, terminal block and other equipment. The box is arranged on the appropriate position of the enclosure. The electronic fence adopts a six-wire system and when a short circuit or an open circuit occurs, the pulse host can send an alarm and send the alarm signal to the auxiliary system integrated monitoring platform. The platform can automatically open the camera in the station to start recording. At the prominent place of the electronic fence, a warning sign is usually installed every 10 meters and the warning sign is installed on the top edge of the fence. The following are the technical requirements of video surveillance and security system.

Monitoring range: all weather image monitoring of the main station's main electrical equipment, buildings and surrounding environment to meet the requirements of safety and inspection of production and operation.

Equipment monitoring: utilize cameras installed in the surveillance target area such as high-voltage power distribution rooms are used to monitor the main equipment in the substation in all directions. The camera supports multiple resolution, adjustable from 720*576, 352*288, 176*144.

Surrounding environmental monitoring: through the electronic fence of the target area, all-round surveillance of the substation walls and gates is carried out without leaving dead corners and blind spots. If it crosses the fence, the alarm will be dealt with, if there are people and cars entering or leaving the gate, a bell will be sent to notify the operator.

Secondary equipment room: monitor secondary equipment indoor and the surrounding environment and install indoor cameras in each room. It will have linkage function with fire alarm system.

Transmission method: the video surveillance and security system are connected to the dedicated network port of the integrated distribution frame of the communication equipment by ethernet and uploaded to the dispatcher through the communication channel.

Dispatching Automation System

The proposed project sets up a dispatch automation system, including the following functions.

- Achieve the collection and transmission of telecontrol information of the project, so that the dispatching and operating personnel can complete the monitoring of the operation status of the PV power station and grasp the operation conditions in time.
- Achieve the electric energy collection and transmission of the project
- The dispatching data transmission mode meets the requirements of EPGE.

The dispatching automation equipment configured in the proposed project is described as follows.

- Configure a remote-control system
- Configure a set of electrical energy metering plant and station system
- Configure a set of power dispatch data network access equipment

Station communication: the automatic telephone is installed in the office, rest room and meeting room etc., which is used for internal telephone communication in the switchyard. For the voice communication method between the PV array and the control room, the wireless intercom and public network mobile phone communication methods are used.

System Communication

According to the current status of the surrounding communication system, comprehensive consideration of factors such as operational safety, stability, reliability and network flexibility, the project's system communication scheme will mainly use optical fiber communication as the main communication method, supplemented by public network communication. The proposed project's system communication scheme shall meet the requirements of EPGE.

Optical cable construction: construct one OPGW optical cable between the PV solar power project and the Taungdawgwin Substation, which length is about 8.37 km. The inbound optical cable adopts ordinary non-metallic optical cable. The optical fiber core adopts G.652.

Device configuration: PV solar power station is configured one SDH optical transmission equipment, one set of integrated distribution frame (ODF36/ DDF64/ MDF 100) and one set of PCM equipment. The Taungdawgwin Substation is configured two optical port boards and one optical fiber distribution module (ODF24).

Telephone system with PABX: dispatching sends dispatching calls to PV solar power station through the communication equipment. The power station apples to the local public network for 1 local telephone access station to meet the communication between the power station and relevant departments such as for government, security and fire protection.

Communication power supply: the DC power supply system of the PV solar power station provides communication power through the DC/ DC conversion device.

The following figure shows the details PV area power monitoring system network of the proposed project.

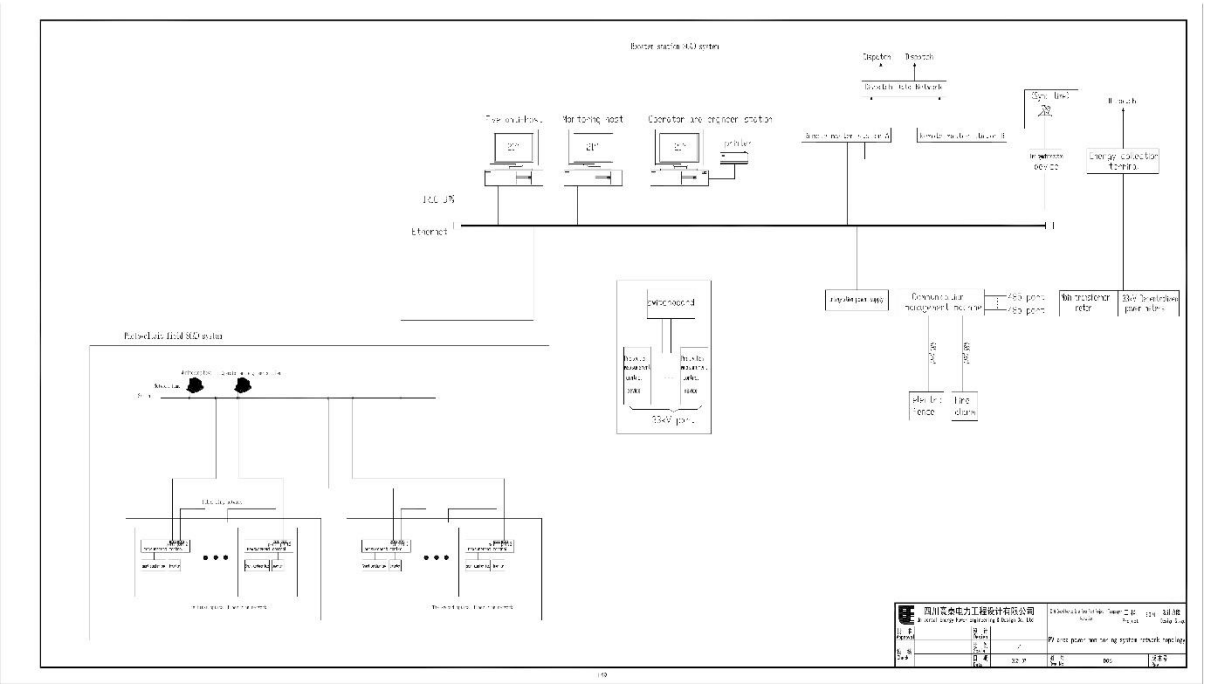


Figure 2. 23 Details PV Area Power Monitoring System Network

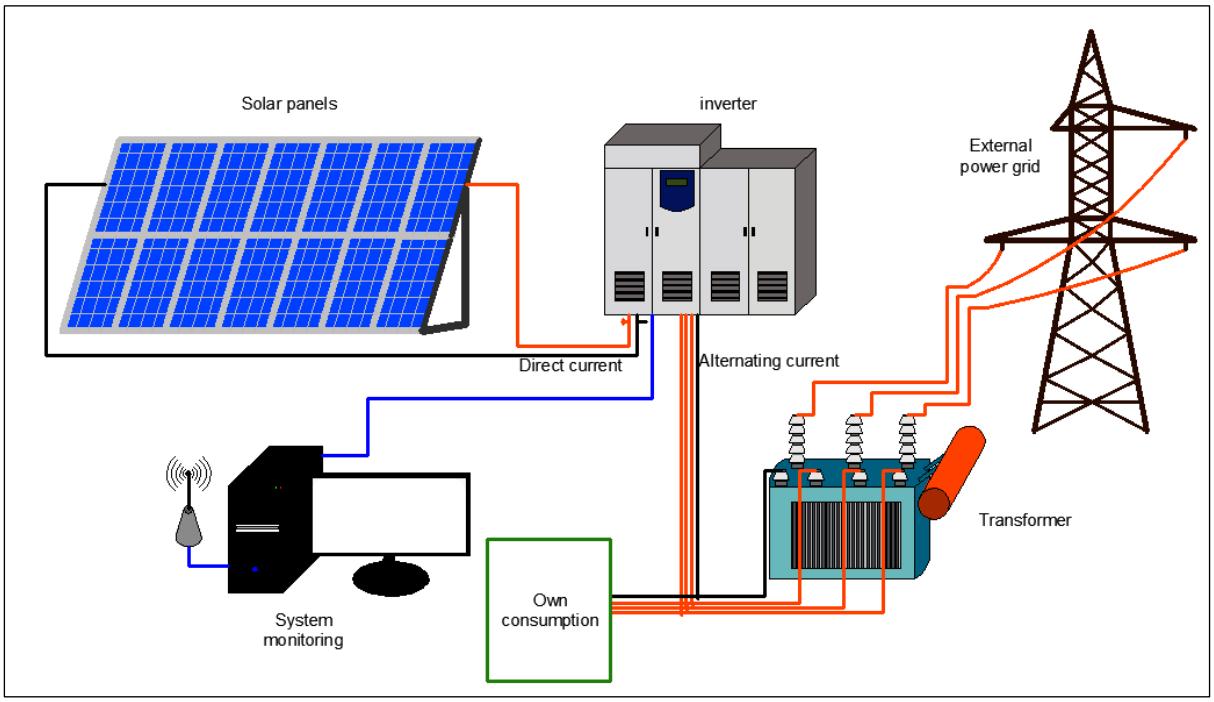


Figure 2. 24 Electricity Generation Processes

2.5 Construction Schedule and Current Conditions of the Project

The estimated construction period of the proposed project is 6 months, of which 1 week is used for construction preparation period such as preparation for electricity supply, water supply and materials arrival. The construction activities started in March, 2022 and will be finished in August, 2022. The construction processes include milestones stage, design stage, fabrication and shipping stage, civil work stage, installation stage and commercial operation stage. The construction processes will be carried out by the project proponent and there is no sub-

contractor for the construction. The following figure shows the details construction schedule of the proposed project.

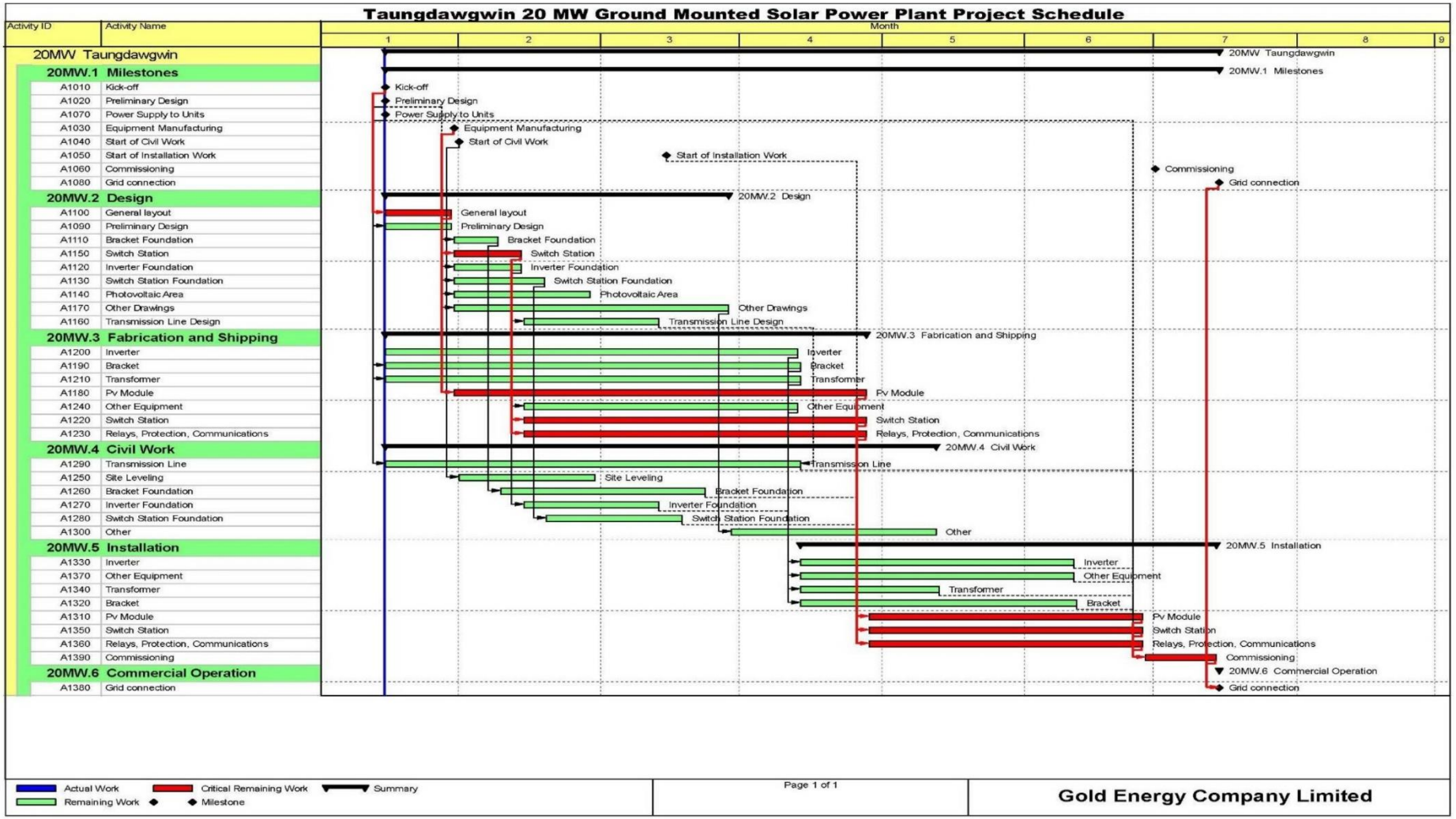


Figure 2. 25 Details Construction Schedule of the Project

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

Tracking Bracket Foundations Construction

Tracking Bracket Foundations Construction

Tracking Bracket Foundations Construction

Tracking Bracket Foundations Construction

Power Station Construction

Transformer Construction

Access Road

Access Road

Staff Quarter

Worker Camp

Myo Gyi Dam Channel within the Project

Myo Gyi Dam Channel within the Project

Outtake Transmission Line Route from the Project

Intake Transmission Route to the Taungdawgwin Substation

Figure 2. 26 Current Site Condition

2.6 Utilities

2.6.1 Construction Materials and Machines Requirement

With regards to construction materials, cement, gravel, steel, wood and chain link will be imported as well as purchased from local providers for the proposed project. Estimated construction materials requirement are 3,166 tons (cement), 4,866 tons (gravel), 380 tons (steel), 84 tons (wood) and 21,528 cubic feet (chain link) for construction phase.

Different types of construction machines and vehicles will be utilized for construction processes of the project. These include bulldozers, excavators, wheel loaders, motor graders, crawler drills, soil compactors, single drum vibrating rollers, three-wheel steel roller, mobile cranes, crawler cranes, transporters, forklifts, water bowers, prime movers, tippers and dump trucks. The following table describes detail construction machines and vehicles used for proposed project.

Table 2. 9 List of Construction Machines and Vehicles

No.	Type of Machines and Vehicles	Number of Machines and Vehicles
1.	Bulldozer	7
2.	Excavator	21
3.	Wheel loader	1
4.	Motor grader	3
5.	Crawler drill	11
6.	Soil compactor	1
7.	Single drum vibrating roller	2
8.	Three-wheel steel roller	2
9.	Mobile crane (25T)	1
10.	Crawler crane	2
11.	Forklift	1
12.	Water bowser	2
13.	Prime mover	2
14.	Transporter	1

No.	Type of Machines and Vehicles	Number of Machines and Vehicles
15.	Long body truck	2
16.	Dump truck	24
17.	Tipper	3
Total		**86**

The following figure shows construction machines and vehicles used for proposed project.

Bulldozer

Excavator


Wheel Loader

Motor Grader


Crawler Drill

Soil Compactor

Single Drum Vibrating Roller

Three-wheel Steel Roller

Mobile Crane (25 T)

Crawler Crane

Forklift

Water Bowser

Prime Mover

Transporter

Dump Truck

Tipper

Figure 2. 27 Construction Machines and Vehicles

Three vehicles will be utilized for administration, operation and utilization purposes in the project at operation phase.

2.6.2 Water Requirement

Estimated water requirement for construction processes are 500,000 gallons per month and domestic water requirement is 40,000 gallons per month. Groundwater will be pumped out from tube-wells in the project site and stored with water tanks for construction phase of the project. Drinking water will be purified with drinking water purification system.

Estimated water requirement for operation processes, especially for PV modules cleaning are 100,000 gallons per month and domestic water requirement is 14,400 gallons per month. Estimated purified drinking water for workers in operation phase is 200 gallons per month. Groundwater will be pumped out from tube-wells in the project site and stored with water tanks for operation process and domestic water. Drinking water will be purified with drinking water purification system.

2.6.3 Electricity and Fuel Requirement

Electricity for construction phase will be obtained from national grid line and estimated electricity requirement is 30 MWh per month. One generator, capacity of 65 kVA, will also install for emergency cases.

Electricity for operation phase will be obtained from national grid line and estimated electricity requirement is 10 MWh per month. One generator, capacity of 65 kVA, will also install for emergency cases.

Diesel will be mainly used for construction processes and estimated requirement is 20,000 gallons per month. Diesel will be purchased from nearby fuel station and stored with fuel tanks in the project site.

Diesel will be also mainly used for operation processes and estimated requirement is 100 gallons per month. Diesel will be purchased from nearby fuel station and stored with portable fuel tanks in the project site.

2.6.4 Human Resources Requirement

A total of 550 workers are required for construction phase of the project, including 2 foreign experts for consultation. Working hours is 8 hours per day and working days is 30 days per month. Working hours is from 9:00 am to 5:00 pm and there is only one working shift in construction phase. There are construction staff quarters for migrant workers and staffs in the project site as well as some local workers will also be employed.

Totally, 24 workers are required for operation phase of the project and working hours is 24 hours per day. Total working day is 30 days per month and there are three working shifts in a day. The project proponent will provide accommodation for the workers and staffs in project site.

2.7 Waste Generation

2.7.1 Solid Wastes Generation

Solar Power Plant: During the construction phase, main sources of solid wastes generation from the proposed project are 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 such as residue of cement, adhesive and cleaning solvents bottles. Construction soil wastes will be also excavated mainly from site preparation, access road construction and leveling activities as well as vegetation debris will be generated during site clearance activities for PV modules, switchyard, multiple-use building, staff quarters, briefing hall, kitchen and dining hall construction. Domestic solid wastes such as garbage and organic waste from construction workers camp and staff quarters, briefing hall, kitchen and dining hall are other sources of solid waste generation.

During the operation phase, there is no operation solid waste which are 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, staff quarters, briefing hall, kitchen and dining hall are common solid wastes generation.

Overhead Transmission Line: During the construction phase, vegetation debris will be generated during site clearance along right of way for overhead transmission line.

2.7.2 Liquid Waste Generation

Solar Power Plant: During the construction phase, cleaning construction machines and vehicles within the project site will generate liquid waste. 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 will be also discharged from the proposed project.

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 of staff quarters, briefing hall, kitchen and dining hall within the project site will be discharged.

Overhead Transmission Line: There is no liquid waste generated from not only construction but also operation activities of overhead transmission line.

2.7.3 Hazardous Waste Generation

Solar Power Plant: During the construction phase, damaged PV modules due to improper installation are common hazardous waste generation of the proposed project because PV modules release toxic chemicals, 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 within the project site are also common hazardous waste.

During the operation phase, damaged PV modules due to improper 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. Other hazardous wastes are used oil from transformers, oil spills and leakage from maintenance activities, vehicles, refueling and fuel storage area.

Overhead Transmission Line: There is no hazardous waste generated from not only construction but also operation activities of overhead transmission line.

3. Identification of Project proponent

The proposed project is proposed by Green Power Energy Co., Ltd., which is the subsidiaries of the Gold Energy Co., Ltd., one of the Asia World Group of Companies. The construction activities of the project started in March, 2022 and will be finished in August, 2022, and then operation processes to generate electricity from solar energy and distribute to the Taungdawgwin Substation will take 20 years. After operation period, the project proponent will submit the application to the relevant authorities to extend the operation period because the project will operate as the Build, Own, Operate (BOO) basis.

3.1 Information of the Project Proponent

Green Power Energy Co., Ltd. is the subsidiaries of the Gold Energy Co., Ltd., one of the Asia World Group of Companies and mainly responsible for electric power generation and distribution. Gold Energy Co., Ltd., one of the Asia World Group of Companies is the first private company to invest in Hydropower energy production in the Republic of the Union of Myanmar. Its initial investment is the construction of Thaukyegat (2) Hydropower Plant in Taunggoo with the total capacity of 120 MW since 2013. Moreover, it has experience for implementation of 30 MW Thapyaywa Solar Power Plant Project as the Clean Power Energy Co., Ltd. Their objective is to invest mainly in the production of energy from Solar Energy and Hydropower (Renewable Energy), which is the most needed element for the development of the country. The office address of Green Power Energy Co., Ltd. is Corner of Pyay Road and Heldan Road, No. (511-B), 5th Floor, Hledan Center, Kamayut Township, Yangon Region, Myanmar. The following table describes the management responsible persons and the following figure shows the organization chart of Green Power Energy Co., Ltd.

Table 3. 1 Mangement Responsible Persons of Green Power Energy Co., Ltd.

No.	Name of Directors	Nation Registration Card Number and Nationality	Company Address
1.	U Khin Mg Win	12/ MaYaKa (Naing) 006150 Myanmar	Corner of Pyay Road and Heldan Road, No. (511-B), 5th Floor, Hledan Center, Kamayut Township, Yangon Region.
2.	Daw Khin San Oo	12/ OuKaMa (Naing) 101222 Myanmar	Corner of Pyay Road and Heldan Road, No. (511-B), 5th Floor, Hledan Center, Kamayut Township, Yangon Region.
3.	U Thaung Kyaing	12/ DaGaNa (Naing) 011810 Myanmar	Corner of Pyay Road and Heldan Road, No. (511-B), 5th Floor, Hledan Center, Kamayut Township, Yangon Region.
4.	U Win Maung	13/ MahSaTa (Naing) 001581 Myanmar	Corner of Pyay Road and Heldan Road, No. (511-B), 5th Floor, Hledan Center, Kamayut Township, Yangon Region.
5.	U Zaw Win	13/ LaYaNa (Naing) 029236	Corner of Pyay Road and Heldan Road, No. (511-B), 5th Floor,

No.	Name of Directors	Nation Registration Card Number and Nationality	Company Address
		Myanmar	Hledan Center, Kamayut Township, Yangon Region.

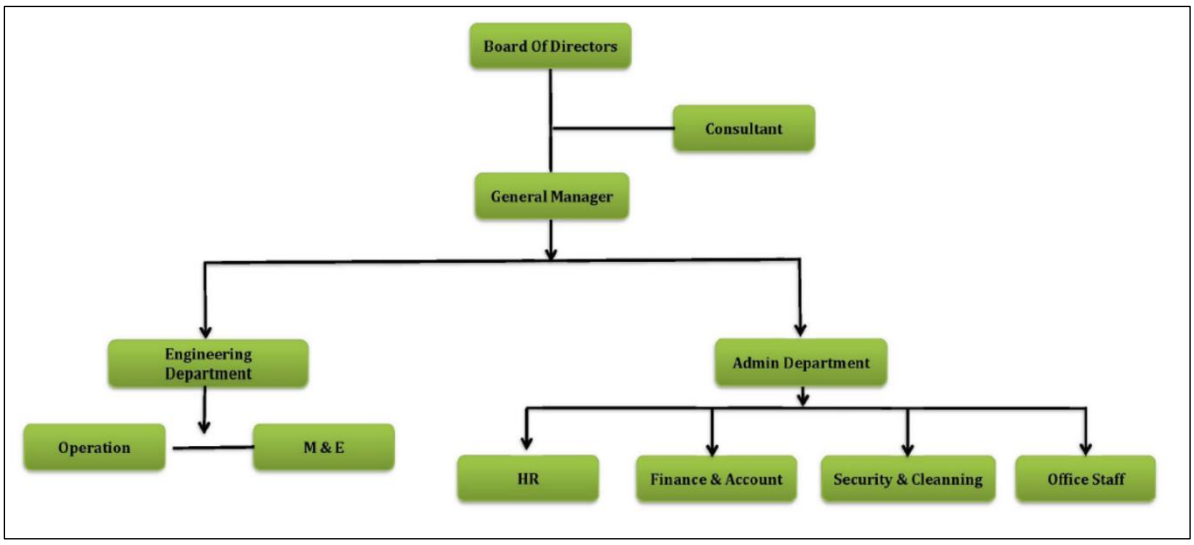


Figure 3. 1 Organization Chart of Green Power Energy Co., Ltd.

3.2 Organizational Structure of 20 MW Ground Mounted Solar Power Plant

The organizational structure of the proposed project can be generally categorized into three departments; Power Generation and Transmission Department, Construction Department and Administrative Department. Solar power generation and transmission line are managed by Power Generation and Transmission Department. Construction Department will have the responsibility for road and building and power plant structure, while Administrative Department manages finance and security matters. Consultant and Project Manager are also assigned to control operation processes and quality of the project. Board of directors manage as management responsible persons of the proposed project. The following figure shows the organization chart of the proposed 20 MW ground mounted solar power plant project.

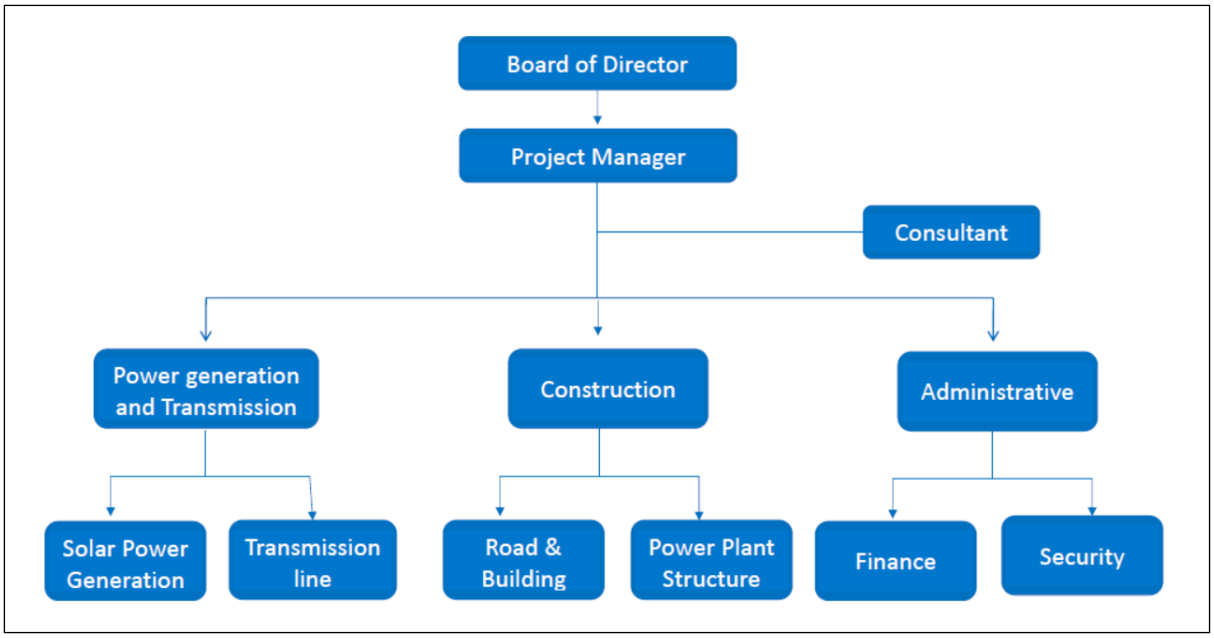


Figure 3. 2 Organization Structure of the Proposed Project

3.3 Investment Plan

The total investment amount for the proposed project is 17.43 million USD and it includes investment for cash, investment for machineries and materials, investment for furniture and equipment and investment for infrastructure. The following table describes detail investment plan for the proposed project.

Table 3. 2 Investment Plan of the Project

No.	Category	Investment Amount (Million USD)
1.	Investment for cash	0.27
2.	Investment for machineries and materials	16.87
3.	Investment for furniture and equipment	0.02
4.	Investment for infrastructure	0.27
Total		**17.43**

4. Identification of the EMP Experts

The Environmental Management Plan (EMP) Report for the proposed 20 MW Ground Mounted Solar Power Plant Project Connected to Taungdawgwin Substation is prepared by E Guard Environmental Services Co., Ltd., which hold Transitional Consultant Registration Certificate No. 00028, issued by the Environmental Conservation Department (ECD). The environmental study was carried out by the study team and the following is a summary of team member's responsibilities.

U Soe Min (Team Leader)

U Soe Min is a civil, water resources and environmental engineer with over 20 years of working experiences for government and private organizations. He is an EIA Consultant registered at ECD, MONREC with TCR No. 00067 issued in 2017. He holds Bachelor of Civil Engineering from (RIT), Yangon and Master of Environmental Engineering from (AIT), Bangkok, Thailand. He had experiences of local and international practices on construction management; contractual works; environmental equipment sales, services and marketing; and environmental consulting services. As a facilitator, he has facilitated various stakeholders meeting at the levels of union, states & regions, townships, and village tracks engaged accordingly as stipulated in MONREC, ECD's procedures. He has involved in various EIA projects SHM meetings including special economic zones developments, water way dredging, off-shore oil & gas exploration, hydropower, mining, transportation, ports, building constructions and various industrial developments. He had worked for ADB and WB as a National Consultant for environmental safeguard capacity building program. He has been working as a National Environmental Consultant for infrastructure projects funded by ADB and JICA in Myanmar. He involves in several EIA projects representing E Guard as a team leader, an environmental specialist and a civil engineer.

U Aung Myint Myat (Associate Consultant)

U Aung Myint Myat is an Associate Consultant, who holds Transitional Consultant Certificate No. 00099, described expertise is Forestry. He has Bachelor Degree in Forestry from the University of Forestry in 2014. He also obtained his Post Graduate Diploma in Geographic Information Systems from the Dagon University in February, 2019 and Post Graduate Diploma in Environmental Impact Assessment and Environmental Management System from the Yangon Technological University in July, 2019. He has eight years-experiences on environmental impact assessments and social impact assessments for development projects in Myanmar. Moreover, he led many environmental site surveys and also socio-economic surveys. Another experience is to cooperate with clients, government authorities and local people to conduct stakeholder engagement and public consultation meeting.

U Aung Si Thu Thein (Assistant 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 Shwe Ya Min Bo (Environmental Specialist)

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 more than five years-experiences in preparation of Environmental Management Plan and Initial Environmental Examination projects' reports and in participation many Environmental Impact Assessment and Resettlement Action Plan projects. She also participates in the activities of socio- economic survey, biodiversity survey, and reviewing the reports.

Daw Htet Shwe Sin Aung (Environmental Specialist)

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.

U Aung Zayar Wint (Project Assistant)

U Aung Zayar Wint is a Project Assistant in Environmental Quality Team at E Guard Environmental Services Co., Ltd. He got Bachelor Degree of Forestry from University of Forestry and Environmental Science (UFES) in 2017. He also got Post Graduate Diploma in Environmental Impact Assessment and Environmental Management System from Yangon Technological University (YTU) in 2019. He has experiences of monitoring environmental quality, writing the environmental quality reports and project monitoring reports.

U Zaw Ye Naung (Project Assistant)

U Zaw Ye Naung, a Project assistant, received Bachelor Degree in Civil Engineering from Technological University (Thanlyin) in 2020. Bachelor degree research papers, "Solid Waste Management System for Technological University (Thanlyin)" and "Drainage Design for

Downtown Yangon Region", were accomplished. He also has foreign training of "Mini Hydro power Design" at Anan Institute of Technology, Tokushima, Japan in 2016. He has experiences in environmental impact assessment, stakeholder engagements and public negotiations, social and resettlement survey. He has also participated in the activities of the assist to the EIA process and Resettlement Action Plan.

Daw May Thu Win (Project Assistant)

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.

U Khin Zaw Min (Surveyor)

U Khin Zaw Min is a Surveyor, who finished matriculation examination and has more than seven years of surveyor experience. He specializes in instrumentation and field data collection of environmental condition of the site and measuring of environment base line data.

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

E Guard Environmental Services Co., Ltd.
No. (145, A2-3), Thiri Mingalar Street, Ward No. (4),
Mayangone Township, 11062, Yangon.
Tel: +95 1 9667757,
Fax: (+95)1 9667757
E-mail: info@eguardservices.com
URL: www.eguardservices.com

5. Policy, Legal and Institutional Framework

We, Green Power Energy Co., Ltd. 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 20 MW Ground Mounted Solar Power Plant Project Connected to Taungdawgwin Substation. Moreover, we also committed to operate the proposed project by following the plans and mitigation measures stated in this EMP report.

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 20 MW Ground Mounted Solar Power Plant Project Connected to Taungdawgwin Substation operated by Green Power Energy Co., Ltd.

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. National Land Use Policy (2016)
7. Myanmar Investment Law (2016)
8. The Law Amending the Prevention and Control of Communicable Disease Law (2011)
9. Prevention of Hazards from Chemical and Related Substances Law (2013)
10. The Control of Smoking and Consumption of Tobacco Product Law (2006)
11. Myanmar Fire Brigade Law (2015)
12. Motor Vehicles Safety and Management Law (2020)
13. The Myanmar Insurance Law (1993)
14. The Public Health Law (1972)
15. Labor Organization Law (2011)
16. Settlement of Labor Dispute Law (2012)
17. The Development of Employment and Skill Law (2013)
18. The Minimum Wages Law (2013)
19. The Payment of Wages Law (2016)
20. Workmen's Compensation Act (1923)
21. The Leaves and Holiday Act (1951)
22. Social Security Law (2012)
23. Occupational Safety and Health Law (2019)
24. The Rights of National Races Law (2015)
25. The Petrol and Petroleum Product Law (2017)
26. Forest Law (2018)

27. Protection of Biodiversity and Protected Area Law (2018)
28. Import and Export Law (2012)
29. Freshwater Fisheries Law (1991)
30. The Underground Water Act (1930)
31. The Electricity Law (2014)
32. The Farm Land Law (2012)
33. Land Acquisition, Resettlement and Rehabilitation Law (2019)
34. 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 cause 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.

The environmental quality shall be within the limit of the following reference values of NEQEG.

Table 5. 1 Reference Values of NEQEG for the Project

Parameter	Unit	Guideline Value
Air Quality		
Nitrogen dioxide (1 hour)	µg/m^3	200
Sulfur dioxide (24 hours)	µg/m^3	20
Particulate Matters (PM_{10}) (24 hours)	µg/m^3	50
Particulate Matters ($PM_{2.5}$) (24 hours)	µg/m^3	25
Effluent Water Quality		
Biochemical oxygen demand	mg/l	30
Chemical oxygen demand	mg/l	125
Oil and grease	mg/l	10
pH	S.U	6-9
Total coliform bacteria	100ml	400
Total nitrogen	mg/l	10
Total phosphorus	mg/l	2
Total Suspended Solid	mg/l	50
Noise Level	**Day Time (07:00-22:00)**	**Night Time (22:00-07:00)**
Standard value for industrial, commercial	70	70
Standard value for residential	55	45

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. 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.

7. 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 ensure the prescribed insurance by rules, under section 73 of said law.

8. 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)
  (a) Mass death of animals included in birds or chicken;
  (b) Mass death of mouse;
  (c) Suspense of occurring of communicable disease or occurring of communicable disease;
  (d) 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.

9. 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.

10. 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.

11. 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.

12. 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.

13. 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 ensure the insurance for injured person under section 15 of said law.
- The project proponent has to ensure 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.

14. 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.

15. Labor 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 labor organizations systematically and independently.

- The project owner promises to allow the labor 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 labor 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 labor 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 labor 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 labor laws under section 20 of said law.
- The project proponent promises the labor organization to participate in solving the collective bargains of the employees in accord with the labor laws under section 21 of said law.
- The project proponent promises the labor 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 Labor Organization under section 22 of said law.

16. Settlement of Labor 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 labor by reducing of product without efficient cause, under section 51 of said Law.

17. 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.

18. The Minimum Wages Law (2013)

Purpose: To ensure the project owner pay the wages not less than prescribed wages and notify obviously this wage 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.

19. 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.

20. 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.

21. 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.

22. 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.

23. 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.

24. 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.

25. 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.

26. 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

27. Protection of Biodiversity and Protected Area Law (2018)

Purpose: to ensure abiding by the prohibitions and stipulations to protect biodiversity and protected area

- The project proponent has to avoid entering the prohibited area located in protected area without permission under sub-section (a) of section35.
- The project proponent has to avoid digging on the land or carrying out any activity in protected area under sub-section (c) of section35.
- The project proponent has to avoid extracting, collecting or destroying in any manner, any kind of wild or cultivated plant in protected area under sub-section (d) of section35
- The project proponent has to avoid polluting soil, water and air, damaging a water-course or poisoning water, electrification, using chemical or explosive materials in protected area under sub-section (a) of section39.
- The project proponent has to avoid possessing or disposing of toxic objectives or mineral wastes in protected area under sub-section (b) of section39.

28. Import and Export Law (2012)

Purpose: To ensure to abide by the permission for import

The project proponent has to abide by the conditions contained in permission for import if the boiler is imported, under section 7 of said law.

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 license before sinking the underground water and to abide by the conditions in license. This law focuses as follow;

- The project owner will obtain the license 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)

The 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. Land Acquisition, Resettlement and Rehabilitation Law (2019)

The project proponent shall provide concern with the compensation to landowner for the land acquisition and other related persons as the following processes-

- In the confiscated land, if there are no permanent buildings and other business buildings, the compensation for this land shall be issued to the landowner and the person concerned in the confiscated land under sub-section (a) of section 39 of said law.
- In the confiscated land, if there are permanent buildings and other business buildings, the compensation for land and building shall be issued to the landowner with local current market price under sub-section (b) of section 39 of said law.
- In the confiscated land, if there are no perennial plants, seasonal crops and livelihood business, the compensation for this land shall be issued to the landowner with local current market price under sub-section (c) of section 39 of said law.
- In the confiscated land, if there are perennial plants, seasonal crops and livelihood business as the following,
    - Three times of local current market price for perennial crop currently grown
    - Three times of local current market price based on the yield per acre for paddy and other crops grown
    - Estimated loss of income due to loss of livelihood and employment
    - Animals, other livestock and materials loss under sub-section (d) of section 39 of said law.
- The representative or effective person shall be identified and compensated for compensation under sub-section (e) of section 39 of said law.

The project proponent shall implement resettlement or rehabilitation as the following plan

- The process of land acquisition and transfer of land is initiated and the landowner is given the right to re-enforce the resettlement process under sub-section (a) of section 46 of said law.
- Housing development process, the necessary infrastructure and support for the livelihood of the households are needed. The resettlement process is including infrastructure and other needs for development of ward and village development under sub-section (b) of section 46 of said law.
- Rehabilitation processes that include livelihood activities and job placement arrangements under sub-section (c) of section 46

34. 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 programs 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.

The following table describes the list of commitments.

Table 5. 2 List of Commitments

Particular	Item	Commitment Description	Reference Chapter
Introduction	1.1	Green Power Energy Co., Ltd. strongly commits that the information about the proponent was correctly described.	3
	1.2	Green Power Energy Co., Ltd. strongly commits that the information about the environmental and social study team for the EMP report preparation was correctly described.	4
Project Description	2	Green Power Energy Co., Ltd. strongly commits that the information and data about the project and the operation process were accurate and correct.	2
Policy, Legal and Institutional Framework	3	Green Power Energy Co., Ltd. strongly commits to follow the related laws, rules, regulations, standards and guideline which was described in the EMP report.	5

Particular	Item	Commitment Description	Reference Chapter
Description of Surrounding Environment and Social Condition	4.1	Green Power Energy Co., Ltd. strongly commits not to disturb the Existing Environment Conditions expressed in Chapter 6.	6
	4.2	Green Power Energy Co., Ltd. strongly commits to consider the baseline condition of environmental and socioeconomic of the surrounding area during the construction and operation phase.	6
	4.3	Green Power Energy Co., Ltd. strongly commits that Air Quality, Water Quality and Noise Level were measured with the proper devices and compared the results with the National Environmental (Emission) Guideline.	6
Identification and Assessment of Potential Environmental Impacts and Mitigation Measures	5.1	Green Power Energy Co., Ltd. strongly commits to certainly follow the mitigation measures for avoiding and reducing the potential environmental and socio-economic impacts during the construction and operation phase.	7
	5.2	Green Power Energy Co., Ltd. specifically commits to follow the mitigation measures for air pollution during the construction and operation phase.	7
	5.3	Green Power Energy Co., Ltd. specifically commits to follow the mitigation measures for water pollution during the construction and operation phase.	7
	5.4	Green Power Energy Co., Ltd. specifically commits to follow the mitigation measures for waste disposal during the construction and operation phase.	7
	5.5	Green Power Energy Co., Ltd. specifically commits to follow the mitigation measures for noise and vibration during the construction and operation phase.	7
Environmental Management Plan	6.1	Green Power Energy Co., Ltd. commits to certainly follow the Environmental Management Plan.	8
	6.2	The compliance monitoring report will be reported annually along with the environmental monitoring plan for the construction and operation phase.	8
	6.3	Green Power Energy Co., Ltd. has established a Grievance Redress Mechanism with local people to solve the problems and complaints concerns with the project.	8
	6.4	Green Power Energy Co., Ltd. implemented the Corporate Social Responsibility Plan to support 2% of annual net profits for developing community	8

Particular	Item	Commitment Description	Reference Chapter
		development and improving socio-economic condition of local people.	
Focus Group Discussion and Information Disclosure	7.1	Green Power Energy Co., Ltd. commits that the time, date, list of attendants, the place and subject of discussion were correct.	9
	7.2	Green Power Energy Co., Ltd. commits to resolve any social and environmental related grievances locally in consultation with the aggrieved party to facilitate smooth implementation of the project.	9

GREEN POWER ENERGY COMPANY LIMITED.
511-B, 5th Floor, Corner of Pyay Road & Hledan Road, Hledan Centre, Kamayut Township, Yangon, Myanmar.
Ph; +95 9 444805511 Email; greenpowerenergycoltd@gmail.com

Commitment to Follow Legal Frameworks Including Environmental Conservation Law, Rules and Standards Stated In the Environmental Management Plan (EMP) Report

With regards to the above matter, we, Green Power Energy Co., Ltd. strongly commit that all our construction and operation activities will be performed in an environmentally friendly manner by following existing laws and regulations, especially Environmental Conservation Law (2012), Environmental Conservation Rules (2014), Environmental Impact Assessment Procedure (2015), National Environmental Quality (Emission) Guidelines (2015) and other relevant environmental standards through successful implementation of mitigation measures stated in the Environmental Management Plans (EMP) of EMP report.

Yours Sincerely,

(Zaw Win)
Managing Director
Green Power Energy Co., Ltd

GREEN POWER ENERGY CO., LTD. No. ..... Date .....

6. Description of the Surrounding Environment

The followings are the methodologies used for analyzing surrounding condition including physical environment, socio-economic environment and biological environment of the proposed project.

i) **Onsite Measurements 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 Administration 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	Purpose	Measuring Instrument
1.	Haz-Scanner EPAS	PM_{10}, $PM_{2.5}$, CO, CO_2, SO_2, NO_2	
2.	Digital Sound Level Meter	Noise level	
3.	Onsite Water Quality Monitor	Water quality	

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 22°C to 27°C year-round.

Temperature and Rainfall- The proposed project site is located at Myitthar Township, Kyaukse District, Mandalay Region. The highest temperature of Myitthar Township is 41 °C and the lowest temperature is 12 °C. Rainfall and temperature of Myitthar Township from 2016 to 2020 is described as followed.

Table 6. 2 Rainfall and Temperature of Myitthar Township

No.	Year	Rainfall		Temperature	
		Rainy Days	Total Rainfall (inches)	Summer (°C) Highest	Winter (°C) Lowest
1.	2016	45	32.98	41	12.5
2.	2017	47	37.74	39	12
3.	2018	42	21.79	38	12
4.	2019	42	26.28	38	12
5.	2020	30	17.76	38	12

Source; Myitthar 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 28th to 29th March, 2022. According to the observed data, the wind blow from North with the highest speed of 6 m/s in the project site.

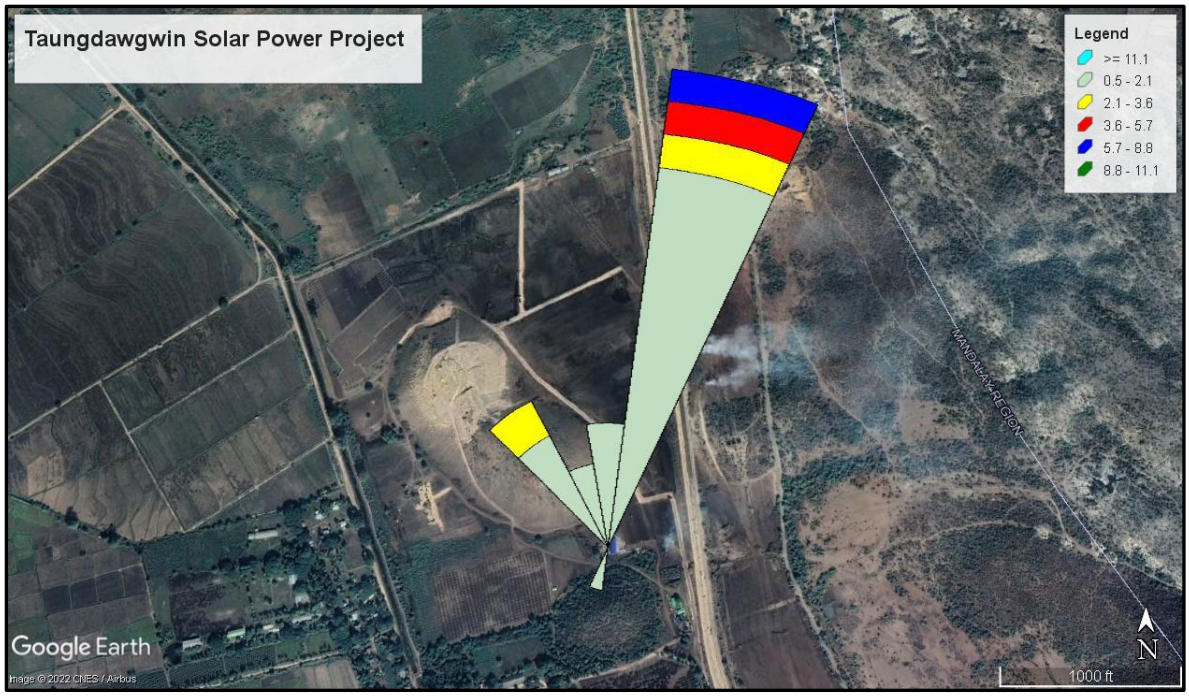


Figure 6. 1 Wind Speed and Wind Direction at the Proposed Project

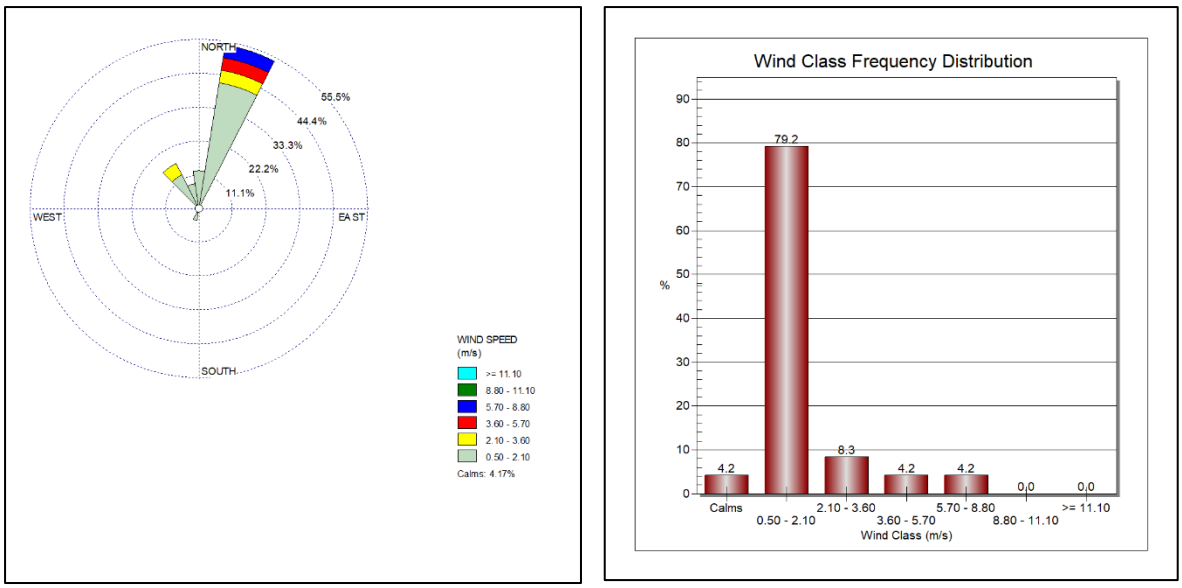


Figure 6. 2 Wind Class Frequency Distribution

6.1.3 Earthquake Intensity

Myanmar is exposed to multiple natural hazards including cyclones, earthquakes, floods and fire and it has been periodically exposed by natural disasters. The Myitthar Township is located close to the 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 of the area in Myanmar can be seen in the following figure.

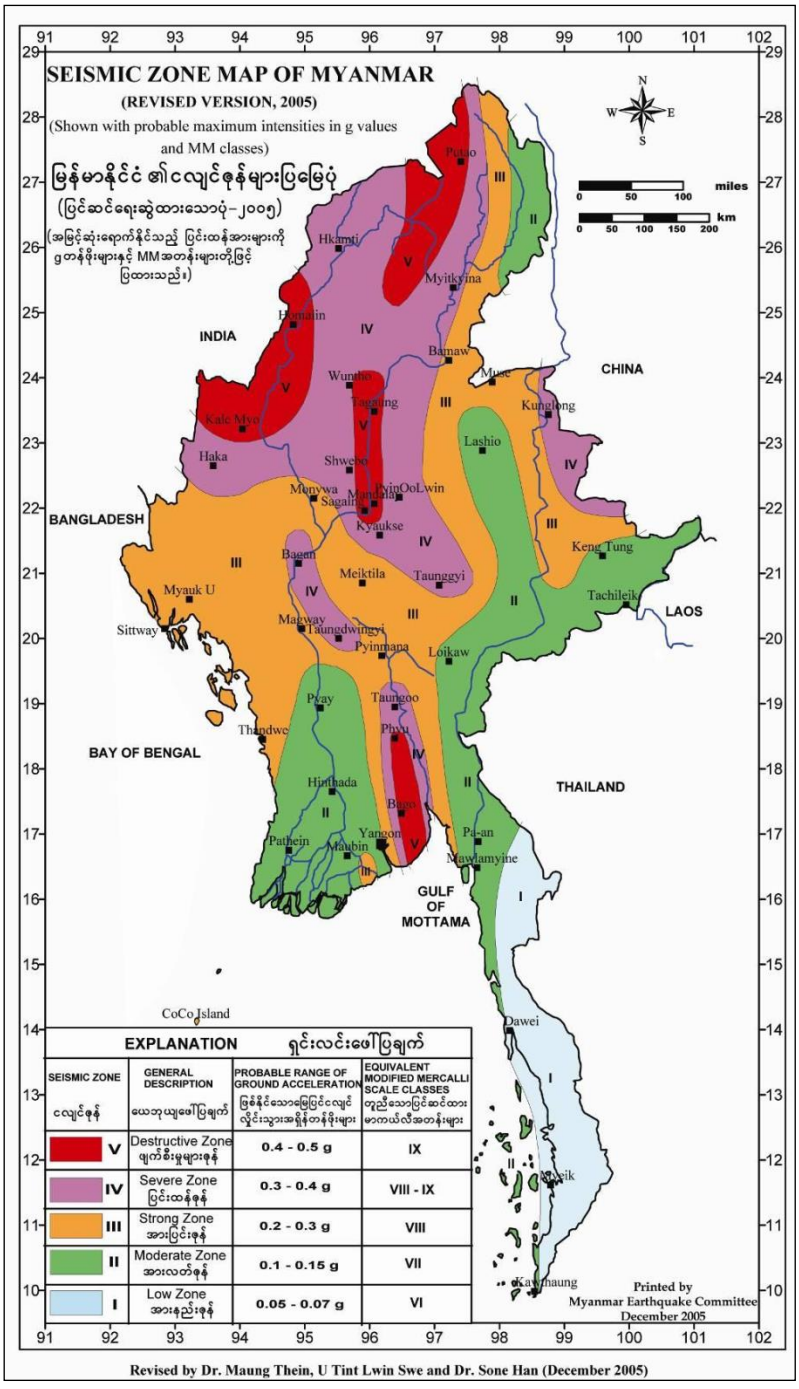


Figure 6. 3 Seismic Zone Map of Myanmar

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 Zone), Zone II (Moderate Zone), Zone III (Strong Zone), Zone IV (Severe Zone), and Zone V (Destructive 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 Zone).** Therefore, the project proponent shall consider all structural designs of the 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

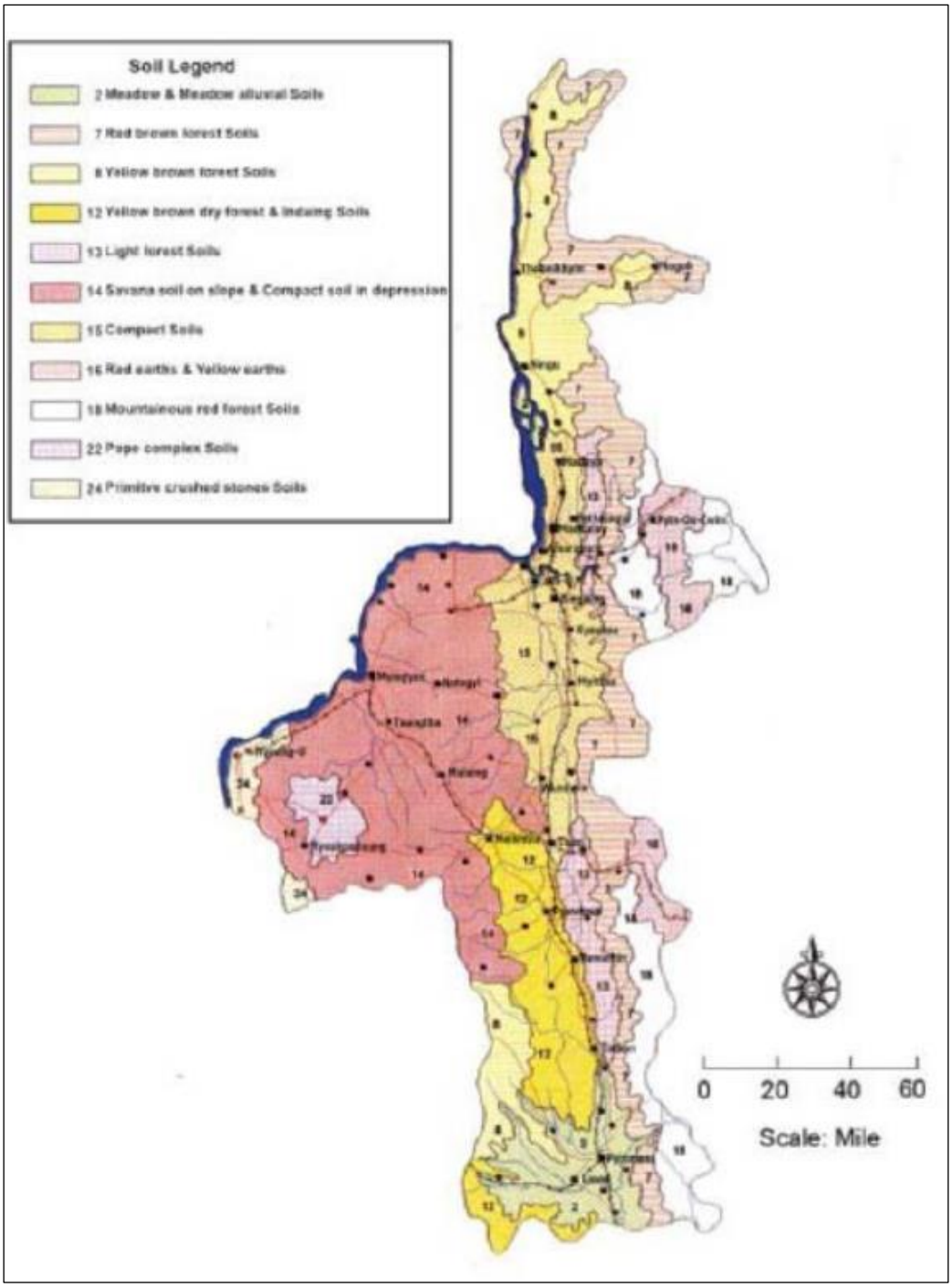
The topography of Myitthar Township is considered as mostly plain region. The well-known mountains are Pyakkhaywe Mountain, Palingu Mountain, Shwe Min Wun Mountain and Moung Mountain.

6.1.5 Hydrology

Creeks in Myitthar Township mostly flow from South to North. The Panlaung River is the well-known river, which flows from East to West near Myitthar Town and flows into the Dote Hta Waddy River at Tadaroo Township. The Samone River also flows through township from South to North and the Htonegyi Creek flows through villages in township from East to West.

6.1.6 Soil Profile

The soil type of the proposed project is Red Brown Forest Soil, which is fair class and its soil texture is clay loam and sandy loam. It is not suitable for crop cultivation and only suitable for forest. Soil depth is medium, pH level is 5.0 – 6.5, Nitrogen level is medium, Phosphorus level is low and Potassium level is medium. The following figure illustrates soil map of Mandalay Region.



Source; Land Use Division, Ministry of Agriculture and Irrigation, Myanmar.

Figure 6. 4 Soil Map of Mandalay Region

6.2 Air Quality

The emissions of dust particles and gases were monitored for 24 hours continuously at the selected site using the Portable Haz Scanner Environmental Parameter Air Station (EPAS) within the project (in front of staff quarter). The EPAS provides direct readings in real time with data logging capabilities. The following table and figure describe detail location of air quality monitoring point for the proposed project.

Table 6. 3 Location and Parameters of Air Quality Monitoring

Date	Item	GPS Coordinates	Locations	Parameters
28.3.2022 – 29.3.2022	Air Quality Monitoring Point	Lat: 21° 26' 32.86" N Long: 96° 17' 10.33" E	In front of staff quarter	**Gaseous Emission:** CO, CO_2, SO_2, NO_2 **Dust Emission:** PM_{10}, $PM_{2.5}$

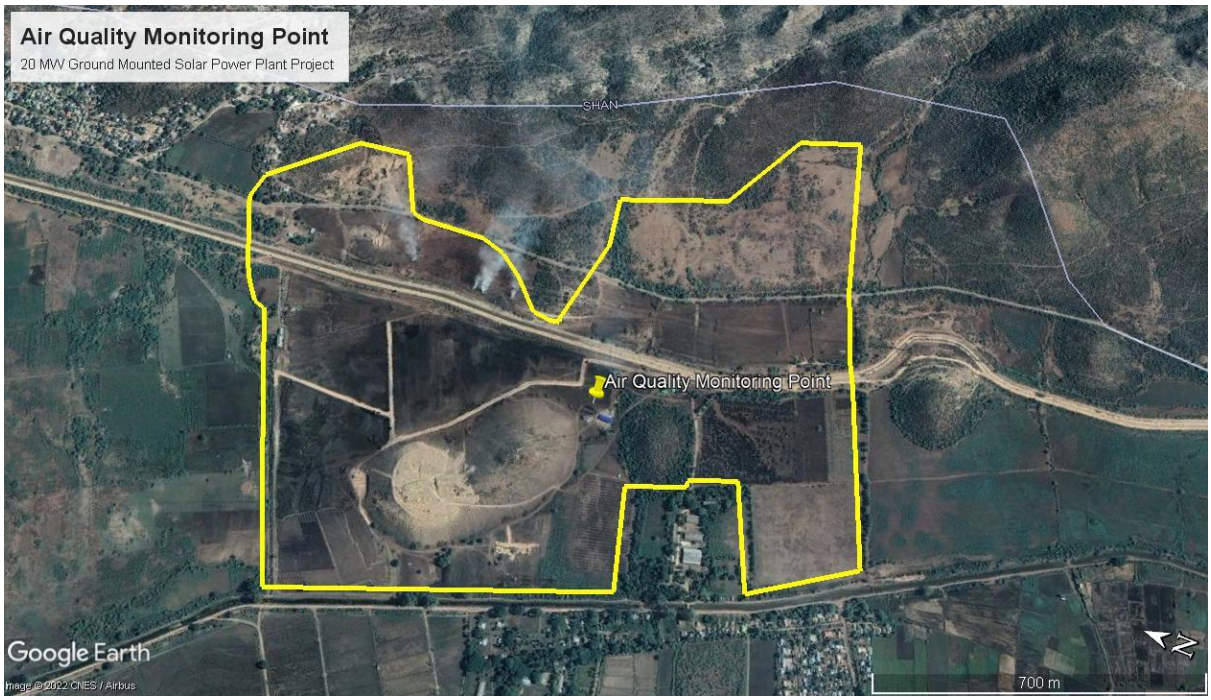


Figure 6. 5 Location of Air Quality Monitoring

The following figures illustrate air quality monitoring for the proposed project.

Figure 6. 6 Air Quality Monitoring at the Proposed Project

Air quality monitoring was carried out in the project site on 28th to 29th March, 2022. The observed values of parameters are compared with National Environmental Quality (Emission) Guideline, National Ambient Air Quality Standards and American Conference of Governmental Industrial Hygienists. The following table describes the detail results of air quality monitoring which are compared with respective guideline values for the proposed project.

Table 6. 4 Air Quality Monitoring Results

Parameter	Observed Value	Guideline Value	Guideline	Unit	Averaging Period
Gaseous Emission					
SO_2	0.14	20	NEQG	µg/m^3	24 hours
NO_2	28.97	200	NEQG	µg/m^3	1 hour
CO	0.01	9	NAAQS	ppm	8 hours
CO_2	451.72	5000	ACGIH	ppm	8 hours
Dust Emission					
PM_{10}	25.13	50	NEQG	µg/m^3	24 hours
$PM_{2.5}$	10.84	25	NEQG	µg/m^3	24 hours

According to the comparison results of gaseous emissions, the observed values of SO_2 (0.14 µg/m^3), NO_2 (28.97 µg/m^3), CO (0.01 ppm) and CO2 (451.72 ppm) are lower than the respective guideline values. For dust emissions, the observed values of PM_{10} (25.13 µg/m^3) and $PM_{2.5}$ (10.84 µg/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 during the construction phase. The project proponent must follow EMPs and mitigation measures in order to sustain baseline air quality of the project. The following figures describe detail air quality monitoring results for 24 hours continuously at the proposed project.

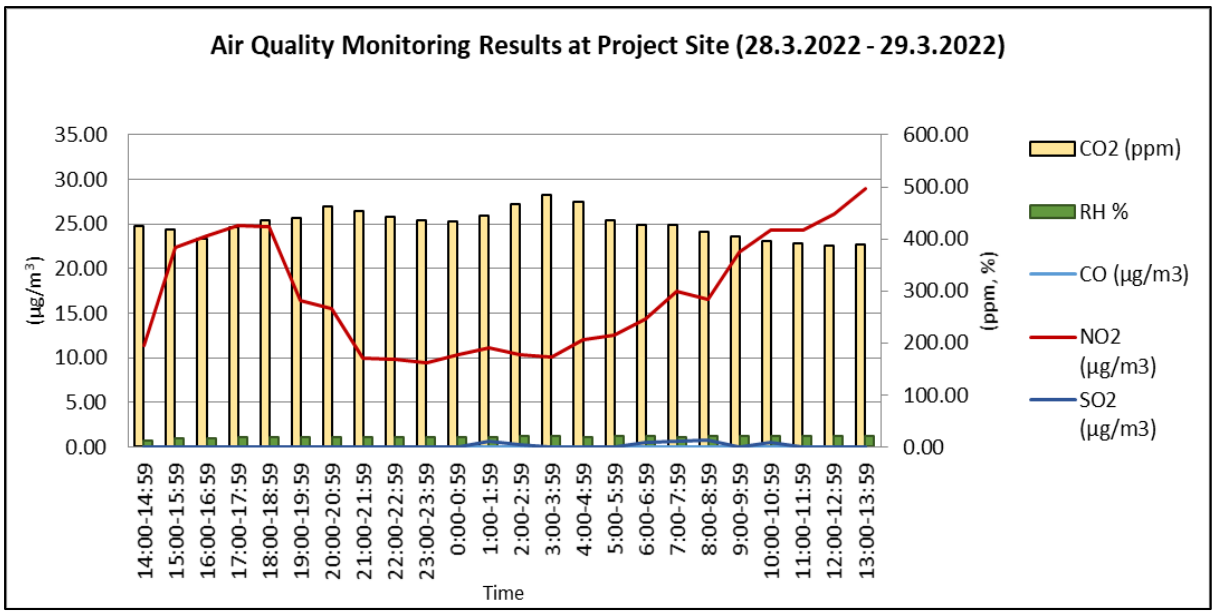


Figure 6. 7 Details Gaseous Emissions Monitoring Results

According to the results of gaseous emissions, the emission level of NO_2 increased significantly between 15:00 and 19:00, 11:00 and 14:00. The highest CO_2 emission level is found at between 2:00 and 5:00. However, steady emission level of CO and SO_2 are found during 24 hours continuous monitoring.

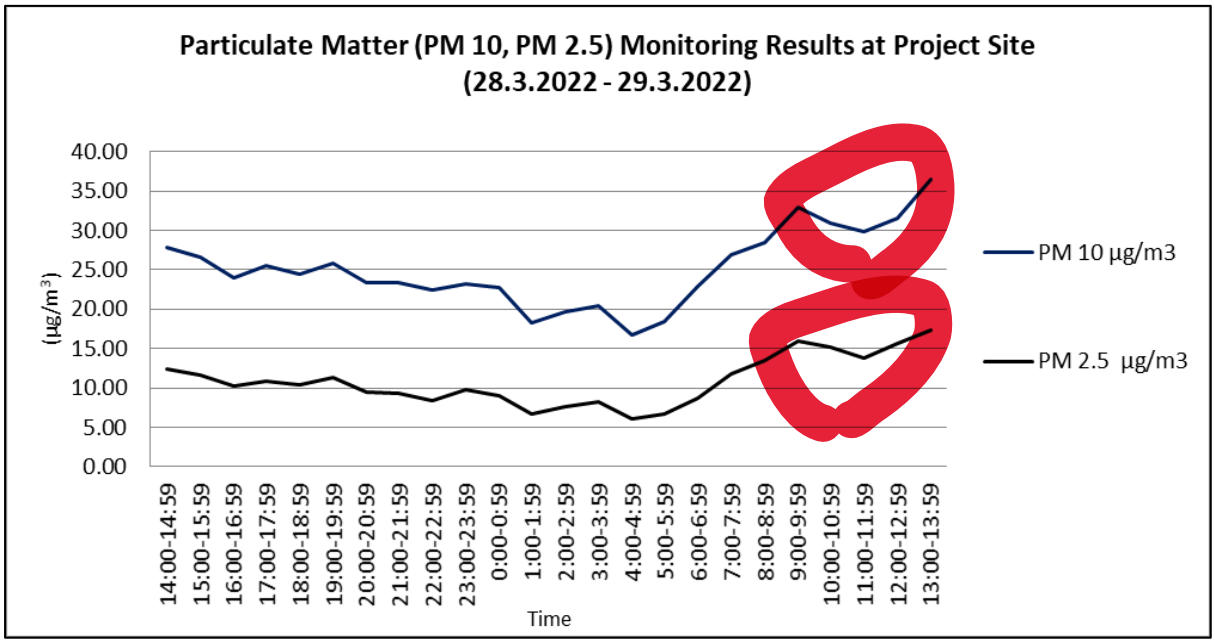


Figure 6. 8 Details Dust Emissions Monitoring Results

According to the results of dust emissions, dust generation of both PM_{10} and $PM_{2.5}$ increased dramatically from 6:00 – 7:00 and peak level of generation is at 13:00 – 14:00, which is the main construction hour of the project.

6.3 Water Quality

The water supply for the proposed project will be taken from tube wells within the project site. Therefore, groundwater quality is measured from one of the tube wells. The surface quality is also measured at the downstream of Myo Gyi Dam Channel, which passes through the project. The existing groundwater and surface water quality were tested by two methods: on-site measurement and sampling water in order to compare the difference between quality of the groundwater and surface water before and after implementation of the project. On the other hand, there is no effluent water discharge from the project, therefore, water quality measurement for effluent water was not carried out. The survey team from E Guard sampled groundwater and surface water on 30th March, 2022 and sent to respective laboratories for measuring the required parameters. National Environmental Quality (Emission) Guideline's reference values are used to compare for data interpretation. The baseline data of groundwater and surface water quality comparing with National Environmental Quality (Emission) Guideline's reference values are described in the following table. Water quality results from laboratories test and on-site measurement are attached in **Appendix- 10 and 11**. The following figures describe location of water samplings and on-site water quality measurement and water sampling.

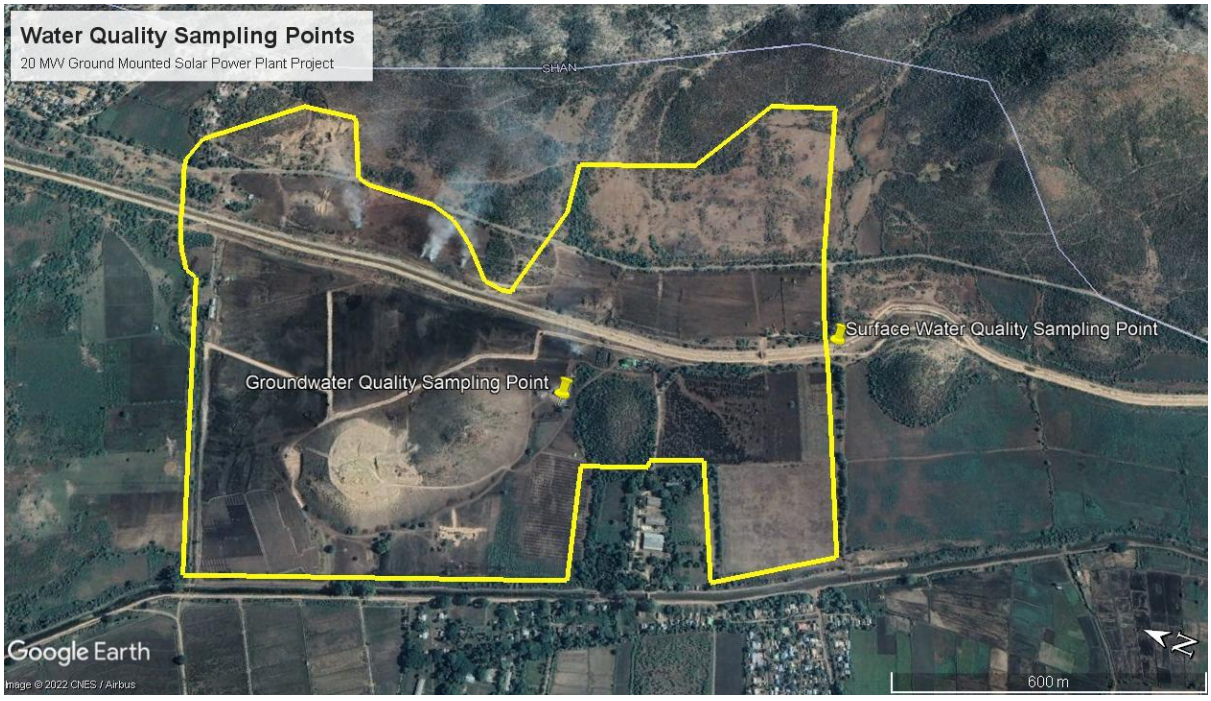


Figure 6. 9 Locations of Water Quality Monitoring

Figure 6. 10 On-site Water Quality Measurements and Water Samplings

Table 6. 5 Water Quality Results of On-site Measurement

Location	pH	Electrical Conductivity			DO (mg/l)	Turbidity (NTU)	Oxidation Reduction Potential (ORP)	Depth (ft)
		EC (ms/cm)	TDS (g/l)	Salinity (ppt)				
Groundwater	6.5	0.06	0.443	0.3	5.43	12.30	363	300
Surface Water	6.0	0.001	0.001	0.0	10.13	3.47	408	-

Table 6. 6 Water Quality Results of Water Samples

Item	Unit	Groundwater	Surface Water	National Environmental Quality (Emission) Guideline
Biological Oxygen Demand (BOD)	mg/l	2	2	30

Item	Unit	Groundwater	Surface Water	National Environmental Quality (Emission) Guideline
Chemical Oxygen Demand (COD)	mg/l	32	32	125
Total Nitrogen	mg/l	1.12	1.12	10
Total Phosphorus	mg/l	<0.01	<0.01	2
Potassium	mg/l	0.88	1.66	-
Oil and Grease	mg/l	<5	<5	10
Total suspended solid (TSS)	mg/l	19	8	50
Total coliform bacteria	CFU/100ml	6	-	400

According to the observed values, all of the parameters are within the reference values of NEQEG for not only groundwater but also surface water. Therefore, it can be considered that both groundwater and surface water quality were quite good during the construction phase. The project proponent must follow EMPs and mitigation measures in order to sustain baseline water qualities of the project.

6.4 Noise Level

Noise level LAeq (dBA) was measured at the selected locations of the project. Duration and frequency were monitored for 24 hours continuously at the selected locations by using the digital sound level meters. Noise level was 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. The following table and figure describe detail locations of noise level monitoring at the proposed project.

Table 6. 7 Location and Parameter of Noise Level Monitoring

Item	GPS Coordinates	Locations	Parameters
Point 1	Lat: 21° 26' 32.73" N Long: 96° 17' 10.40" E	In front of staff quarter	*Noise: (LAeq (dB (A))* 1hr interval for 24 hours)
Point 2	Lat: 21° 26' 46.14" N Long: 96° 17' 12.97" E	Junction of main access road and Myo Gyi Dam Channel	

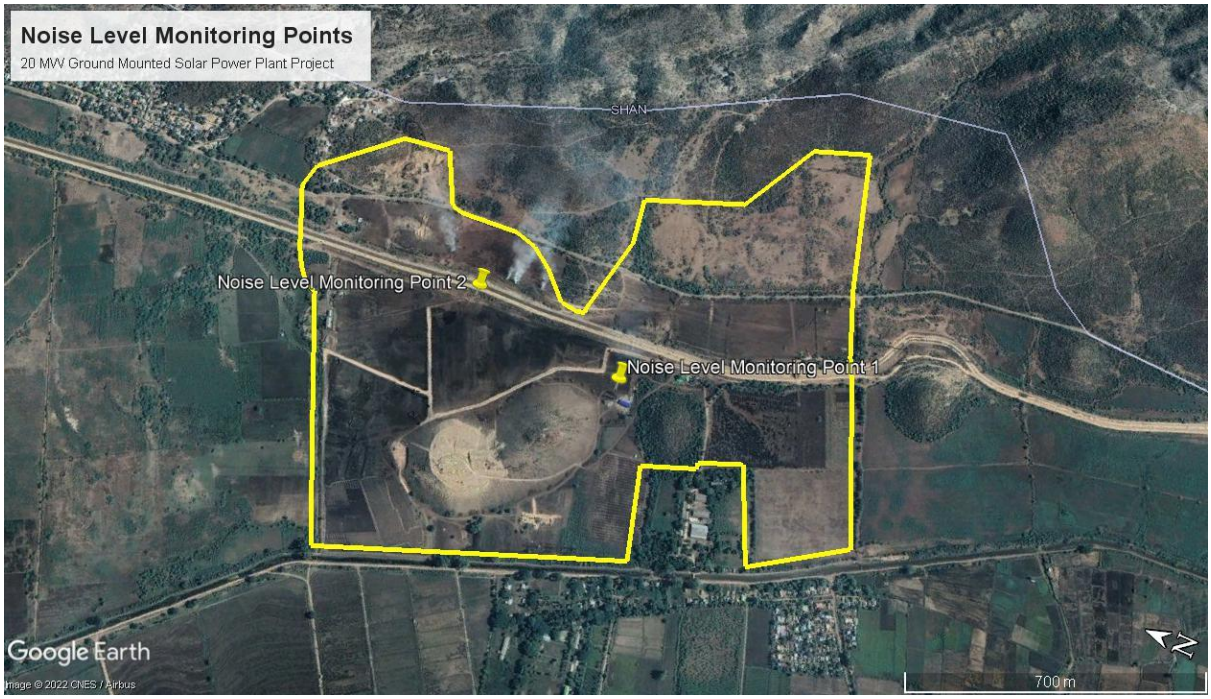


Figure 6. 11 Locations of Noise Level Monitoring

Figure 6. 12 Noise Level Monitoring at Point 1 and 2 of the Proposed Project

Hourly averaged noise levels in energy weighted values of day and night time averages are shown in the following table. The results are compared with National Environmental Quality (Emission) Guidelines.

Table 6. 8 Noise Level Monitoring Results

Location	Measured Values (dB (A))	
	Day Time (07:00-22:00)	**Night Time (22:00-7:00)**
Point 1	52.92	41.55
Point 2	54.22	40.64
Noise Level Standards from National Environmental Quality (Emission) Guidelines		
Standard value for industrial, commercial	70	70
Standard value for residential	55	45

As the proposed project is located at residential area, standard values for noise level at day time is considered as 55 dBA and at night time is 45 dBA. With regards to noise level at Point 1, the results are lower than standard value not only at day time (52.92 dBA) but also at night time (41.55 dBA). With regards to noise level at Point 2, the results are lower than standard value not only at day time (54.22 dBA) but also at night time (40.64 dBA). Therefore, it can be considered that the noise level at the proposed project is within the guideline value of NEQEG during construction phase of the project. The project proponent must follow EMPs and mitigation measures in order to sustain baseline noise levels of the project. The following figures illustrate detail noise level at Point 1 and 2 of the proposed project.

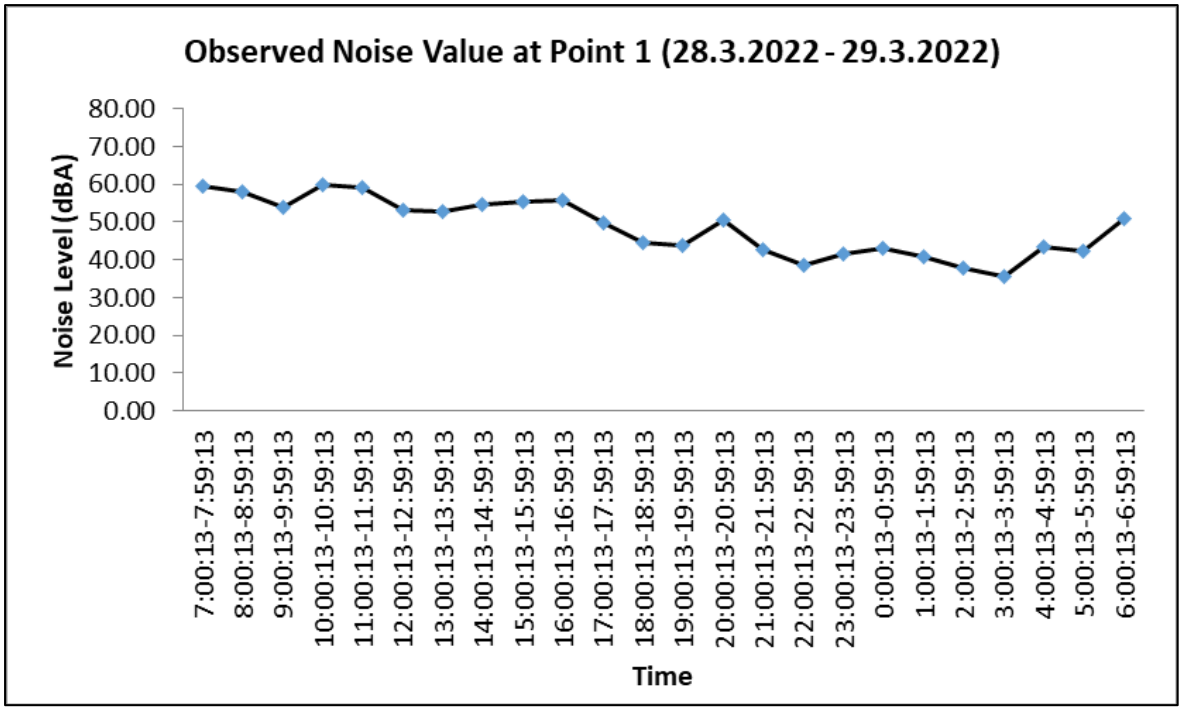


Figure 6. 13 Detail Noise Level Monitoring Results at Point 1

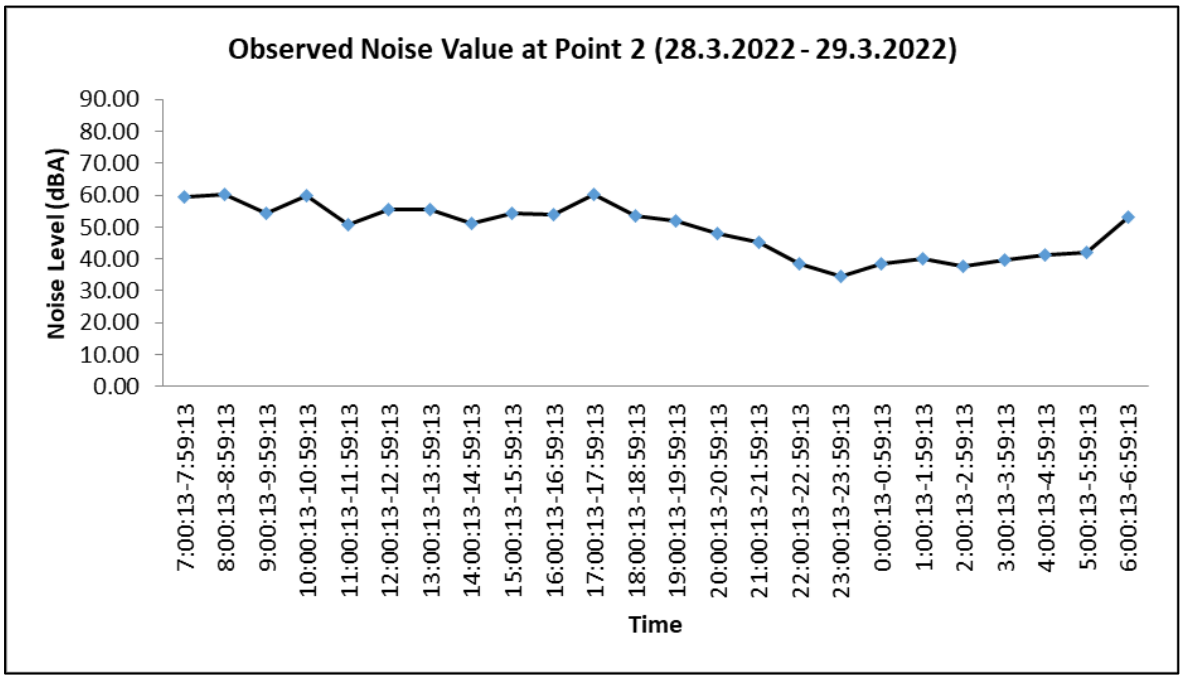


Figure 6. 14 Detail Noise Level Monitoring Results at Point 2

According to the results of noise level at Point 1, peak level of noise generation was found between 10:00 and 12:00. On the other hand, peak level of noise generation at Point 2 was found at between 10:00 and 11:00 and 17:00 and 18:00, which is construction hour of the project.

6.5 Biological Environment

The existing of biologicals as not only terrestrial but also aquatic are rare conditions and only bushes and small trees are found. In addition, there are no forests, protected areas and coastal resources within the proposed project area as well as the route of overhead transmission line, similarly.

Table 6. 9 Biological Environment of the Proposed Project

Biological Resources	Existing Conditions
Fisheries and aquatic biology	No fisheries and aquatic biology existing within the scope of the study
Wildlife	No wildlife existing within the scope of the study
Natural Vegetation	Only bushes and small trees are found within the scope of the study
Rare or endangered species	No rare or endangered species existing within the scope of the study
Protected areas	No protected areas existing within the scope of the study
Coastal resources	No coastal resources existing within the scope of the study

Source; Myitthar Township Data (GAD, 2020)

6.6 Socio-economic Environment

6.6.1 Demographic Profile

The following table describes the number of houses, households, quarter, village tracts and villages in Myitthar Township.

Table 6. 10 Administrative Structure of Myitthar Township

No.	Subject	Houses	Households	Quarters	Village Tracts	Villages
1.	Urban	6,586	7,026	11	-	-
2.	Rural	41,092	42,583	-	81	226
Total		**47,678**	**49,609**	**11**	**81**	**226**

Source; Myitthar Township Data (GAD, 2020)

The detail population status of Myitthar Township is described in the following table.

Table 6. 11 Population Status of Myitthar Township

No.	Subject	Male	Female	Total
1.	Urban	14,511	16,346	30,857
2.	Rural	81,078	87,346	168,424
Total		**95,589**	**103,692**	**199,281**

Source; Myitthar Township Data (GAD, 2020)

The detail number of ethnic people who live in Myitthar Township is described in the following table.

Table 6. 12 Ethnic Status of Myitthar Township

No.	Ethnic	Total Population in Township	Number of Ethnic People	Percentage of Total Population
1.	Kachin	199,281	-	0
2.	Kayah	199,281	-	0
3.	Kayin	199,281	-	0
4.	Chin	199,281	11	0.005
5.	Mon	199,281	-	0
6.	Bamar	199,281	199,233	99.970
7.	Rakhine	199,281	-	0
8.	Shan	199,281	24	0.012
9.	Other	199,281	-	0
Total			**199,268**	**99.990**

Source; Myitthar Township Data (GAD, 2020)

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

Table 6. 13 Religious Status of Myitthar Township

No.	Religion	Number of People
1.	Buddhist	196,193
2.	Christian	34
3.	Hindu	8
4.	Islam	3,046
Total		**199,281**

Source; Myitthar Township Data (GAD, 2020)

6.6.2 Socio-economic Profile

Socio-economic profile of Myitthar Township is summarized as the following table.

Table 6. 14 Socio-economic Conditions of Myitthar Township

Socio-economic Profile	
Population of workers	Workable population- 139,222 Workers population- 128,293 Jobless population- 10,929 Jobless percentage- 7.85%
Per capita GDP	1,082,539 (2017-2018) 1,257,049 (2018-2019) 1,195,738 (2019-2020)
Number of industries	Public factories- 3 factories Private factories- 1 factory Workshops- 0 workshop Small and medium enterprises- 154
Number of universities	N/A

Socio-economic Profile	
Number of schools	10 Pre-primary schools 136 Primary schools 20 Post-primary schools 5 Middle schools 5 Middle schools (branch) 9 High schools 8 High schools (branch) 6 Monastery schools
Literacy percentage	99.84%
Public health facilities	Public general hospitals- 5 hospitals Private hospitals- 2 hospitals Private clinics- 27 clinics Public clinics- 43 clinics
Transportation	The main transportation is occupied by roads and railways. There is no navigation and aviation transport.

Source; Myitthar Township Data (GAD, 2020)

6.6.3 Land Use Status

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

Table 6. 15 Land Use Status of Myitthar Township

No.	Type of Land	Area (Acres)
1.	Agricultural Land	126,554
	Paddy land	70,094
	Dry land	55,930
	Alluvial	-
	Garden land	530
	Dani	-
2.	Fellow Land	10,163
	Paddy land	2,473
	Dry land	7,690
	Alluvial	-
	Garden land	-
	Dani	-
3.	Grazing Land	-
4.	Industrial Land	204
5.	Urban Land	578
6.	Rural Land	3,989
7.	Other type of Land	13,032
8.	Reserved Forest/ Protected Public Forest	23,162
9.	Virgin Land	1,400
10.	Wild Land	970
11.	Non-agricultural Land	39,234

No.	Type of Land	Area (Acres)
Total		**219,286**

Source; Myitthar Township Data (GAD, 2020)

6.7 Historical and Well-known Places

An Ancient City (Pin Lal, Mine Maw), which is located at Mine Maw Village Tract, is a historical place in Myitthar Township.

7. Identification, Assessment and Mitigation Measures of Potential Impacts

7.1 Objectives of the Study

The objectives of the study are to identify 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 Taungdawgwin Substation. The construction period of the proposed project is 6 months, which was started in March, 2022 and will be finished in August, 2022.

Operation Phase: includes electric power generation from solar energy and distributing to the Taungdawgwin Substation through 33 kV overhead transmission line, which length is almost 10.139 km (6.3 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 as per Build, Own, Operate (BOO) basis. 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 wastes 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 permanent 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	Very improbable	Improbable	Probable	Highly probably	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 site 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 and operation phases, however, consideration for decommissioning phase of the project is excluded in this study.

7.5 Positive Impacts

7.5.1 Construction Phase

Job Opportunities

Providing job opportunities for civil engineers, electrical engineers, surveyors, electricians, machine operators, drivers, bricklayers, carpenters and general labors are one of the positive impacts of the project. Other service providers such as security services, cleaning and waste collection are will benefit indirectly. Especially, the proposed project will create job

opportunities as causal labors from local community. The advanced technology, skill, knowledge and experience of local community will be improved by cooperating with experienced engineers and workers of the project. The net effect of job opportunities creation is livelihood and living standard improvement of local community and poverty reduction.

Business Opportunities

A huge quantity of building and road materials such as sand, gravel, stones, woods, cement and other construction materials will be required to construct the proposed project. This will provide business opportunities for local providers and will enhance their income. The implementation of the project will also provide several business opportunities for small-scale traders and vendors of local community such as food stalls and cold drink stalls near the project site.

7.5.2 Operation Phase

Job Opportunities

Providing job opportunities for several workers such as electrical engineers, electricians, managers, cleaners, securities and drivers is one of the positive impacts due to the operation of the project. Among them, local workers and local graduates will have the chance to obtain job opportunities.

Carbon Emission Reduction and Resources Conservation

Electric power generation from solar energy emit insignificant carbon into the atmosphere. This reduces carbon emission which compared to other types of electricity generations such as coal, oil and gas power plant. With fewer carbon emissions, solar power plant has a much lower effect on climate change than fossil fuel alternatives do. Besides, the proposed project does not require any solid fuel such as coal, oil or gas mining activities for generating electricity, which has huge benefits for resources conservation.

Green Economy

Although solar power continues to account for a small share of overall energy supply, the residential and commercial sectors are slowly embracing renewable energy, especially solar energy. As cost of solar power plant implementation continue to decline, it is expected that solar energy systems become more prevalent and lead to green economy.

Revenue to National and Local Government

National and local government will earn payment of relevant taxes such as properties tax, income tax and other fees from the proposed project throughout operation lifespan of the project as the positive impact.

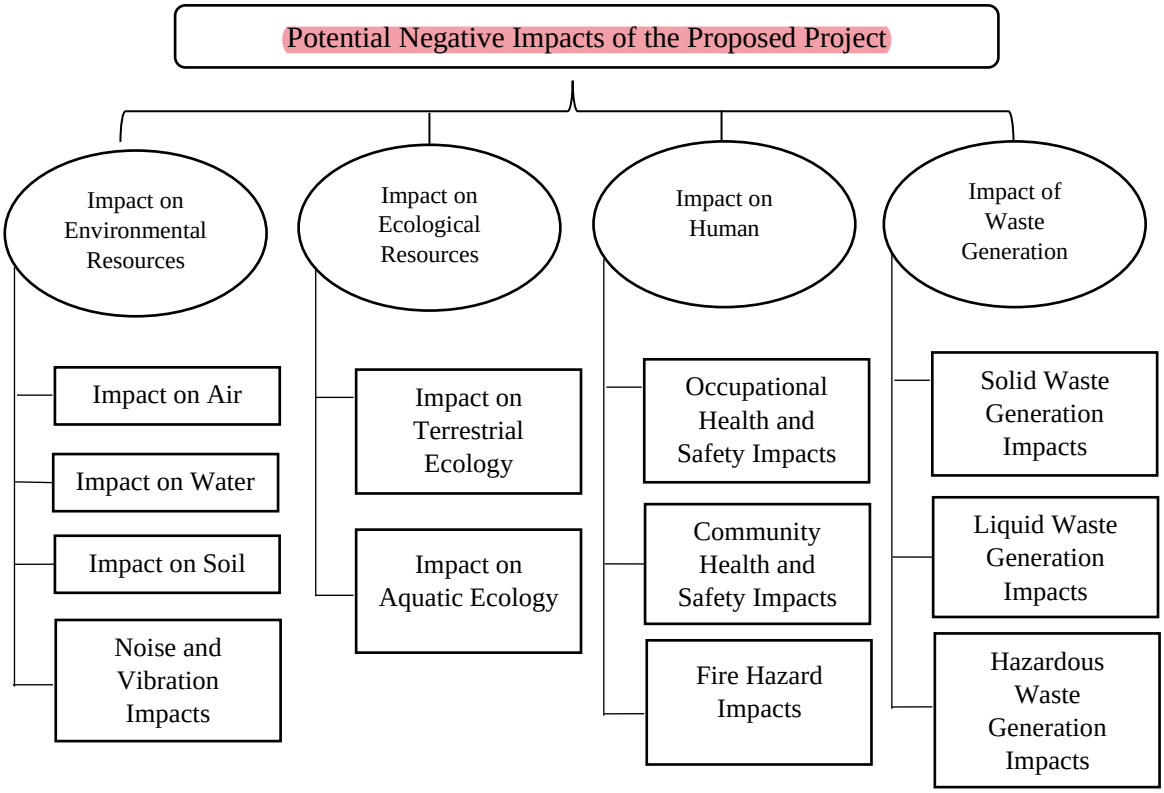
CSR Developments

The project proponent shall contribute CSR activities to surrounding local community by providing support to schools, clinics, roads and bridges throughout operation lifespan of the

project. This will lead to local community improvement due to implementation of the proposed project.

7.6 Negative Impacts

The following figure briefly describes 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.

Figure 7. 1 Potential Negative Impacts of the Proposed Project

7.6.1 Impacts on Environmental Resources

Impact on Air

Solar Power Plant: During the construction phase, the main reasons of dust emission are site clearing, leveling and earth working activities, which will get worse during dry season. Operating and movement of construction machines and vehicles such as bulldozers, excavators, wheel loaders, motor graders, crawler drills, soil compactors, single drum vibrating rollers, three-wheel steel rollers, mobile cranes, forklifts, water bowsers, primer movers, transporters, trucks and tippers as well as operating generators will cause gaseous emission and dust emission into the air. It is also anticipated that vehicles which used for delivering electrical equipment such as PV modules, tracking brackets, inverters, transformers and construction materials to the project site will also emit dust and gases. Odor from painting of multiple-use building, staff quarters, briefing hall, kitchen and dining hall will also affect indoor air quality.

During the operation phase, although, dust emission from the operation activities of the project is insignificant, gaseous emission from office vehicles, maintenance vehicles, generators,

refrigerators and air conditioning system of the project is anticipated. Odor and smoke can also be emitted from kitchen.

Overhead Transmission Line: During the construction phase, dust and gaseous emissions can cause due to operating and movement of construction vehicles and transportation vehicles. Site clearing, leveling and earth moving activities can also generate dust.

During the operation phase, operating and movement of maintenance vehicles can cause dust and gaseous emission.

Impact on Water

Solar Power Plant: During the construction phase, oil spillage and leakage from construction machines, construction vehicles, transportation vehicles and generators may contaminate groundwater and surface water of Myo Gyi Dam Channel. Water discharged from construction activities may also contaminate groundwater and surface water. Especially, concrete foundation of tracking brackets, switchyard, multiple-use building and other buildings in the project will excavate surface layer of earth and deeply excavated foundation processes need to use cement and hardener chemicals, which will impact negatively on groundwater quality. Sewage disposed of from toilets used by construction workers can also lead to groundwater pollution. Improper temporary PV modules storage, damaged PV modules released from improper installing, improper waste storage, fuel storage, refueling, machineries maintenance and parking area can also cause groundwater pollution by penetrating into groundwater layer. Water usage demand will also increase for site clearing, site preparation, water spraying activities and other water required construction activities and construction workers.

During the operation phase, 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 within the project site. Improper handling of damaged PV modules due to improper cleaning and maintenance activities and uninstalled lifespan-expired PV modules can cause groundwater pollution because these PV modules release toxic chemicals, if cracked. Water consumption will increase for cleaning PV modules in order to enhance their efficiency for generating electricity.

Overhead Transmission Line: During the construction phase, water discharged from construction activities will also contaminate groundwater and nearby surface water. Especially, concrete foundation of poles of overhead transmission line will impact negatively on groundwater quality.

Impacts on Soil

Solar Power Plant: During the construction phase, soil structure and formation will be disturbed due to site preparation and leveling activities. Especially, soil excavation for the foundation of tracking brackets, switchyard, multiple-use building and other buildings in the project can result in disturbance of soil structure, which may cause an increasing soil erosion at the project site 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 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 will also cause soil pollution.

During the operation phase, improper handling of damaged PV modules due to improper cleaning and maintenance activities and uninstalled lifespan-expired PV modules are main drivers of soil contamination because these PV modules release toxic chemicals, if cracked. Soil can also be polluted by leakage from improper waste storage, oil spillage and leakage from transformers accident, fuel storage and refueling.

Overhead Transmission Line: During the construction phase, 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.

Noise and Vibration Impacts

Solar Power Plant: During the construction phase, main sources of noise and vibration are operating and movement of construction vehicles and machines such as such as bulldozers, excavators, wheel loaders, motor graders, crawler drills, soil compactors, single drum vibrating rollers, three-wheel steel rollers, mobile cranes, forklifts, water bowsers, primer movers, transporters, trucks and tippers as well as operating generators. Improper mobilization of construction machines and vehicles, unloading electrical equipment, construction materials and other equipment will also cause noise pollution.

During the operation phase, operating generators, movement of management vehicles and maintenance vehicles mainly cause noise generation. Other sources include transformers and inverters; however, this impact is insignificant.

Overhead Transmission Line: During the construction phase, 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 can also cause noise pollution.

During the operation phase, main source of noise generation is from maintenance vehicles, however, this impact is insignificant.

7.6.2 Impacts on Ecological Resources

Impacts on Terrestrial Ecology

Solar Power Plant: The impact on terrestrial ecology is insignificance during construction and operation phases because the project is surrounded by agricultural land and farm land. Only bushes and small trees are found within the project site area and there is no huge natural vegetation or forests. There is no national park, reserved forest, protected public forest, protected area and wildlife within the scope of study area of the proposed project.

Overhead Transmission Line: Overhead transmission line will pass through mainly agricultural and farm land. Therefore, only bushes and small trees are found along the route of overhead transmission line.

Impacts on Aquatic Ecology

Solar Power Plant: The impact on aquatic ecology is insignificance during construction and operation phases because there is no marine park, coastal resource and mangrove area within the scope of study area for the proposed project. However, Myo Gyi Dam Channel passes through the project site for agricultural purposes.

Overhead Transmission Line: There is no aquatic ecology along the route of overhead transmission line as well as marine park, coastal resource and mangrove area are not situated within the scope of study area for the project.

7.6.3 Impacts on Human Resources

Impacts on Occupational Health and Safety

Solar Power Plant: During the construction phase, the common possible accidental injuries include falling from height related to ladder which can cause fatal or permanent disabling injury. 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 proper traffic sign and warning sign board can impact on the workers' occupational health and safety. 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 such as physical contact, spill, dust emission, noise and vibration. Construction workers' safety could be also affected by 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 including insect borne disease, water borne disease, and sexually transmitted infections (STIs), including HIV/AIDS. The construction workers can also be infected COVID-19 virus during Pandemic period, if they do not follow strictly the instructions.

During the operation phase, the common occupational health and safety impacts are falling from height related to ladder for maintenance activities which can cause fatal or permanent disabling injury. Small injuries due to slips and falls, accidents and electric shock can also happen. The electromagnetic field can be occurred due to the operations of PV modules and switchyard, which can impact on occupational health of workers. However, this impact is insignificant because voltage level of the project is low and the project will use qualified products and modern technology for electricity generation. Workers' safety could be affected by lack of adequate Personal Protective Equipment (PPEs) and lockout-tagout system while repair and maintenance for electrical equipment of solar power plant. Domestic wastewater

such as grey water and black water from the project can impact on occupational health 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 within the project site. Improper housekeeping is also an important factor in causing injuries, illness and property damage that may results from hazards such as trips, slips and falls, fires and pest infestation. The operation workers and staffs can also be infected COVID-19 virus during Pandemic period, if they do not follow strictly the instructions.

Overhead Transmission Line: During the construction phase, the possible accidental injury sources are 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 for overhead transmission line stringing can also impact on occupational health and safety. Poor working conditions will damage health and put workers at risk as well as operating machinery and using materials in the overhead transmission line construction can pose temporary hazard such as physical contact, spill, dust emission, noise and vibration. Lack of adequate Personal Protective Equipment (PPEs) and warning signs can also impact on construction workers' safety.

During the operation phase, falling from height related to poles of overhead transmission line for maintenance activities is main occupational health and safety impact. Other impact includes lack of adequate Personal Protective Equipment (PPEs) and lockout-tagout system while repair and maintenance for overhead transmission line.

Impacts on Community Health and Safety

Solar Power Plant: During the construction phase, the accidents due to operating and movement of construction machines, vehicles and transportation vehicles at public roads are common community health and safety impacts of the project. Activities such as earth working, site leveling, switchyard, multiple-use building, staff quarters, briefing hall, kitchen, dining hall and access road construction can generate dust, gases, noise and vibration, which can impact directly and indirectly on community health and safety in terms of nuisance and health effects. However, these impacts are insignificance because of short construction period and certain distance from nearby villages to project site.

During the operation phase, electromagnetic field can be occurred due to the operations of PV modules and switchyard, which can impact on community health of nearby villagers. However, this impact is insignificant because voltage level of the project is low and the project will use qualified products and modern technology for electricity generation. Although, there is a certain distance from project site to local communities, glint and glare from PV modules can impact on nearby local communities under particular conditions. 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 can also impact on community health and safety.

Overhead Transmission Line: During the construction phase, overhead transmission line's cable stringing and poles erection along the route is main impact of community health and safety. Other impacts are operating and movement of construction machines and vehicles.

During the operation phase, maintenance activities for overhead transmission line and climbing poles of overhead transmission line by nearby villagers are main community health and safety impacts.

Fire Hazards Impacts

Solar Power Plant: During the construction phase, poor installation of electrical equipment and overloads, heating from bunched cables and damaged cables at construction workers camp, staff quarters, briefing hall, kitchen and dining hall are common high risks of fire hazards. Improper storage of raw materials for electrical equipment and construction materials at storage yard can cause fire hazards. Fuel storage area, improper fuel handling and improper maintenance of construction machines and vehicles are also main reasons for fire hazards.

During the operation phase, improper and irregular maintenance of electrical equipment of ground mounted solar power plant are common high risks of fire hazards. 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 are other factors of fire hazards.

Overhead Transmission Line: During the operation phase, improper and irregular maintenance of overhead transmission line is main fire hazard impact.

7.6.4 Wastes Generation Impacts

Solid Wastes Generation Impacts

Solar Power Plant: During the construction phase, main sources of solid wastes generation from the proposed project are 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 such as residue of cement, adhesive and cleaning solvents bottles. Construction soil wastes will be also excavated mainly from site preparation, access road construction and leveling activities as well as vegetation debris will be generated during site clearance activities for PV modules, switchyard, multiple-use building, staff quarters, briefing hall, kitchen and dining hall construction. Domestic solid wastes such as garbage and organic waste from construction workers camp and staff quarters, briefing hall, kitchen and dining hall are other sources of solid waste generation.

During the operation phase, there is no operation solid waste which are 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, staff quarters, briefing hall, kitchen and dining hall are common solid wastes generation.

Overhead Transmission Line: During the construction phase, vegetation debris will be generated during site clearance along right of way for overhead transmission line.

Liquid Waste Generation Impacts

Solar Power Plant: During the construction phase, cleaning construction machines and vehicles within the project site will generate liquid waste. 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 will be also discharged from the proposed project.

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 of staff quarters, briefing hall, kitchen and dining hall within the project site will be discharged.

Overhead Transmission Line: There is no liquid waste generated from not only construction but also operation activities of overhead transmission line.

Hazardous Waste Generation Impacts

Solar Power Plant: During the construction phase, damaged PV modules due to improper installation are common hazardous waste generation of the proposed project because PV modules release toxic chemicals, 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 within the project site are also common hazardous waste.

During the operation phase, damaged PV modules due to improper 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. Other hazardous wastes are used oil from transformers, oil spills and leakage from maintenance activities, vehicles, refueling and fuel storage area.

Overhead Transmission Line: There is no hazardous waste generated from not only construction but also operation activities of overhead transmission line.

7.7 Impact Significance

The above-mentioned potential adverse impacts of the proposed project should be assessed in order to formulate for reducing these impacts. Therefore, the following table shows the details impact significance of potential adverse impacts of the project.

Table 7. 3 Details Impact Significance of Potential Adverse Impacts of the Project

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	**Solar Power Plant:** • 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 **Overhead Transmission Line:** • Dust and gaseous emission can occur due to operating and	4	1	2	5	35	Moderate

No.	Potential Adverse Impacts	Project Activities	Significance of Potential Adverse Impacts					Impact Significance
			M	D	E	P	SP	
		movement of construction vehicles and transportation vehicles • Site clearing, leveling and earth moving activities						
2.	Impacts on Water	**Solar Power Plant:** • Groundwater and surface water quality of Myo Gyi Dam Channel will be negatively 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	3	1	2	3	18	Low

No.	Potential Adverse Impacts	Project Activities	Significance of Potential Adverse Impacts					Impact Significance
			M	D	E	P	SP	
		• Sewage disposed of from toilets used by construction workers • 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 **Overhead Transmission Line:** • Groundwater and surface water quality will be negatively impacted by water discharged from construction activities • Especially, concrete foundation of poles of overhead transmission line						
3.	Impacts on Soil	**Solar Power Plant:**	5	1	1	5	35	Moderate

No.	Potential Adverse Impacts	Project Activities	Significance of Potential Adverse Impacts					Impact Significance
			M	D	E	P	SP	
		• 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 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,						

No.	Potential Adverse Impacts	Project Activities	Significance of Potential Adverse Impacts					Impact Significance
			M	D	E	P	SP	
		refueling, machineries maintenance and parking area **Overhead Transmission Line:** • 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						
4.	Noise and Vibration Impacts	**Solar Power Plant:** • 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 **Overhead Transmission Line:**	4	1	1	5	30	Moderate

No.	Potential Adverse Impacts	Project Activities	Significance of Potential Adverse Impacts					Impact Significance
			M	D	E	P	SP	
		• 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						
5.	Impacts on Occupational Health and Safety	**Solar Power Plant:** • 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	1	4	28	Low

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						

No.	Potential Adverse Impacts	Project Activities	Significance of Potential Adverse Impacts					Impact Significance
			M	D	E	P	SP	
		• The construction workers can also be infected COVID-19 virus during Pandemic period **Overhead Transmission Line:** • 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 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	**Solar Power Plant:** • Accidents due to operating and movement of construction machines, vehicles and	4	1	2	4	28	Low

No.	Potential Adverse Impacts	Project Activities	Significance of Potential Adverse Impacts					Impact Significance
			M	D	E	P	SP	
		transportation vehicles at public roads • Construction activities, earth working and site leveling can generate dust, gases, noise and vibration, which can impact directly and indirectly on community health and safety in terms of nuisance and health effects **Overhead Transmission Line:** • Overhead transmission line's cable stringing and poles erection along the route • Movement of construction machines and vehicles						
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	5	1	1	4	28	Low

No.	Potential Adverse Impacts	Project Activities	Significance of Potential Adverse Impacts					Impact Significance
			M	D	E	P	SP	
		construction materials at storage yard • Fuel storage area, improper fuel handling and improper maintenance of construction machines and vehicles						
8.	Solid Waste Generation Impacts	**Solar Power Plant:** • 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	4	1	1	5	30	Moderate

No.	Potential Adverse Impacts	Project Activities	Significance of Potential Adverse Impacts					Impact Significance
			M	D	E	P	SP	
		• Vegetation debris will be generated during site clearance activities • Domestic solid wastes such as garbage and organic waste from construction workers camp and staff quarters, briefing hall, kitchen and dining hall **Overhead Transmission Line:** • During the construction phase, vegetation debris will be generated during site clearance along right of way for overhead transmission line						
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	2	1	1	3	12	Very Low

No.	Potential Adverse Impacts	Project Activities	Significance of Potential Adverse Impacts					Impact Significance
			M	D	E	P	SP	
10.	Hazardous Waste Generation Impacts	• Damaged PV modules due to improper installation because PV modules release toxic chemicals, 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	4	24	Low
B.	**Operation Phase**							
1.	Impacts on Air	**Solar Power Plant:** • Gaseous emission from office vehicles, maintenance vehicles, generators, refrigerators and air conditioning system • Odor and smoke from kitchen **Overhead Transmission Line:** • Operating and movement of maintenance vehicles	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	4	4	2	4	40	Moderate

No.	Potential Adverse Impacts	Project Activities	Significance of Potential Adverse Impacts					Impact Significance
			M	D	E	P	SP	
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 transformers accident, fuel storage and refueling	3	4	1	3	24	Low
4.	Noise Impacts	**Solar Power Plant:** • Operating generators, movement of management vehicles and maintenance vehicles • Operating transformers and inverters **Overhead Transmission Line:** • Operating and movement of maintenance vehicles	3	4	1	3	24	Low
5.	Impacts on Occupational Health and Safety	**Solar Power Plant:** • Falling from height related to ladder for maintenance activities	5	4	1	4	40	Moderate

No.	Potential Adverse Impacts	Project Activities	Significance of Potential Adverse Impacts					Impact Significance
			M	D	E	P	SP	
		• 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 • Operation workers and staffs can also be infected COVID-19 virus during Pandemic period						

No.	Potential Adverse Impacts	Project Activities	Significance of Potential Adverse Impacts					Impact Significance
			M	D	E	P	SP	
		Overhead Transmission Line: • 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						
6.	Impacts on Community Health and Safety	**Solar Power Plant:** • 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 **Overhead Transmission Line:**	4	4	2	4	40	Moderate

No.	Potential Adverse Impacts	Project Activities	Significance of Potential Adverse Impacts					Impact Significance
			M	D	E	P	SP	
		• Maintenance activities for overhead transmission line • Climbing poles of overhead transmission line by nearby villagers						
7.	Fire Hazard Impacts	**Solar Power Plant:** • 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 **Overhead Transmission Line:** • Improper and irregular maintenance of overhead transmission line	5	4	1	4	40	Moderate
8.	Solid Waste Generation Impacts	• Domestic solid waste such as garbage, rejected office materials	2	4	1	3	21	Low

No.	Potential Adverse Impacts	Project Activities	Significance of Potential Adverse Impacts					Impact Significance
			M	D	E	P	SP	
		• Organic waste from multiple-use building, staff quarters, briefing hall, kitchen and dining hall						
9.	Liquid Waste Generation Impacts	• 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 of staff quarters, briefing hall, kitchen and dining hall	3	4	1	5	40	Moderate
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

During the ***construction phase***, impacts on air, soil, noise and vibration impacts and solid waste generation impacts are assessed as **Moderate Impacts** and other impacts such as impacts on water, occupational health and safety, community health and safety, fire hazards impacts and hazardous waste generation impacts are categorized as **Low Impacts** as well as liquid waste generation impact is considered as **Very Low Impact** as per the results of assessments. During the ***operation phase***, impacts on water, occupational health and safety, community health and safety, fire hazard impacts, liquid waste generation and hazardous waste generation impacts are assessed as **Moderate Impacts** and other impacts like impacts on air, soil, noise impacts and solid waste generation impacts are categorized as **Low Impacts** according to the results of assessments. The following figure illustrates detail impact significances of potential adverse impacts of the proposed project.

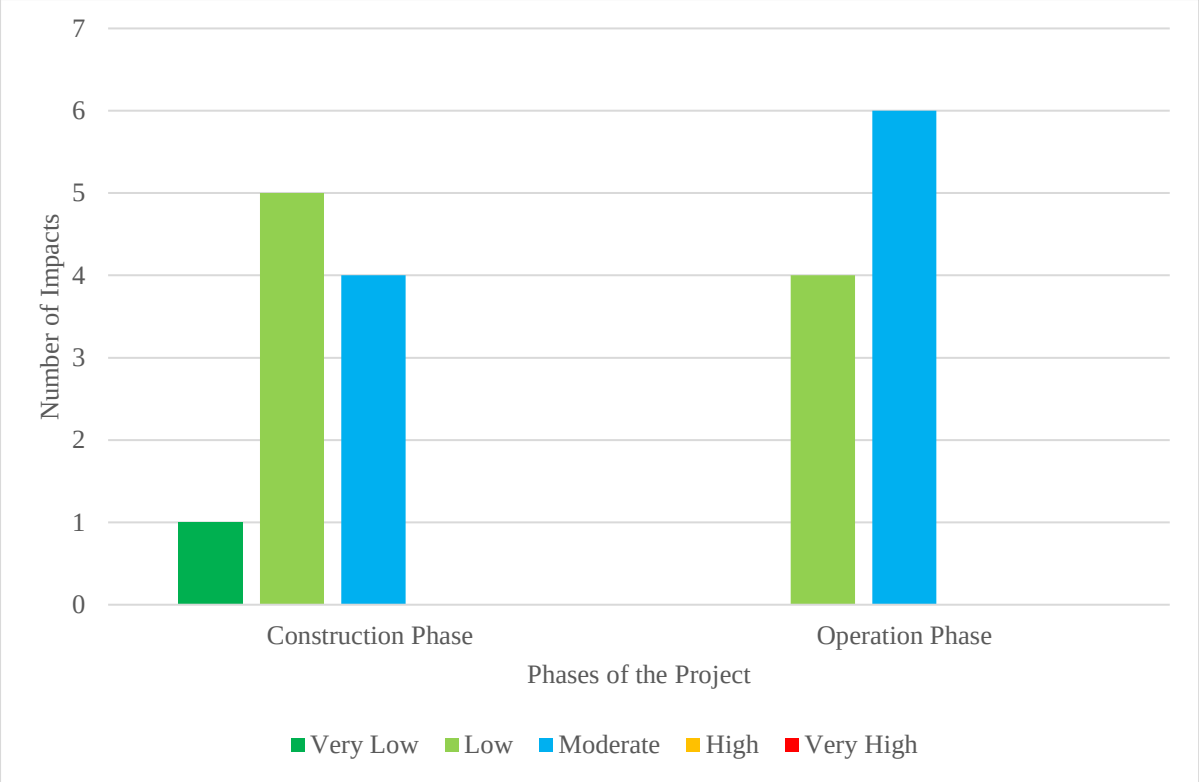


Figure 7. 2 Impact Significance of Potential Adverse Impacts of the Proposde Project

7.8 Mitigation Measures

7.8.1 Mitigation Measures for Impacts on Environmental Resources

Mitigation Measures for Impacts on Air

Solar Power Plant: During the construction phase, regular water spraying on access roads and working places must be carried out in order to control dust emission by increasing humidity of working area. If possible, access roads of the project should be paved to control dust emission. Speed of construction vehicles and transportation vehicles must be controlled within the project site for controlling dust emission. Transportation vehicles must need to install proper covers when carrying soil, sand and cement to avoid falling down along route of transportation and dust emission. Construction activities and earth working, leveling 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 in order to control dust emission from the project to nearby local community. Personal Protective Equipment (PPEs) such as masks and dust respirators must be provided for construction workers who work in intensive dust generation area. Regular inspection and proper maintenance for the construction machines, vehicles and generators must be implemented to control gaseous emission from the proposed project.

During the operation phase, all access roads within the project shall be paved for preventing dust emissions. Regular maintenance and inspection for management vehicles, maintenance vehicles, generators, refrigerators and air conditioning system must be implemented to control gaseous emission. Good ventilation system must be ensured and project proponent will install 40 air conditioners in the project to reduce adverse impacts of indoor air quality. Some shady trees must be planted to reduce impacts on air of the project.

Overhead Transmission Line: During the construction phase, 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 in order to control dust emission to nearby local community.

Mitigation Measures for Impacts on Water

Solar Power Plant: During the construction phase, site leveling should be done with minimum alteration in contour level to prevent natural drainage system of the project. Regular inspection for construction machines, vehicles and generators must be carried out to prevent oil leak and spillage. A total of 80 toilets, 10 septic tanks and 50 basins are provided for the construction workers to reduce impacts on water. Waste from construction activities and domestic solid and liquid waste shall not be disposed into the Myo Gyi Dam Channel. Moreover, the project proponent must manage groundwater usage systematically in construction activities to prevent groundwater depletion.

During the operation phase, project proponent must install proper drainage system within the project site to reduce impacts on water. PV modules cleaning and maintenance activities must be carried out properly in order to prevent damaging PV modules. Damaged PV modules and uninstalled lifespan-expired PV modules must be disposed with adequate 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. HSE Officer must monitor handling, stockpiling and disposal of PV modules as per monitoring plan. Transformers, management vehicles, maintenance vehicles and generators must be inspected and maintained regularly to reduce oil spillage. In case of transformers accident, an accident oil pool with reinforced concrete structure, which has the function of separating oil and water, will be installed in the project. After accident, separated oil will be reused. Refueling must be done properly and drainage system must be checked and cleaned properly. A total of 80 toilets, 10 septic tanks and 50 basins are provided for the operation workers and staff. Direct disposing

domestic waste from multiple-use building, staff quarters, briefing hall, kitchen and dining hall into the drains and the Myo Gyi Dam Channel must be prohibited to prevent drainage block.

Overhead Transmission Line: During the construction phase, domestic solid, liquid wastes and water discharged from construction activities shall not be discharged into the Myo Gyi Dam Channel.

Mitigation Measures for Impacts on Soil

Solar Power Plant: During the construction phase, earth working activities and concrete mixing processes for foundation of PV modules' tracking brackets, switchyard, multiple-use building, staff quarters, briefing hall, kitchen and dining hall must be carried out systematically and properly. Modernized construction machines and vehicles shall be used for the construction activities of the project. These machines and vehicles must be maintained regularly and isolated machineries maintenance area must be identified with paved ground in the project. Leak-proof fuel containers with secondary containments must be used in fuel storage area. Refueling must be done carefully for preventing oil spills and leakage. PV modules installing must be carried out properly in order to prevent damaging PV modules. If PV modules are damaged, direct buried must be strongly prohibited and disposing with adequate packaging at waste management authorities, according to the instructions of the government, must be implemented. Storage yard for electrical equipment and construction materials must be defined with impervious surface to prevent seepage into the soil layer. A total of 80 toilets, 10 septic tanks and 50 basins are provided for the construction workers to reduce impacts on soil. Some shady trees must be planted to reduce soil erosion and restore top soil.

Figure 7. 3 Leak-proof Fuel Container in the Project

During the operation phase, proper drainage system must be installed within the project site to reduce impacts on soil. PV modules cleaning and maintenance must be carried out carefully in order to prevent damaging PV modules. Damaged PV modules and uninstalled lifespan-expired PV modules must be disposed with adequate 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. HSE Officer must monitor handling, stockpiling and disposal of PV modules as per monitoring plan. Fuel storage area and

generators area must be designed with impervious surface in order to prevent seepage into soil layer. Electrical equipment maintenance especially for transformers must be carried out systematically by technicians and experts. In case of transformers accident, an accident oil pool with reinforced concrete structure, which has the function of separating oil and water, will be installed in the project. Temporary domestic waste storage area, fuel storage area and switchyard must be inspected regularly to reduce impacts on soil. A total of 80 toilets, 10 septic tanks and 50 basins are provided for the operation workers and staff.

Overhead Transmission Line: During the construction phase, earth working activities and concrete mixing processes for foundation of poles of overhead transmission line must be carried out properly. Proper management must be needed for cable stringing and vegetation clearance along right of way of overhead transmission line.

Mitigation Measures for Noise and Vibration Impacts

Solar Power Plant: During the construction phase, excessive noise and vibration generated construction activities must be notified to nearby local communities, firstly. Construction machines and vehicles used in construction activities must be inspected and maintained regularly for reducing noise and vibration. Personal Protective Equipment (PPEs) such as earplugs and earmuffs must be provided for construction workers who work in excessive noise generated area. Transportation vehicles' drivers should be instructed to avoid gunning of vehicle engines or hooting when passing through sensitive areas such as schools and hospitals across transportation routes. Unloading electrical equipment and construction raw materials must be done properly. Highly noise and vibration generated construction machines and generators must be placed in enclosures to minimize noise generation. Noise and vibration generated construction activities must not be carried out at night, if possible.

During the operation phase, generators, inverters, transformers, management vehicles and maintenance vehicles must be inspected and maintained regularly to reduce noise pollution. Silence-type generator is recommended to use and some shady trees must be planted to reduce noise impacts. On the other hand, no specific mitigation measures are required to reduce vibration impacts because all of the electricity generation processes from ground mounted solar power plant and electricity distributing processes to the Taungdawgwin Substation via overhead transmission line do not generate vibration significantly.

Overhead Transmission Line: During the construction phase, 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 such as schools and hospitals across transportation routes. Noise and vibration generated construction activities must not be carried out at night, if possible.

7.8.2 Mitigation Measures for Impacts on Ecological Resources

Mitigation Measures for Impacts on Terrestrial Ecology

Solar Power Plant: Vegetation clearance beyond designated area of ground mounted solar power plant must be prohibited strongly. Introduction of exotic species by workers shall not be allowed during the construction and operation phase of the project.

Overhead Transmission Line: Vegetation clearance within right of way of overhead transmission line must be minimized as much as possible.

Mitigation Measures for Impacts on Aquatic Ecology

There is no marine park, coastal resource, mangrove area as well as water body such as river, creek, stream, lake and reservoir within the scope of study area for the proposed project. However, the Myo Gyi Dam Channel passes through the project for agricultural purposes and waste from construction activities and domestic waste shall not be disposed into the channel.

7.8.3 Mitigation Measures for Impacts on Human

Mitigation Measures for Occupational Health and Safety Impacts

Solar Power Plant: During the construction phase, personal fall restraint system must be provided for installation workers who are working at height. Lockout-tagout system must be used for installation of electrical equipment. The project proponent provides 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 to reduce occupational health and safety impacts. The project proponent must monitor regularly whether construction workers use PPEs adequately or not for ensuring safe working site. Besides, safety notices and emergency contact numbers of the Fire Services Department, Hospitals and Police Stations and contact persons for emergency cases must be tagged at noticeable places of the project site. First aid training, safety training, firefighting training, electrical equipment installation training and other essential trainings for construction activities must be arranged for all construction workers and first aid kits must be provided in the project site. HSE Officer carries out toolbox meeting every morning before working hours and safety meeting every week. Safety induction meetings are also provided for every fresh worker. Construction machines and construction vehicles must be operated by trained and licensed industrial machine operators. The project proponent must 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 at the project site. The project proponent provides purified drinking water to prevent health risk of workers. Especially, all construction workers must follow the instructions to prevent COVID-19 virus infection during pandemic period.

During the operation phase, personal fall restraint system must be provided for maintenance workers who are working at height. Lockout-tagout system must be used for maintenance of electrical equipment. The project proponent must provide Personal Protective Equipment (PPEs) such as safety helmets, safety gloves, reflected safety suits and safety boots for all maintenance workers to reduce occupational health and safety impacts. The project proponent must monitor regularly whether maintenance workers use PPEs adequately or not for ensuring safe working site. Besides, safety notices and emergency contact numbers of the Fire Services

Department, Hospitals and Police Stations and contact persons for emergency cases must be tagged at noticeable places of the project site. First aid training, safety training, firefighting training, electrical equipment repairs and maintenance training and other essential trainings for operation processes of electricity generation and distributing must be arranged for all workers and first aid kits must be provided in the project site. All energized electrical equipment of the project must be marked with warning signs. Proper management for electricity generation and distributing such as checking all electrical cords, cables and do not use overload voltage must be carried out. The voltage level of the project is low and the project will use qualified products and modern technology for electricity generation, therefore, the power frequency electromagnetic field generated has little impacts on occupational health and safety. Moreover, housekeeping staffs must be trained and assigned to do regular cleaning and housekeeping for prevention of accidents due to poor housekeeping in the project. The project proponent must manage the drainage systems of the project properly and provide purified drinking water to prevent health risk of workers. Especially, all operation workers and staff must follow the instructions to prevent COVID-19 virus infection during pandemic period.

Overhead Transmission Line: During the construction phase, 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) such as safety helmets, splash goggles, dust respirators, ear muffs, safety gloves, reflected safety suits and safety boots for all construction workers to reduce occupational health and safety impacts. The project proponent must monitor regularly whether construction workers use PPEs adequately or not for ensuring safe working site. Cable stringing processes must be carried out properly to reduce occupational health and safety impacts. Construction machines and construction vehicles must be operated by trained and licensed industrial machine operators.

During the operation phase, personal fall restraint system must be provided for overhead transmission line maintenance workers who are working at height. The project proponent must provide Personal Protective Equipment (PPEs) such as safety helmets, safety gloves, reflected safety suits and safety boots for all maintenance workers to reduce occupational health and safety impacts. The project proponent must monitor regularly whether maintenance workers use PPEs adequately or not for ensuring safe working site.

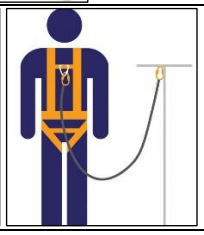
Figure 7. 4 Tagged Safety Signages in the Project

Figure 7. 5 Toolbox Meeting and Safety Induction

Figure 7. 6 Drinking Water Purification System

Table 7. 4 Types of PPEs and Their Functions

Function of PPEs	Feature and Characteristics
Protective Goggles (Suitable for protection from dust, particle, chips, chemical splattering)	
Goggles with direct vents are suitable for protection from chemical splattering or smoke.	
Hearing Protection	

Function of PPEs	Feature and Characteristics
Cotton earplugs: disposable earplugs for short- term use – not suitable for high noise levels	
Earmuffs: They offer a high level of sound reduction and are suitable for high noise levels. They can be used in combination with a safety helmet.	 
Respiratory Protection	
Dust mask: lightweight mask that is fitted over the nose and mouth and secured behind the head with elastic.	
Head Protection	
Use head gear which conforms to recognized safety standards	
Hand and Arm Protection	
Gloves for common tasks (cotton/ leather)	
Foot Protection	
Select footwear that fits the purpose and conforms to recognized safety standards.	
Body Protection	
Reflective clothing: For working in busy traffic: brightly-colored reflective clothing can increase the visibility of employees and reduce their chances of being struck by vehicles or machinery	
High fall protective equipment (personal fall restraint system): to prevent construction workers from falling off of overhead platforms, elevated work stations or into holes in the floor and walls.	 

Mitigation Measures for Community Health and Safety Impacts

Solar Power Plant: During the construction phase, construction vehicle drivers and transportation vehicle drivers must drive carefully with low speed at public road while mobilizing, transporting electrical equipment and construction materials to reduce community

health and safety impacts. Public road, nearby project site, must be cleaned and repaired, if damaged after the construction period.

During the operation phase, voltage level of the project is low and the project will use qualified products and modern technology for electricity generation, therefore, the power frequency electromagnetic field generated has little impacts on community health and safety. The project proponent must follow international standards to generate electricity and distribute to Taungdawgwin Substation. Before PV modules installation, project proponent must assess glint and glare on nearby local communities and consult with experts to reduce glint and glare impacts. Safety notices and warning signs must be tagged at the fence of the project site in order to prohibit local people entering the project area without permission.

Overhead Transmission Line: During the construction phase, cable stringing and poles construction for overhead transmission line must be informed to nearby local community and done properly to reduce community health and safety impacts.

During the operation phase, safety notices and warning signs must be tagged at poles of overhead transmission line to prohibit local people climbing poles.

Mitigation Measures for Fire Hazard Impacts

Solar Power Plant: During the construction phase, construction machines and vehicles and electrical system of construction worker camps and staff quarters must be inspected and maintained regularly. Fire extinguishers must be installed at storage yard, fuel storage area, generators, construction worker camps and staff quarters. A total of 16 fire extinguishers (3 kg and 5 kg) and 16 fire extinguisher balls are installed and 2 water bowsers are standby in the project for firefighting. Firefighting equipment must be inspected regularly. Water for firefighting must be stored adequately and properly with storage tanks. Firefighting training and fire drills must be provided for all construction workers in order to extinguish fire cases. Besides, safety notices and emergency contact numbers of the Fire Services Department, Hospitals and Police Stations and contact persons for emergency cases must be tagged at noticeable places of the project site. An assembly point is assigned for emergency cases to gather construction workers and smoking must be strongly prohibited in the project site.

During the operation phase, maintenance activities must be implemented regularly and properly for electrical equipment of ground mounted solar power plant to protect fire hazards. Fire extinguishers must be installed at fuel storage area, generators, switchyard, multiple-use building and other buildings. 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. Firefighting training and fire drills must be provided for all workers in order to extinguish fire cases. Fire protection lane must be defined around the project site to prevent fire in dry season. Water must be stored adequately and properly with storage tanks for other type of fire cases. Fire hose reels and fire hydrants must be installed to extinguish fire by using water for other types of fire. An assembly point must be assigned for emergency cases to gather workers and smoking must be strongly prohibited in the project site. Visible and audible fire alarm system must be installed and emergency routes and exists must be assigned at multiple-use building and other buildings, these emergency routes and exists must not be blocked.

Besides, safety notices and emergency contact numbers of the Fire Services Department, Hospitals and Police Stations and contact persons for emergency cases must be tagged at noticeable places of the project site.

Overhead Transmission Line: During the operation phase, maintenance activities must be implemented regularly and properly for overhead transmission line to protect fire hazards.

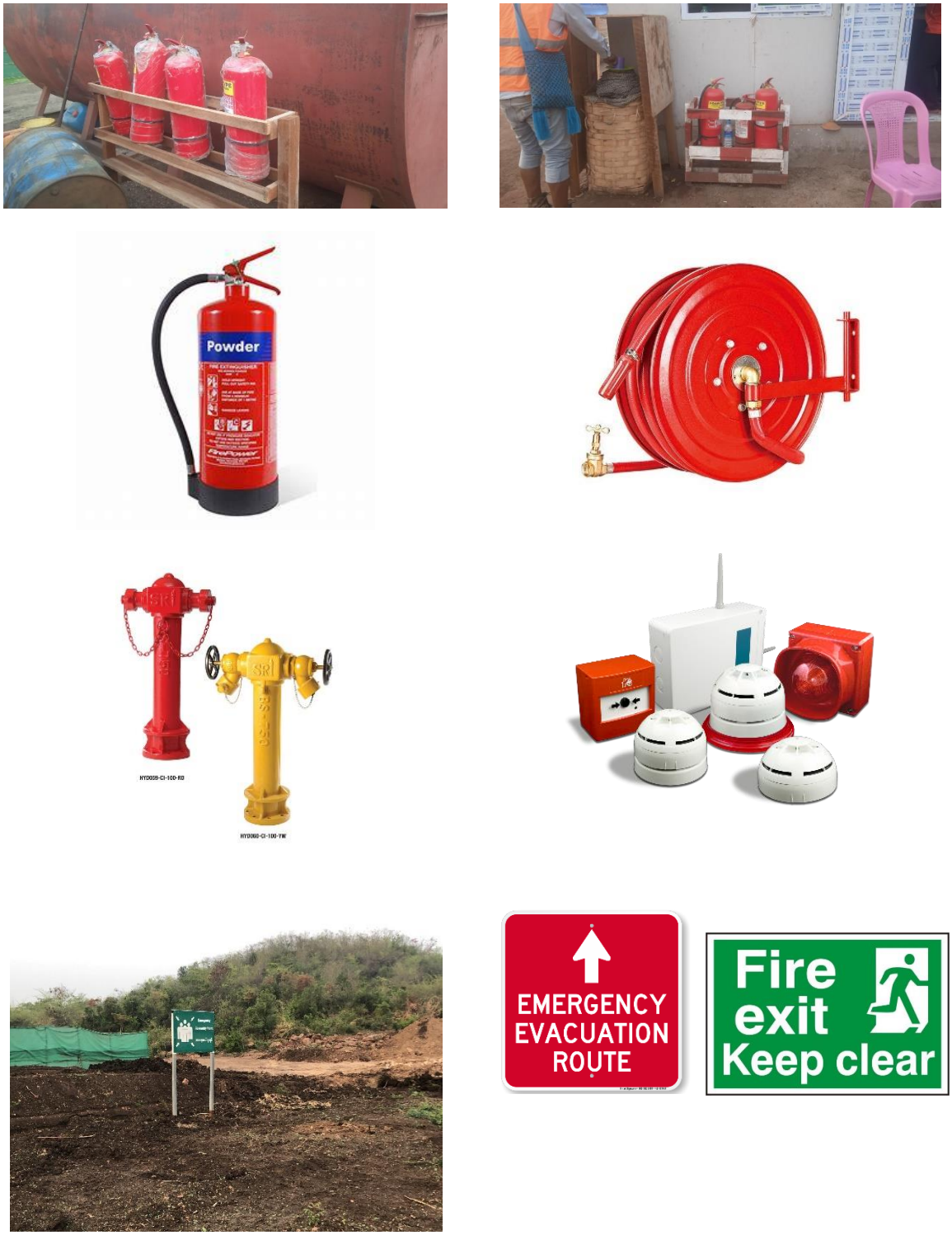


Figure 7. 7 Firefighting Equipment, Assembly Point and Singage

7.8.4 Mitigation Measures for Waste Generation Impacts

Mitigation Measures for Solid Waste Generation Impacts

Solar Power Plant: During the construction phase, vegetation debris generated from land clearance activities must be collected at separate place and excavated soil must be reused at other places of the project as soil filing and leveling activities. The project proponent must calculate detail requirement of raw materials for purchasing electrical equipment and construction materials to reduce solid waste generation. Recycling, reuse and refurbishment of solid waste will reduce the amount of construction waste other than disposal. The project proponent defines temporary disposal site within the project, before final disposal and these wastes must be segregated by using different appropriate waste bins. Direct disposing domestic waste from multiple-use building, staff quarters, briefing hall, kitchen and dining hall into the drains and the Myo Gyi Dam Channel must be prohibited to prevent drainage block. Burning and landfilling solid waste at the project site must be strictly prohibited and final disposal must be transferred to the Township Development Committee.

During the operation phase, there is no operation solid waste generation from electricity generation and distributing processes of the proposed project. However, the project proponent must define temporary disposal site within the project for domestic waste, before final disposal and domestic solid wastes from multiple-use building, staff quarters, briefing hall, kitchen and dining hall must be segregated by using different appropriate waste bins. Burning and landfilling solid waste at the project site and disposed of into the Myo Gyi Dam Channel must be strongly prohibited and final disposal must be transferred to the Township Development Committee.

Overhead Transmission Line: During the construction phase, vegetation debris generated from land clearance activities along right of way of overhead transmission line must be collected at separate place and excavated soil must be reused as soil filing and leveling activities.

Figure 7. 8 Waste Bins and Temporary Waste Disposal

Mitigation Measures for Liquid Waste Generation Impacts

During the construction phase, sanitation facilities such as toilets, washing basins and septic tanks must be provided adequately. Therefore, a total of 80 toilets, 10 septic tanks and 50 basins are provided for construction workers in order to control domestic wastewater.

During the operation phase, project proponent must install proper drainage system within the project site to reduce liquid waste generation impacts. Sanitation facilities such as toilets, washing basins and septic tanks must be provided adequately. Therefore, a total of 80 toilets, 10 septic tanks and 50 basins are provided for operation workers and staff in order to control domestic wastewater.

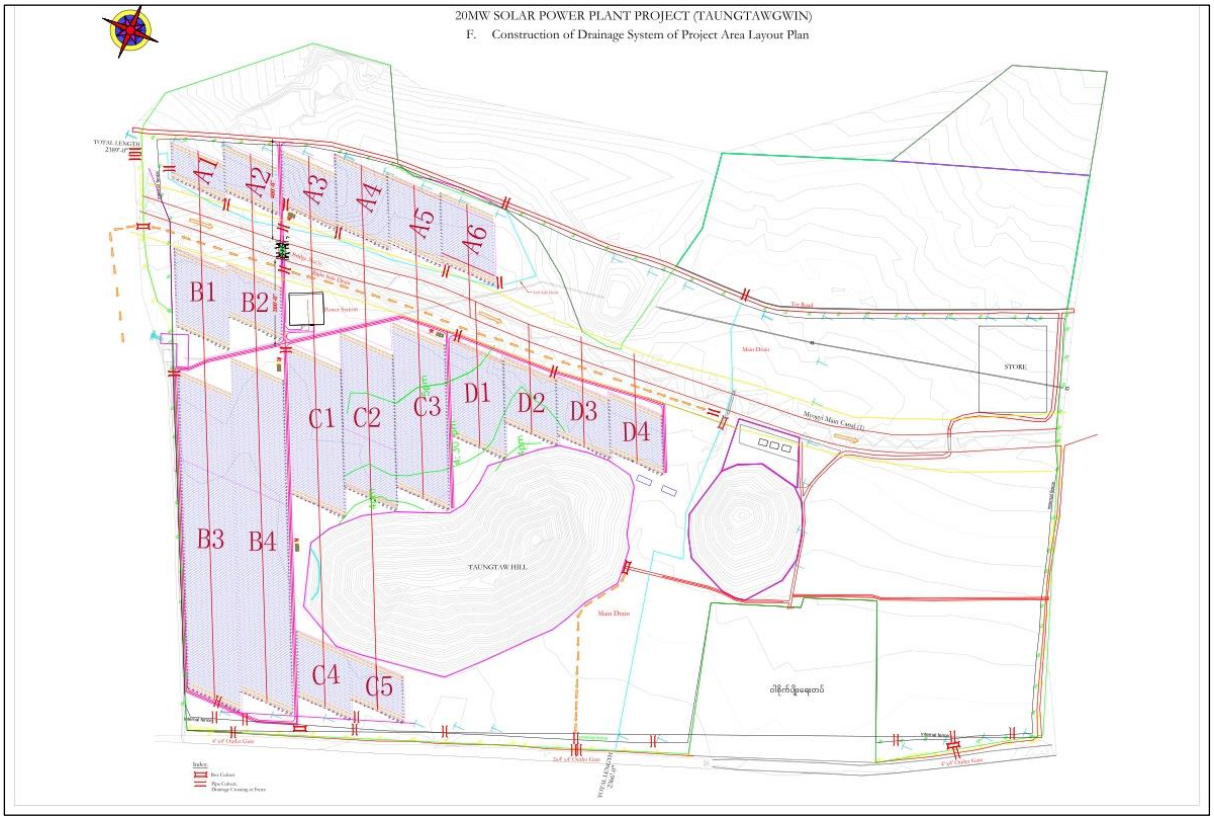


Figure 7. 9 Drainage System of the Project

Mitigation Measures for Hazardous Waste Generation Impacts

During the construction phase, fuel and lubricants for construction machines and vehicles must be kept and handled systematically. Used oil must be disposed of by collecting with leak proof containers and machineries maintenance area must be identified with paved ground in the project. If PV modules are damaged during installing, direct buried must be strongly prohibited and disposing with adequate packaging at waste management authorities, according to the instructions of the government and direct buried must be strongly prohibited. HSE Officer must monitor disposal of PV modules as per monitoring plan. Residual cement, solvent-based paints and other lubricants must be collected separately at designated area and final disposal of hazardous waste must be transferred to the hazardous waste service providers, recognized by Township Municipal and Mandalay Region ECD.

During the 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 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. HSE Officer must monitor handling, stockpiling and disposal of PV modules as per monitoring plan. Used oil must be disposed of by collecting with leak proof containers and final disposal of hazardous waste must be transferred to the hazardous waste service providers, recognized by Township Municipal and Mandalay Region ECD.

8. Institutional Requirement and Environmental Management Plan (EMP)

8.1 Institutional Requirement

This Environmental Management Plan (EMP) report is prepared as an environmental management framework for 20 MW Ground Mounted Solar Power Plant Project Connected to Taungdawgwin 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 appoints one Health, Safety and Environment (HSE) Officer throughout the life span of the project. The HSE Officer 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. Green Power Energy Co., Ltd. is responsible party for this Environmental Management Plan of 20 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, Green Power Energy Co., Ltd. will add additional funds to get the target of these plans through the project lifespan. Any suggestions, comments and questions must be directed to 20 MW Ground Mounted Solar Power Plant Project. We, Green Power Energy Co., Ltd. had made commitment that we will construct and operate our project in line with our commitments and implement Environmental Management Plans (EMP) and mitigation measures that are mentioned in this EMP report, prepared by E Guard Environmental Services Co., Ltd. for our project. We also 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.

8.2 Environmental Management Plan

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

- Construction Phase and
- Operation Phase

The objectives of EMP areas are as follows:

- Identify the possible environmental impacts due to implementation the activities of the project;
- Develop measures to minimize, mitigate and manage these impacts and
- Estimate the budget of EMP for each phase.

Green Power Energy Co., Ltd. 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

Responsible Persons for EMP and Mitigation Measures

Implementation of the EMP, management practices and mitigation measures are the responsibility of all site personnel: however, key personnel (Project Director, Project Manager, HSE Director, 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 tables in terms of their name, position, department and responsibilities.

Table 8. 1 Responsible Persons for EMP and Mitigation Measures

No.	Name	Position	Department	Responsibilities and Duties
1.	U Khin Mg Win	Director	Green Power Energy Co., Ltd.	• Implementation of the EMP • Supervision and management of the implementation of EMP
2.	U Myint Htwe and U Myo Naing Oo	Project Manager		• Implementation of the EMP • Supervision and monitoring of the implementation of EMP
3.	U Shu Khaing	HSE Officer		• 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

No.	Name	Position	Department	Responsibilities and Duties
				○ Indicate specific non-compliances 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 non-compliances 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).**

The detail Environmental Management Plans for the proposed project is described in the following tables.

Table 8. 2 Environmental Management Plan for Construction Phase

No.	Potential Impacts	Location	Impacts	Mitigation Measures	Estimated Cost of Proposed Measures	Residual Impacts	Responsible Party
1.	Impacts on air	Solar Power Plant	Dust and gaseous emission	• Regular water spraying on access roads and working places must be carried out • If possible, access roads of the project should be paved • Speed of construction vehicles and transportation vehicles must be controlled • Transportation vehicles must need to install proper covers • Construction activities and earth working, leveling and excavation activities which generate excessive dust must be avoided on extremely windy days • Temporary building	Already included in cost estimation for EMP	Low	Green Power Energy Co., Ltd.

No.	Potential Impacts	Location	Impacts	Mitigation Measures	Estimated Cost of Proposed Measures	Residual Impacts	Responsible Party
				enclosures (green shade net fencing) must be installed at excessive dust generated working area • Personal Protective Equipment (PPEs) such as masks and dust respirators must be provided for construction workers • Regular inspection and proper maintenance for the construction machines, vehicles and generators must be implemented			
		Overhead Transmission Line		• Overhead transmission line construction activities and earth working and excavation activities which generate			

No.	Potential Impacts	Location	Impacts	Mitigation Measures	Estimated Cost of Proposed Measures	Residual Impacts	Responsible Party
				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			
2.	Impacts on water	Solar Power Plant	Groundwater pollution and groundwater depletion	• Site leveling should be done with minimum alteration in contour level • Regular inspection for construction machines, vehicles and generators must be carried out • A total of 80 toilets, 10 septic tanks and 50 basins are provided for the construction workers • Waste from	Already included in cost estimation for EMP	Very Low	Green Power Energy Co., Ltd.

No.	Potential Impacts	Location	Impacts	Mitigation Measures	Estimated Cost of Proposed Measures	Residual Impacts	Responsible Party
				construction activities and domestic solid and liquid waste shall not be disposed into the Myo Gyi Dam Channel • The project proponent must manage groundwater usage systematically in construction activities			
		Overhead Transmission Line		• Domestic solid, liquid wastes and water discharged from construction activities shall not be discharged into the Myo Gyi Dam Channel			
3.	Impact on soil	Solar Power Plant	Soil contamination	• Earth working activities and concrete mixing processes for foundation of infrastructure must be carried out	Already included in cost estimation for EMP	Low	Green Power Energy Co., Ltd.

No.	Potential Impacts	Location	Impacts	Mitigation Measures	Estimated Cost of Proposed Measures	Residual Impacts	Responsible Party
				systematically and properly • Modernized construction machines and vehicles shall be used for the construction activities • These machines and vehicles must be maintained regularly • Isolated machineries maintenance area must be identified with paved ground • Leak-proof fuel containers with secondary containments must be used in fuel storage area • Refueling must be done carefully • PV modules installing			

No.	Potential Impacts	Location	Impacts	Mitigation Measures	Estimated Cost of Proposed Measures	Residual Impacts	Responsible Party
				must be carried out properly • If PV modules are damaged, direct buried must be strongly prohibited and disposing with adequate packaging at waste management authorities, according to the instructions of the government, must be implemented • HSE Officer must monitor disposal of PV modules as per monitoring plan • Storage yard for electrical equipment and construction materials must be defined with impervious surface			

No.	Potential Impacts	Location	Impacts	Mitigation Measures	Estimated Cost of Proposed Measures	Residual Impacts	Responsible Party
				• A total of 80 toilets, 10 septic tanks and 50 basins are provided for the construction workers • Some shady trees must be planted			
		Overhead Transmission Line		• Earth working activities and concrete mixing processes for foundation of poles must be carried out properly • Proper management must be needed for cable stringing and vegetation clearance along right of way of overhead transmission line			
4.	Noise and vibration	Solar Power Plant	Nuisance due to noise and vibration	• Excessive noise and vibration generated construction activities	Already included in cost estimation for	Low	Green Power Energy Co.,

No.	Potential Impacts	Location	Impacts	Mitigation Measures	Estimated Cost of Proposed Measures	Residual Impacts	Responsible Party
	impacts		generation	must be notified to nearby local communities, firstly • Construction machines and vehicles used in construction activities must be inspected and maintained regularly • Personal Protective Equipment (PPEs) such as earplugs and earmuffs must be provided for construction workers who work in excessive noise generated area • Transportation vehicles' drivers should be instructed to avoid gunning of vehicle engines or hooting when passing through sensitive areas	EMP		Ltd.

No.	Potential Impacts	Location	Impacts	Mitigation Measures	Estimated Cost of Proposed Measures	Residual Impacts	Responsible Party
				• Unloading electrical equipment and construction raw materials must be done properly • Highly noise and vibration generated construction machines and generators must be placed in enclosures • Noise and vibration generated construction activities must not be carried out at night, if possible			
		Overhead Transmission Line		• Excessive noise and vibration generated construction activities must be notified to nearby local communities, firstly • Transportation vehicles' drivers should			

No.	Potential Impacts	Location	Impacts	Mitigation Measures	Estimated Cost of Proposed Measures	Residual Impacts	Responsible Party
				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			
5.	Impacts on terrestrial ecology	Solar Power Plant	Disturbance terrestrial ecology and habitats	• Vegetation clearance beyond designated area of ground mounted solar power plant must be prohibited strongly • Introduction of exotic species by workers shall not be allowed	Already included in cost estimation for EMP	Very Low	Green Power Energy Co., Ltd.
		Overhead Transmission Line		• Vegetation clearance within right of way of overhead transmission line must be minimized as much as possible			

No.	Potential Impacts	Location	Impacts	Mitigation Measures	Estimated Cost of Proposed Measures	Residual Impacts	Responsible Party
6.	Occupational health and safety impacts	Solar Power Plant	Health and safety problems for construction workers	• Personal fall restraint system must be provided for installation workers who are working at height • Lockout-tagout system must be used • The project proponent must provide Personal Protective Equipment (PPEs) for all construction workers • The project proponent must monitor regularly whether construction workers use PPEs adequately or not • Safety notices and emergency contact numbers must be tagged at noticeable	Already included in cost estimation for EMP	Very Low	Green Power Energy Co., Ltd.

No.	Potential Impacts	Location	Impacts	Mitigation Measures	Estimated Cost of Proposed Measures	Residual Impacts	Responsible Party
				places • First aid training, safety training, firefighting training, electrical equipment installation training and other essential trainings for construction activities must be arranged • First aid kits must be provided • HSE Officer carries out toolbox meeting every morning before working hours and safety meeting every week • Safety induction meetings are also provided for every fresh worker • Construction machines and construction			

No.	Potential Impacts	Location	Impacts	Mitigation Measures	Estimated Cost of Proposed Measures	Residual Impacts	Responsible Party
				vehicles must be operated by trained and licensed industrial machine operators • The project proponent must 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 • The project proponent provides purified drinking water • All construction workers must follow the instructions to prevent COVID-19 virus infection during			

No.	Potential Impacts	Location	Impacts	Mitigation Measures	Estimated Cost of Proposed Measures	Residual Impacts	Responsible Party
				pandemic period			
		Overhead Transmission Line		• 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			

No.	Potential Impacts	Location	Impacts	Mitigation Measures	Estimated Cost of Proposed Measures	Residual Impacts	Responsible Party
				vehicles must be operated by trained and licensed industrial machine operators			
7.	Community health and safety impacts	Solar Power Plant	Health and safety problems for nearby local communities	• Construction vehicle drivers and transportation vehicle drivers must drive carefully with low speed at public road • Public road, nearby project site, must be cleaned and repaired, if damaged after the construction period	Already included in cost estimation for EMP	Very Low	Green Power Energy Co., Ltd.
		Overhead Transmission Line		• Cable stringing and poles construction for overhead transmission line must be informed to nearby local community and done properly			
8.	Fire hazard	All	Loss of	• Construction machines	Already	Very	Green Power

No.	Potential Impacts	Location	Impacts	Mitigation Measures	Estimated Cost of Proposed Measures	Residual Impacts	Responsible Party
	impacts	construction area	properties and life	and vehicles and electrical system of construction worker camps and staff quarters must be inspected and maintained regularly • Fire extinguishers must be installed at storage yard, fuel storage area, generators, construction worker camps and staff quarters • A total of 16 fire extinguishers (3 kg and 5 kg) and 16 fire extinguisher balls are installed and 2 water bowsers are standby • Firefighting equipment must be inspected regularly	included in cost estimation for EMP	Low	Energy Co., Ltd.

No.	Potential Impacts	Location	Impacts	Mitigation Measures	Estimated Cost of Proposed Measures	Residual Impacts	Responsible Party
				• Water for firefighting must be stored adequately and properly with storage tanks • Firefighting training and fire drills must be provided • Safety notices and emergency contact numbers must be tagged at noticeable places • An assembly point is assigned for emergency cases • Smoking must be strongly prohibited			
9.	Wastes generation impacts	Solar Power Plant	Water and soil pollution and impacts on health	• Vegetation debris generated from land clearance activities must be collected at separate place	Already included in cost estimation for EMP	Low	Green Power Energy Co., Ltd.

No.	Potential Impacts	Location	Impacts	Mitigation Measures	Estimated Cost of Proposed Measures	Residual Impacts	Responsible Party
				• Excavated soil must be reused at other places of the project as soil filing and leveling activities • The project proponent must calculate detail requirement of raw materials for purchasing electrical equipment and construction materials • Recycling, reuse and refurbishment of solid waste will reduce the amount of construction waste other than disposal • The project proponent defines temporary disposal site within the project, before final disposal			

No.	Potential Impacts	Location	Impacts	Mitigation Measures	Estimated Cost of Proposed Measures	Residual Impacts	Responsible Party
				• These wastes must be segregated by using different appropriate waste bins • Direct disposing domestic waste from multiple-use building, staff quarters, briefing hall, kitchen and dining hall into the drains and the Myo Gyi Dam Channel must be prohibited • Burning and landfilling solid waste at the project site must be also strongly prohibited • A total of 80 toilets, 10 septic tanks and 50 basins are provided for construction workers • Fuel and lubricants for construction machines			

No.	Potential Impacts	Location	Impacts	Mitigation Measures	Estimated Cost of Proposed Measures	Residual Impacts	Responsible Party
				and vehicles must be kept and handled systematically • Used oil must be disposed of by collecting with leak proof containers • Machineries maintenance area must be identified with paved ground • If PV modules are damaged during installing, direct buried must be strongly prohibited and disposing with adequate packaging at waste management authorities, according to the instructions of the government • HSE Officer must			

No.	Potential Impacts	Location	Impacts	Mitigation Measures	Estimated Cost of Proposed Measures	Residual Impacts	Responsible Party
				monitor disposal of PV modules as per monitoring plan • Residual cement, solvent-based paints and other lubricants must be collected separately at designated area • Final disposal of solid waste and hazardous waste must be transferred to the Township Development Committee			
		Overhead Transmission Line		• Vegetation debris generated from land clearance activities along right of way of overhead transmission line must be collected at separate place			

No.	Potential Impacts	Location	Impacts	Mitigation Measures	Estimated Cost of Proposed Measures	Residual Impacts	Responsible Party
				• Excavated soil must be reused as soil filing and leveling activities			

Table 8. 3 Environmental Management Plan for Operation Phase

No.	Potential Impacts	Location	Impacts	Mitigation Measures	Estimated Cost of Proposed Measures	Residual Impacts	Responsible Party
1.	Impacts on air	All operation area	Dust and gaseous emission	• All access roads within the project shall be paved • Regular maintenance and inspection for management vehicles, maintenance vehicles, generators, refrigerators and air conditioning system must be implemented • Good ventilation	Already included in cost estimation for EMP	Very Low	Green Power Energy Co., Ltd.

No.	Potential Impacts	Location	Impacts	Mitigation Measures	Estimated Cost of Proposed Measures	Residual Impacts	Responsible Party
				system must be ensured • The project proponent will install 40 air conditioners to reduce adverse impacts of indoor air quality • Some shady trees must be planted			
2.	Impacts on water	All operation area	Groundwater pollution and groundwater depletion	• The project proponent must install proper drainage system • PV modules cleaning and maintenance activities must be carried out properly • Damaged PV modules and uninstalled lifespan-expired PV modules must be disposed with adequate packaging at waste management authorities or service	Already included in cost estimation for EMP	Low	Green Power Energy Co., Ltd.

No.	Potential Impacts	Location	Impacts	Mitigation Measures	Estimated Cost of Proposed Measures	Residual Impacts	Responsible Party
				providers, according to the instructions of the government and direct burry and open burning must be strictly prohibited. • HSE Officer must monitor handling, stockpiling and disposal of PV modules as per monitoring plan. Transformers, management vehicles, maintenance vehicles and generators must be inspected and maintained regularly • In case of transformers accident, an accident oil pool with reinforced concrete structure, which has the function of separating oil and			

No.	Potential Impacts	Location	Impacts	Mitigation Measures	Estimated Cost of Proposed Measures	Residual Impacts	Responsible Party
				water, will be installed • Refueling must be done properly • Drainage system must be checked and cleaned properly • A total of 80 toilets, 10 septic tanks and 50 basins are provided for the operation workers and staff • Direct disposing domestic waste into the drains and the Myo Gyi Dam Channel must be prohibited			
3.	Impact on soil	All operation area	Soil contamination	• Proper drainage system must be installed within the project site • PV modules cleaning and maintenance must be carried out carefully • Damaged PV modules	Already included in cost estimation for EMP	Very Low	Green Power Energy Co., Ltd.

No.	Potential Impacts	Location	Impacts	Mitigation Measures	Estimated Cost of Proposed Measures	Residual Impacts	Responsible Party
				and uninstalled lifespan-expired PV modules must be disposed with adequate 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. • HSE Officer must monitor handling, stockpiling and disposal of PV modules as per monitoring plan. Fuel storage area and generators area must be designed with impervious surface • Electrical equipment			

No.	Potential Impacts	Location	Impacts	Mitigation Measures	Estimated Cost of Proposed Measures	Residual Impacts	Responsible Party
				maintenance especially for transformers must be carried out systematically by technicians and experts • In case of transformers accident, an accident oil pool with reinforced concrete structure, which has the function of separating oil and water, will be installed in the project • Temporary domestic waste storage area, fuel storage area and switchyard must be inspected regularly • A total of 80 toilets, 10 septic tanks and 50 basins are provided			
4.	Noise and vibration	All operation area	Nuisance due to noise and	• Generators, inverters, transformers,	Already included in cost	Very Low	Green Power Energy Co.,

No.	Potential Impacts	Location	Impacts	Mitigation Measures	Estimated Cost of Proposed Measures	Residual Impacts	Responsible Party
	impacts		vibration generation	management vehicles and maintenance vehicles must be inspected and maintained regularly • Silence-type generator is recommended to use • Some shady trees must be planted	estimation for EMP		Ltd.
5.	Impacts on terrestrial ecology	All operation area	Disturbance terrestrial ecology and habitats	• Introduction of exotic species by workers shall not be allowed	Already included in cost estimation for EMP	Very Low	Green Power Energy Co., Ltd.
6.	Impacts on aquatic ecology	All operation area	Disturbance aquatic ecology and habitats	• Domestic waste shall not be disposed into the Myo Gyi Dam Channel	Already included in cost estimation for EMP	Very Low	Green Power Energy Co., Ltd.
7.	Occupational health and safety impacts	Solar Power Plant	Health and safety problems for construction	• Personal fall restraint system must be provided for maintenance workers who are working at	Already included in cost estimation for EMP	Low	Green Power Energy Co., Ltd.

No.	Potential Impacts	Location	Impacts	Mitigation Measures	Estimated Cost of Proposed Measures	Residual Impacts	Responsible Party
			workers	height • Lockout-tagout system must be used for maintenance of electrical equipment • The project proponent must provide Personal Protective Equipment (PPEs) for all maintenance workers • The project proponent must monitor regularly whether maintenance workers use PPEs adequately or not • Safety notices and emergency contact numbers must be tagged at noticeable places • First aid training, safety training, firefighting training, electrical			

No.	Potential Impacts	Location	Impacts	Mitigation Measures	Estimated Cost of Proposed Measures	Residual Impacts	Responsible Party
				equipment repairs and maintenance training and other essential trainings for operation processes of electricity generation and distributing must be arranged • First aid kits must be provided • All energized electrical equipment of the project must be marked with warning signs • Proper management for electricity generation and distributing such as checking all electrical cords, cables and do not use overload voltage must be carried out • The voltage level of the project is low and the			

No.	Potential Impacts	Location	Impacts	Mitigation Measures	Estimated Cost of Proposed Measures	Residual Impacts	Responsible Party
				project will use qualified products and modern technology for electricity generation • Housekeeping staffs must be trained and assigned • The project proponent must manage the drainage systems properly and provide purified drinking water • All operation workers and staff must follow the instructions to prevent COVID-19 virus infection during pandemic period			
		Overhead Transmission Line		• Personal fall restraint system must be provided for overhead transmission line maintenance workers			

No.	Potential Impacts	Location	Impacts	Mitigation Measures	Estimated Cost of Proposed Measures	Residual Impacts	Responsible Party
				who are working at height • The project proponent must provide Personal Protective Equipment (PPEs) The project proponent must provide Personal Protective Equipment (PPEs) for all maintenance workers • The project proponent must monitor regularly whether maintenance workers use PPEs adequately or not			
8.	Community health and safety impacts	Solar Power Plant	Health and safety problems for nearby local communities	• Voltage level of the project is low and the project will use qualified products and modern technology for electricity generation • The project proponent	Already included in cost estimation for EMP	Low	Green Power Energy Co., Ltd.

No.	Potential Impacts	Location	Impacts	Mitigation Measures	Estimated Cost of Proposed Measures	Residual Impacts	Responsible Party
				must follow international standards to generate electricity and distribute to Taungdawgwin Substation • Before PV modules installation, project proponent must assess glint and glare on nearby local communities and consult with experts • Safety notices and warning signs must be tagged at the fence of the project site			
		Overhead Transmission Line		• Safety notices and warning signs must be tagged at poles of overhead transmission line			

No.	Potential Impacts	Location	Impacts	Mitigation Measures	Estimated Cost of Proposed Measures	Residual Impacts	Responsible Party
9.	Fire hazard impacts	Solar Power Plant	Loss of properties and life	• Maintenance activities must be implemented regularly and properly for electrical equipment • Fire extinguishers must be installed at fuel storage area, generators, switchyard, multiple-use building and other buildings • 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 • Firefighting training and fire drills must be provided for all workers	Already included in cost estimation for EMP	Low	Green Power Energy Co., Ltd.

No.	Potential Impacts	Location	Impacts	Mitigation Measures	Estimated Cost of Proposed Measures	Residual Impacts	Responsible Party
				• Fire protection lane must be defined around the project site to prevent fire in dry season • Water must be stored adequately and properly with storage tanks for other type of fire cases • Fire hose reels and fire hydrants must be installed to extinguish fire by using water for other types of fire • An assembly point must be assigned for emergency cases • Smoking must be strongly prohibited • Visible and audible fire alarm system must be installed			

No.	Potential Impacts	Location	Impacts	Mitigation Measures	Estimated Cost of Proposed Measures	Residual Impacts	Responsible Party
				• Emergency routes and exists must be assigned at multiple-use building and other buildings • These emergency routes and exists must not be blocked • Safety notices and emergency contact numbers must be tagged at noticeable places			
		Overhead Transmission Line		• Maintenance activities must be implemented regularly and properly			
10.	Wastes generation impacts	All operation area	Water and soil pollution and impacts on health	• The project proponent must define temporary disposal site, before final disposal • Domestic solid wastes must be segregated by using different appropriate waste bins	Already included in cost estimation for EMP	Low	Green Power Energy Co., Ltd.

No.	Potential Impacts	Location	Impacts	Mitigation Measures	Estimated Cost of Proposed Measures	Residual Impacts	Responsible Party
				• Burning and landfilling solid waste at the project site and disposed of into the Myo Gyi Dam Channel must be strongly prohibited • Project proponent must install proper drainage system • A total of 80 toilets, 10 septic tanks and 50 basins are provided for operation workers and staff • Fuel and lubricants for maintenance vehicles must be kept and handled systematically • Damaged PV modules and uninstalled lifespan-expired PV modules due to			

No.	Potential Impacts	Location	Impacts	Mitigation Measures	Estimated Cost of Proposed Measures	Residual Impacts	Responsible Party
				exchanging new PV modules at the time of extending operation period of the project must be disposed with adequate 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. • HSE Officer must monitor handling, stockpiling and disposal of PV modules as per monitoring plan. Used oil must be disposed of by collecting with leak proof containers			

No.	Potential Impacts	Location	Impacts	Mitigation Measures	Estimated Cost of Proposed Measures	Residual Impacts	Responsible Party
				• Final disposal of solid waste and hazardous waste must be transferred to the Township Development Committee			

8.3 Environmental Monitoring Plan

The following table describes the detail Environmental Monitoring Plan for construction phase and operation phase of the proposed project.

Table 8. 4 Environmental Monitoring Plan

No.	Environmental Concerns	Parameters	Frequency	Location	Estimated Cost	Responsible Party
A.	**Construction Phase (Solar Power Plant)**					
1.	Air quality	PM_{10}, $PM_{2.5}$, CO, CO_2, SO_2, NO_2	Once	In front of staff quarter	Already included in cost estimation for EMP	Green Power Energy Co., Ltd.
2.	Groundwater quality	pH, EC, TDS, Salinity, DO, Turbidity, Oxidation Reduction Potential (ORP), Biological Oxygen Demand (BOD),	Once	An outlet from tube well within the project site	Already included in cost estimation for EMP	Green Power Energy Co., Ltd.

No.	Environmental Concerns	Parameters	Frequency	Location	Estimated Cost	Responsible Party
		Chemical Oxygen Demand (COD), Total Nitrogen, Total Phosphorus, Potassium, Oil and Grease, Total Suspended Solid (TSS), Total Coliform Bacteria				
3.	Surface water quality	pH, EC, TDS, Salinity, DO, Turbidity, Oxidation Reduction Potential (ORP), Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Nitrogen, Total Phosphorus, Potassium, Oil and Grease, Total Suspended Solid (TSS)	Once	Downstream of Myo Gyi Dam Channel	Already included in cost estimation for EMP	Green Power Energy Co., Ltd.
4.	Noise level	Equivalent Noise Level dB (A)	Once	Point 1 (In front of staff quarter) Point 2 (Junction of main access road and Myo Gyi Dam Channel**)**	Already included in cost estimation for EMP	Green Power Energy Co., Ltd.
5.	Waste Quantity	Amount of construction solid waste, domestic solid waste and hazardous waste disposal	Monthly	All construction area	Already included in cost estimation for EMP	Green Power Energy Co., Ltd.
B.	**Construction Phase (Overhead Transmission Line)**					

No.	Environmental Concerns	Parameters	Frequency	Location	Estimated Cost	Responsible Party
1.	Air quality	PM_{10}, $PM_{2.5}$, CO, CO_2, SO_2, NO_2	Once	In the middle of transmission line's route	Already included in cost estimation for EMP	Green Power Energy Co., Ltd.
2.	Noise level	Equivalent Noise Level dB (A)	Once	In the middle of transmission line's route	Already included in cost estimation for EMP	Green Power Energy Co., Ltd.
C.	**Operation Phase**					
1.	Air quality	PM_{10}, $PM_{2.5}$, CO, CO_2, SO_2, NO_2	Once a year	In front of staff quarter	Already included in cost estimation for EMP	Green Power Energy Co., Ltd.
2.	Groundwater quality	pH, EC, TDS, Salinity, DO, Turbidity, Oxidation Reduction Potential (ORP), Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Nitrogen, Total Phosphorus, Potassium, Oil and Grease, Total Suspended Solid (TSS), Total Coliform Bacteria	Once a year	An outlet from tube well within the project site	Already included in cost estimation for EMP	Green Power Energy Co., Ltd.
3.	Surface water quality	pH, EC, TDS, Salinity, DO, Turbidity, Oxidation Reduction Potential (ORP), Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Nitrogen, Total	Once a year	Downstream of Myo Gyi Dam Channel	Already included in cost estimation for EMP	Green Power Energy Co., Ltd.

No.	Environmental Concerns	Parameters	Frequency	Location	Estimated Cost	Responsible Party
		Phosphorus, Potassium, Oil and Grease, Total Suspended Solid (TSS)				
4.	Discharged water quality	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	At final outlet of drainage system	Already included in cost estimation for EMP	Green Power Energy Co., Ltd.
5.	Noise level	Equivalent Noise Level dB (A)	Once a year	Point 1 (In front of staff quarter) Point 2 (Junction of main access road and Myo Gyi Dam Channel**)**	Already included in cost estimation for EMP	Green Power Energy Co., Ltd.
6.	Waste Quantity	Amount of domestic solid waste and hazardous waste disposal	Quarterly	All operation area	Already included in cost estimation for EMP	Green Power Energy Co., Ltd.
7.	Environmental auditing	Assess the compliances with this EMP as well as laws, rules, policies and regulations	Once a year	At the project office	Already included in cost estimation for EMP	Green Power Energy Co., Ltd.

8.4 Cost Estimation for EMP and EMoP

The following table shows the expenditures for the implementation of Environmental Management Plan and mitigation measures. Estimated prices may be varied according to the implementation time and service providers. We, Green Power Energy Co., Ltd. strongly commit that we will add required funds for the implementation of Environmental Management Plan and mitigation measures including monitoring plan if the following cost estimation for EMP is not enough at the time of real practices throughout the project lifespan.

Table 8. 5 Cost Estimation for EMP and Mitigation Measures

No.	Item	Unit	Frequency	Unit Cost (MMK)	Cost (MMK)
A.	**Mitigation Measures for Construction Phase**				
1.	Dust control			Lump Sum	3,000,000
2.	Provide Personal Protective Equipment (PPEs) to workers			Lump Sum	1,000,000
3.	Provide adequate toiles and septic tanks facilities			Lump Sum	800,000
4.	Use leak-proof fuel containers with secondary containments			Lump Sum	500,000
5.	Provide first aid kits and training for workers			Lump Sum	800,000
6.	Provide purified drinking water for workers			Lump Sum	600,000
7.	Install fire extinguishers			Lump Sum	500,000
8.	Wastes disposal			Lump Sum	900,000
Subtotal					**8,100,000**
B.	**Mitigation Measures for Operation Phase**				
1.	Install good ventilation system			Lump Sum	2,500,000
2.	Plant some shady trees			Lump Sum	1,000,000
3.	Install proper drainage system			Lump Sum	1,500,000
4.	Provide Personal Protective			Lump Sum	500,000

No.	Item	Unit	Frequency	Unit Cost (MMK)	Cost (MMK)
	Equipment (PPEs) for workers				
5.	Provide first aid kits for workers			Lump Sum	500,000
6.	Provide purified drinking water for workers			Lump Sum	1,000,000
7.	Install dry powder type fire extinguishers, fire hose reels and fire hydrants			Lump Sum	800,000
8.	Install visible and audible fire alarm system			Lump Sum	500,000
9.	Waste disposal	Month	12	100,000	1,200,000
	Subtotal				**9,500,000**
Contingency					**2,000,000**
Total					**19,600,000**

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

Table 8. 6 Cost Estimation for Monitoring, Supervision 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	Frequency per year	1	900,000	900,000
3.	Noise level	Frequency per year	1	400,000	400,000
4.	Waste quantity	Frequency per year	4	150,000	600,000
5.	Environmental auditing	Frequency per year	1	300,000	300,000
Subtotal					**3,000,000**

No.	Item	Unit	Quantity	Unit Cost (MMK)	Annual Cost (MMK)
B.	**Supervision**				
1.	HSE Officer	Months	12	700,000	8,400,000
2.	HSE Assistant	Months	12	400,000	4,800,000
Subtotal					**13,200,000**
C.	**Capacity Building Programs (Training for workers)**				**1,500,000**
Total					**17,700,000**

8.5 Corporate Social Responsibility (CSR) Plan

Green Power Energy Co., Ltd. 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 attached in **Appendix- 8**.

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%

8.6 Grievance Redress Mechanism

People who settle near the project site or stakeholders concerned with the problems and impacts that they suffer from the proposed project, they can complain though Grievance Committee, which includes the responsible persons of the project proponent, representatives from Taysoe Village Tract, No. (3) Village and Padonma Village and representative from General Administration Department (Myitthar 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.

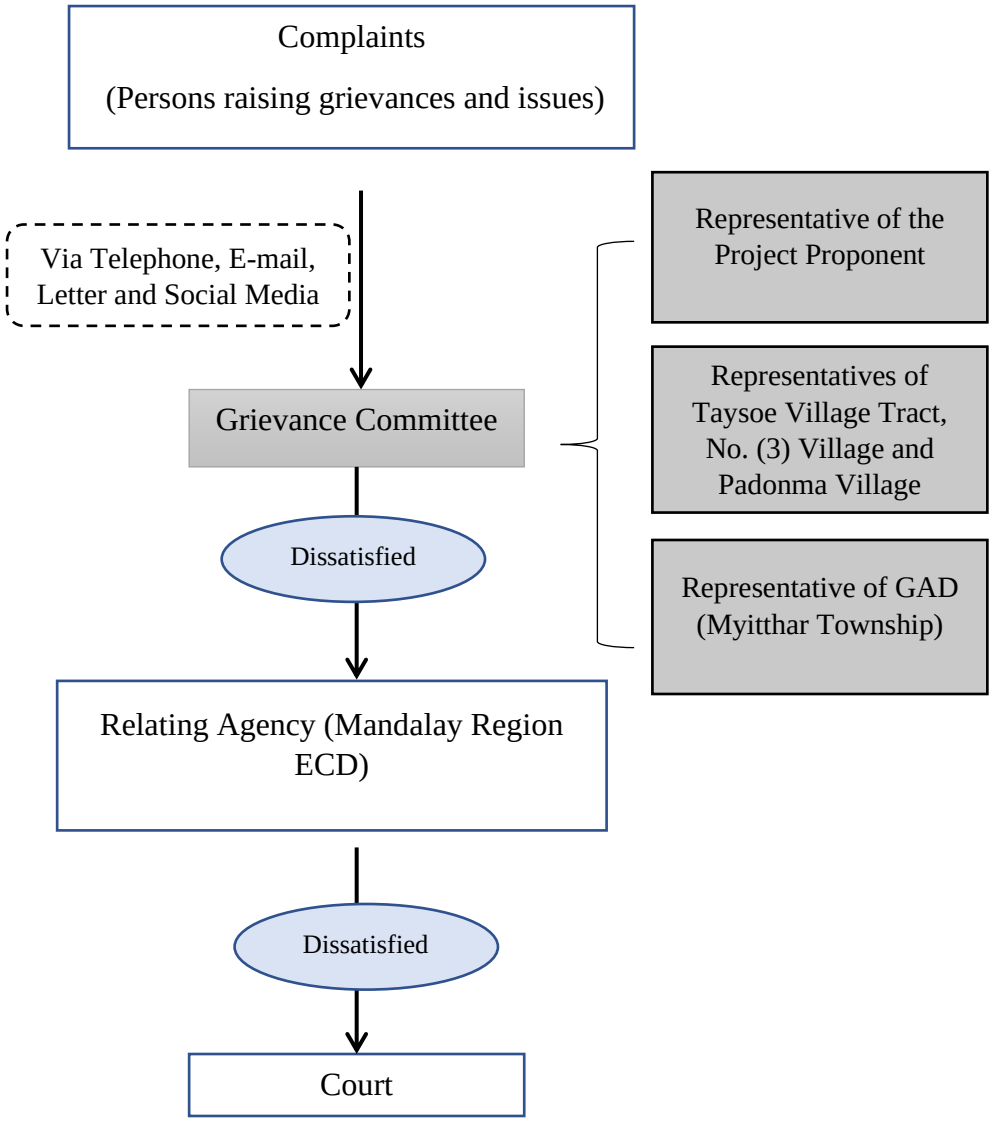


Figure 8. 1 Grievance Redress Mechanism for the Proposed Project

8.7 Firefighting Plan

Fire extinguishers must be installed at storage yard, 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 cases. Fire hose reels and fire hydrants must be installed to extinguish fire by using water. Firefighting training and fire drills must be provided for all workers and staff in order to extinguish fire cases. Besides, safety notices and emergency contact numbers of the Fire Services Department, Hospitals and Police Stations and contact persons for emergency cases must be tagged at noticeable places of the project site. An assembly point must be assigned for emergency cases to gather workers and smoking must be strongly prohibited in the project site. Visible and audible fire alarm system must be installed and emergency routes and exists must be assigned at multiple-use building, staff quarters, briefing hall, kitchen and dining hall, these emergency routes and exists must not be blocked. Moreover, the project proponent assigns teams for firefighting such as preparedness team, extinguishing team, evacuation team and first

aid team. In extinguishing team, there will be 14 members to extinguish fire effectively and there will be 14 members in evacuation team to evacuate properties and human to safe place. Detail firefighting plan of the proposed project is attached in **Appendix- 9**.

8.8 Emergency Response and Preparedness Plan

In case of fire, all the workers including guests should be evacuated systematically as soon as possible. Firefighting group must be assigned which will cooperate with Myitthar Township's Fire Services Department. The proponent has committed to abide guidelines provided by Myanmar Fire Services Department. Emergency escape plan must be tagged at multiple-use building and other buildings.

As the project is located within the **Zone IV (Severe Zone)** earthquake zone, the emergency preparedness for earthquake must also be taken. The multiple-use building, staff quarters, briefing hall, kitchen and dining hall and electrical equipment including switchyard and overhead transmission line must be built with the international standards to withstand the risk of earthquake. The workers and staff should have the knowledge concerning with the earthquake.

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


[FIRE]
A fire is both frightening and destructive. Fires are a danger to buildings and residents in equal measure. Keep your cool in the event of a fire by following these SAFE STEPS:
BE PREPARED...
PREPARE YOUR GO-BAGS
KNOW AND PRACTICE YOUR ESCAPE ROUTE
FIRE ALARM
GET IT
INSTALL IT
CHECK IT
CARRY OUT ANNUAL CHECKS, ENSURE FIRE ALARMS WORK
DO NOT LEAVE BURNING CIGARETTES OR CANDLES UNATTENDED
SAND
PREPARE FIRE FIGHTING EQUIPMENT...
AND KNOW HOW TO EXTINGUISH A FIRE
PULL
AIM
SQUEEZE
SWEEP
IF USING EXTINGUISHER, PULL PIN, AIM AND SQUEEZE HANDLE, SWEEP BASE OF FIRE
NEVER USE WATER OR FOAM EXTINGUISHER ON AN OIL OR ELETRICAL FIRE
IN CASE OF FIRE...
IF YOUR CLOTHES CATCH FIRE...
STOP
STOP WHERE YOU ARE
DROP
DROP TO THE GROUND
ROLL
ROLL ON THE FLOOR TO PUT OUT THE FLAMES
IF THERE IS SMOKE...
GET DOWN LOW - COVER YOUR MOUTH WITH A DAMP CLOTH AND GET OUT!
EXIT
GET OUT THROUGH A SAFE EXIT
FIRE ALARM
SOUND ALARM AND CALL FOR HELP
BEWARE OF GAS LEAKS AND EXPOSED WIRE
DO NOT GO HOME UNLESS LOCAL AUTHORITIES DEEM IT SAFE
NATIONAL GEOGRAPHIC CHANNEL
SAFESTEPS.COM
SAFE STEPS TIPS APPROVED BY:
International Federation of Red Cross and Red Crescent Societies
PRUDENCE FOUNDATION

Figure 8. 2 Safety Cards for Awareness of Emergency Cases

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

- Activate fire alarm system
- Alert other workers and staff to gather at assembly point
- Report to project managers and supervisors

- For electrical fire, turn off electricity distributing devices before fighting
- For electrical fire, oil and lubricant fire DO NOT USE WATER, rather use dry powder type fire extinguishers
- If small, control using an extinguisher or fire hose reel
- Contact Fire Services Department if not under immediate control
- Attend to human life in immediate danger
- Once out of the building, stay out. Do not allow people to go back into the burning building to collect valuables. While existing the building, close doors (but do not lock) to slow down the spread of fire
- Obey all instructions issued by the project proponent
- Proceed to emergency evacuation area
- First aid measures should be followed to all injured persons and transfer to clinic or hospital if necessary.

9. Results of the Public Consultation

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. Public 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 (PAP) should be considered in identification of impacts, impact assessment, mitigation measures formulating, environmental management plans 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 formulation of 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 the proposed ground mounted solar power plant's project office, office of Green Power Energy Co., Ltd. and office of E Guard Environmental Services and the following link, where any interested persons can review for further comments and suggestions.

https://www.mediafire.com/folder/lf3cev20r65jh/Taungdawgwin_20_MW_Ground_Mounted_Solar_Power_Plant_Project_(EMP)

Public consultation and information disclosure concerning with the Environmental Management Plan (EMP) for the construction and operation of 20 MW ground mounted solar power plant project connected to Taungdawgwin Substation, proposed by Green Power Energy Co., Ltd. was held on 29th March, 2022 at Yezin Agricultural University (Kyaukse Branch), Taysoe Village Tract, Myitthar Township. The staring time was 4:00 pm and finished at 5:30 pm. 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. The attendance list, meeting minutes, recorded photos and presentation file of public consultation meeting are described in **Appendix- 4, 5, 6 and 7.** The number of attendees in the meeting is briefly shown in the following table**.**

Table 9. 1 Attendance List of Public Consultation Meeting

No.	Category	Number of Participants
1.	Local People from Taysoe Village	5
2.	Local People from No. (3) Village	12
3.	Local People from Padonma Village	1
4.	Representatives of Project Proponent	6

No.	Category	Number of Participants
5.	Representatives of E Guard Environmental Services	3
Total		**27**

9.3 Agenda of Public Consultation Meeting

The meeting was held in accordance with the following agenda;

1) Opening the ceremony
2) Presentation of Project Information by U Aung Ko Myint (Electrical Assistant Engineer, Green Power Energy Co., Ltd.)
3) Presentation of Environmental Management Plan (EMP) for construction and operation of 20 MW ground mounted solar power plant project connected to Taungdawgwin Substation by U Aung Si Thu Thein (Assistant Consultant, E Guard Environmental Services Co., Ltd.)
4) Questions, Comments and Suggestions from the attendees.
5) Closing the ceremony

The detail of each agenda is described at the following:

1. Opening Ceremony

2. Presentation of Project Information by U Aung Ko Myint (Electrical Assistant Engineer, Green Power Energy Co., Ltd.)

U Aung Ko Myint 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 20 MW ground mounted solar power plant project connected to Taungdawgwin Substation by U Aung Si Thu Thein (Assistant Consultant, E Guard Environmental Services Co., Ltd.)

U Aung Si Thu Thein 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 during the site visit.

4. Questions, Comments and Suggestions from the Attendees

Question*:* U Min Aung (Padonma Village) discussed that he would like to thank for economic development of the country due to the project implementation. He wants to know the impacts on environment both pros and cons. He also wants to request to slow down vehicular movement in the area of villages.
Answer: U Aung Ko Myint (Electrical Assistant Engineer, Green Power Energy Co., Ltd.) answered that the project proponent has the regulations for the workers and staffs, they will make penalties for the offenders who do not obey the regulations among their workers.

Mitigation measures for vehicle accidents have already applied for project just like limitation for vehicle speed not more than 10 miles per hour in the vicinity of project and near villages.
Answer: U Aung Si Thu Thein (Assistant Consultant, E Guard Environmental Services Co., Ltd.) also answered that there are both positive and negative impacts due to project implementation. However, negative impacts can be reduced by implementing mitigation measures, Environmental Management Plans and Environmental Monitoring Plans.

Question: U Than Tun (No 3 Village) discussed that sudden and potential weather changes can be occurred due to solar panel uses in this area.
Answer: U Aung Si Thu Thein (Assistant Consultant, E Guard Environmental Services Co., Ltd.) answered that it was nearly zero chances to effect on weather due to project implementation as using renewable energy for electricity generation. The company has already prepared on impact assessment and mitigation measures for potential impacts on environment.

Question: U Aung Kyi (No 3 Village) asked that he was worrying electrical hazards in period of raining and flooding?
Answer: U Aung Ko Myint (Electrical Assistant Engineer, Green Power Energy Co., Ltd.) answered it was not likely to happen electrical hazards in raining and flooding period because of the quality of the electrical equipment, 24-hour surveillance on operation and emergency response plans.

Question: Daw Zin Mar Tun (No 3 Village) asked that nearby village can get electricity from operation of solar project or not?
Answer: U Aung Ko Myint (Electrical Assistant Engineer, Green Power Energy Co., Ltd.) answered that generated electricity will be distributed according to the government plan and project proponent has no authority to supply electricity as their own decision. Electricity generation from solar energy by this project will connect to Taungdawgwin Substation and go to national grid.

5. Closing the Ceremony

10. Conclusion

This Environmental Management Plan (EMP) Report was prepared by E Guard Environmental Services Co., Ltd. for construction and operation of 20 MW ground mounted solar power plant project connected to Taungdawgwin Substation, proposed by Green Power Energy Co., Ltd., which is formed by Gold Energy Co., Ltd. The proposed project is located at Taysoe Village Tract, Myitthar Township, Kyaukse District, Mandalay Region, Myanmar. Its coordinate points are 21° 26' 31.62" N, 96° 17' 10.63" E and the average altitude of the site is 0 m. The construction of the proposed project includes box transformer foundation, supporting bracket and foundation of solar power station, multiple-use building, staff quarters, briefing hall, kitchen, dining hall and outdoor equipment foundation construction as well as construction and stringing of 33 kV overhead transmission line. 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, however, study for decommissioning phase is excluded because after operation period, 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. The project proponent will have prior to submission of the decommissioning plan if they have a plan to close their project permanently. Environmental Management Plan (EMP) has been conducted for the proposed project in accordance with Environmental Impact Assessment Procedure as per instructions of Environmental Conservation Department (ECD). The project proponent has to implement the proposed project in compliance with the National laws and regulations for environmental protection.

E Guard Environmental Services conducted environmental quality monitoring at project site on March 28 and 29, 2022. According to the observed data, the observed values of gases such as SO_2, NO_2, CO and CO_2 are lower than the respective guideline values. For dust emissions, the observed values of both PM_{10} and $PM_{2.5}$ are also within the guideline values of NEQEG. All of the parameter measured to analyze groundwater and surface water quality are within the reference values of NEQEG. With regards to noise level at Point 1, the results are lower than standard value not only at day time but also at night time. Similarly, with regards to noise level at Point 2, the results are lower than standard value not only at day time but also at night time. Therefore, it can be considered that the baseline environmental quality (air quality, water quality and noise level) at the proposed project are within the respective guideline values during construction phase of the project. The project proponent must follow EMPs and mitigation measures in order to sustain baseline environmental quality of the project.

This project can ensure some positive impacts such as providing job opportunities, business opportunities, carbon emission reduction, revenue to government, CSR development, resources conservation and green economy. The assessment of each impact is based on consideration of the magnitude, duration, extent and probability of activities which are going to be carried out during construction and operation phases. During the ***construction phase***, impacts on air, soil, noise and vibration impacts and solid waste generation impacts are assessed as **Moderate Impacts** and other impacts such as impacts on water, occupational health and safety, community health and safety, fire hazards impacts and hazardous waste generation impacts are categorized as **Low Impacts** as well as liquid waste generation impact is considered as **Very**

Low Impact as per the results of impact assessments. During the ***operation phase***, impacts on water, occupational health and safety, community health and safety, fire hazard impacts, liquid waste generation and hazardous waste generation impacts are assessed as **Moderate Impacts** and other impacts like impacts on air, soil, noise impacts and solid waste generation impacts are categorized as **Low Impacts** according to the results of assessments.

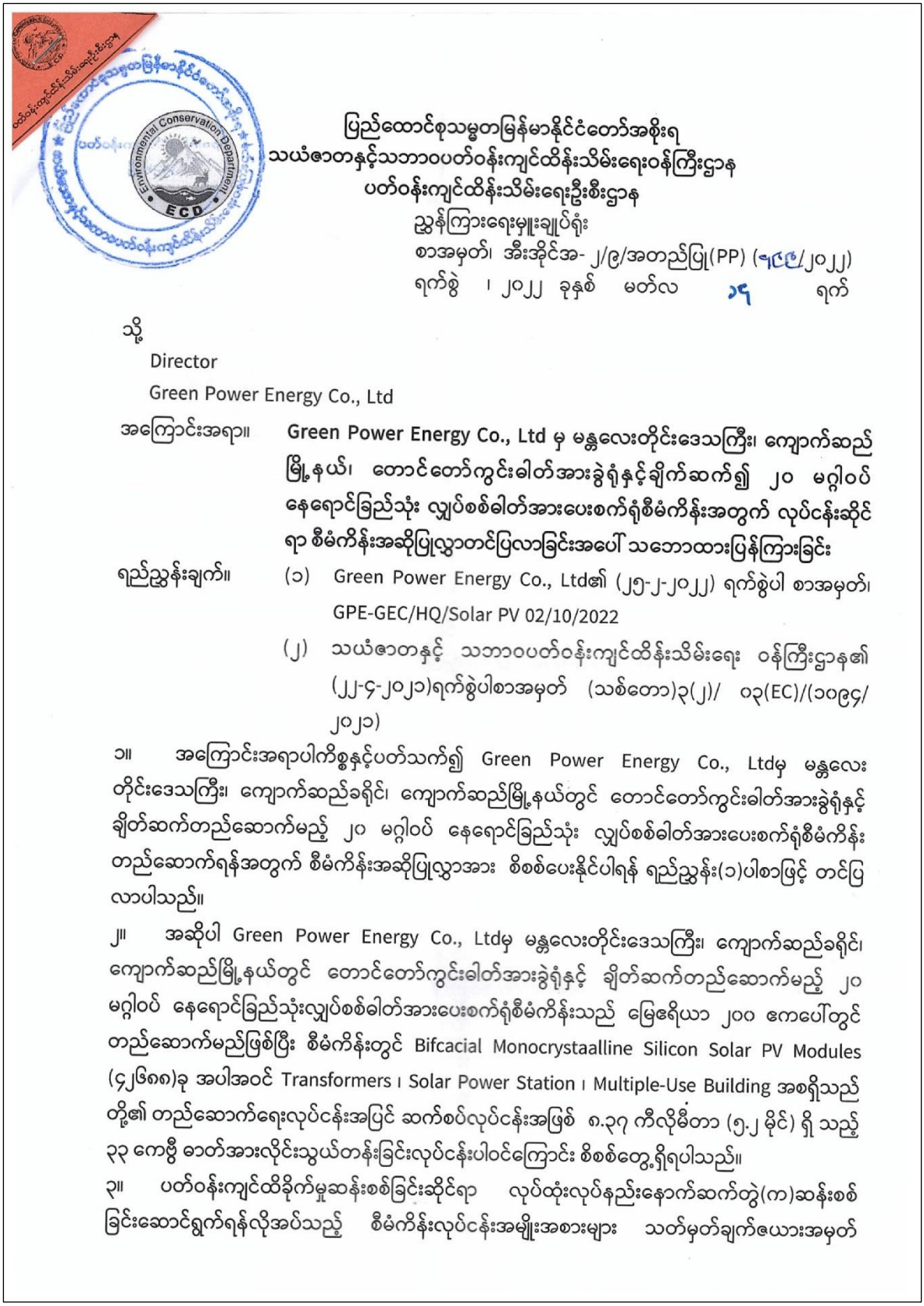
However, Environmental Management Plan (EMP) must be implemented to control these negative impacts in construction and operation phases. Environmental Monitoring Plan (EMoP) must need to implement for monitoring the environmental quality of the proposed project. Then, the estimated budget needed for implementing Environmental Management Plan, Environmental Monitoring Plan, supervision and capacity building programs are mentioned in this report. Moreover, CSR plan, firefighting plan, emergency preparedness and response plan and grievance redress mechanism to solve the complaints related with the proposed project are also described. Finally, the project proponent shall follow comments and suggestions made by ECD after reviewing this EMP report. Once EMP report is approved by concerned authorities, effective implementation of EMPs and EMoPs by the project proponent is essential. The proponents shall abide environmental policy, laws, rules and instructions of the Republic of the Union of Myanmar during the lifespan of the project.

References

- E Guard Environmental Services Co., Ltd., 2021, *"Environmental Management Plan for 30 MW Ground Mounted Solar Power Plant Project, Connected to Thapyaywa Substation"*.
- General Administration Department (Myitthar Township), 2020, *"Myitthar 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"*.
- Myanmar Survey Research (MSR), 2017, "*Environmental and Socio-economic Impact Assessment (ESIA) Report for Implementing Solar Power Plant Project in Minbu District, Magwe Region*".

Appendix

(1) Instructions to prepare EMP report



ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်အစိုးရ
သယံဇာတနှင့်သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာန
ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန
ညွှန်ကြားရေးမှူးချုပ်ရုံး
စာအမှတ်၊ အီးအိုင်အ- ၂/၉/အတည်ပြု(PP) (၅၉၅/၂၀၂၂)
ရက်စွဲ ၊ ၂၀၂၂ ခုနှစ် မတ်လ ၁၄ ရက်

သို့
Director
Green Power Energy Co., Ltd

အကြောင်းအရာ။ **Green Power Energy Co., Ltd မှ မန္တလေးတိုင်းဒေသကြီး၊ ကျောက်ဆည်မြို့နယ်၊ တောင်တော်ကွင်းခါတ်အားခွဲရုံနှင့်ချိတ်ဆက်၍ ၂၀ မဂ္ဂါဝပ် နေရောင်ခြည်သုံး လျှပ်စစ်ခါတ်အားပေးစက်ရုံစီမံကိန်းအတွက် လုပ်ငန်းဆိုင်ရာ စီမံကိန်းအဆိုပြုလွှာတင်ပြလာခြင်းအပေါ် သဘောထားပြန်ကြားခြင်း**

ရည်ညွှန်းချက်။ (၁) Green Power Energy Co., Ltd၏ (၂၅-၂-၂၀၂၂) ရက်စွဲပါ စာအမှတ်၊ GPE-GEC/HQ/Solar PV 02/10/2022

(၂) သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေး ဝန်ကြီးဌာန၏ (၂၂-၄-၂၀၂၁)ရက်စွဲပါစာအမှတ် (သစ်တော)၃(၂)/ ဝ၃(EC)/(၁၀၉၄/ ၂၀၂၁)

၁။ အကြောင်းအရာပါကိစ္စနှင့်ပတ်သက်၍ Green Power Energy Co., Ltdမှ မန္တလေးတိုင်းဒေသကြီး၊ ကျောက်ဆည်ခရိုင်၊ ကျောက်ဆည်မြို့နယ်တွင် တောင်တော်ကွင်းခါတ်အားခွဲရုံနှင့် ချိတ်ဆက်တည်ဆောက်မည့် ၂၀ မဂ္ဂါဝပ် နေရောင်ခြည်သုံး လျှပ်စစ်ခါတ်အားပေးစက်ရုံစီမံကိန်း တည်ဆောက်ရန်အတွက် စီမံကိန်းအဆိုပြုလွှာအား စိစစ်ပေးနိုင်ပါရန် ရည်ညွှန်း(၁)ပါစာဖြင့် တင်ပြလာပါသည်။

၂။ အဆိုပါ Green Power Energy Co., Ltdမှ မန္တလေးတိုင်းဒေသကြီး၊ ကျောက်ဆည်ခရိုင်၊ ကျောက်ဆည်မြို့နယ်တွင် တောင်တော်ကွင်းခါတ်အားခွဲရုံနှင့် ချိတ်ဆက်တည်ဆောက်မည့် ၂၀ မဂ္ဂါဝပ် နေရောင်ခြည်သုံးလျှပ်စစ်ခါတ်အားပေးစက်ရုံစီမံကိန်းသည် မြေဧရိယာ ၂၀၀ ဧကပေါ်တွင် တည်ဆောက်မည်ဖြစ်ပြီး စီမံကိန်းတွင် Bifcacial Monocrystaalline Silicon Solar PV Modules (၄၂၆၈၈)ခု အပါအဝင် Transformers ၊ Solar Power Station ၊ Multiple-Use Building အစရှိသည်တို့၏ တည်ဆောက်ရေးလုပ်ငန်းအပြင် ဆက်စပ်လုပ်ငန်းအဖြစ် ၈.၃၇ ကီလိုမီတာ (၅.၂ မိုင်) ရှိ သည့် ၃၃ ကေဗွီ ဓာတ်အားလိုင်းသွယ်တန်းခြင်းလုပ်ငန်းပါဝင်ကြောင်း စိစစ်တွေ့ရှိရပါသည်။

၃။ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်းနောက်ဆက်တွဲ(က)ဆန်းစစ်ခြင်းဆောင်ရွက်ရန်လိုအပ်သည့် စီမံကိန်းလုပ်ငန်းအမျိုးအစားများ သတ်မှတ်ချက်ဇယားအမှတ်

စဉ်(၁၁)အရ "နေရောင်ခြည်သုံးလျှပ်စစ်ဓာတ်အားထုတ်လုပ်ခြင်းလုပ်ငန်းအတွက် ထုတ်လုပ်မှုပမာဏ ၅၀ မဂ္ဂါဝပ်နှင့်အထက်ကို ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်းပြုလုပ်ရမည်ဖြစ်ပြီး ဝန်ကြီးဌာနက ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းပြုလုပ်ရန် လိုအပ်သည်ဟု သတ်မှတ်သည့် စီမံကိန်းအားလုံးကို ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းပြုလုပ်ရမည်"ဟု ဖော်ပြပါရှိပါသည်။ ထို့အပြင် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း လုပ်ထုံးလုပ်နည်း အပိုဒ်(၂၄)တွင် "ဝန်ကြီးဌာနသည် အခြားမည်သည့် စီမံကိန်း သို့မဟုတ် လုပ်ငန်းကိုမဆို ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်ရေးဆွဲရန် လိုအပ်ခြင်း ရှိမရှိ ရွေးချယ်သတ်မှတ်နိုင်သည်"ဟု ဖော်ပြထားပါသည်။

၄။ သို့ဖြစ်ပါ၍ Green Power Energy Co., Ltdမှ မန္တလေးတိုင်းဒေသကြီး၊ ကျောက်ဆည်ခရိုင်၊ ကျောက်ဆည်မြို့နယ်တွင် တောင်တော်ကွင်းဓါတ်အားခွဲရုံနှင့် ချိတ်ဆက်တည်ဆောက်မည့် ၂၀ မဂ္ဂါဝပ် နေရောင်ခြည်သုံး လျှပ်စစ်ဓါတ်အားပေးစက်ရုံစီမံကိန်းနှင့်ပတ်သက်သည့် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်းအပိုဒ်(၂၄)အရ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်ပြုလုပ်ရန် လိုအပ်ကြောင်းနှင့် (၂၀) မဂ္ဂါဝပ် နေရောင်ခြည်သုံး လျှပ်စစ်ဓာတ်အားထုတ်လုပ်ခြင်းလုပ်ငန်းနှင့် ၎င်း၏ ဆက်စပ်လုပ်ငန်းဖြစ်သော ၈.၃၇ ကီလိုမီတာ(၅.၂မိုင်)ရှိသည့် ၃၃ ကေဗွီ ဓာတ်အားလိုင်းသွယ်တန်းခြင်းလုပ်ငန်းအားလုံးကို ခြုံငုံသော ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်ကို အောက်ပါအတိုင်း ဆောင်ရွက်တင်ပြရန် လိုအပ်ကြောင်း သဘောထားမှတ်ချက်ပြန်ကြားအပ်ပါသည်-

(က) (၂၀) မဂ္ဂါဝပ်နေရောင်ခြည်သုံးလျှပ်စစ်ဓာတ်အားထုတ်လုပ်ခြင်းလုပ်ငန်းနှင့် ၎င်း၏ ဆက်စပ်လုပ်ငန်းဖြစ်သော ၈.၃၇ ကီလိုမီတာ(၅.၂မိုင်)ရှိသည့် ၃၃ ကေဗွီ ဓာတ်အားလိုင်းသွယ်တန်းခြင်းလုပ်ငန်းအားလုံးကို ခြုံငုံသော ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ် (Environmental Management Plan-EMP) ကို ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်းအပိုဒ်(၆၃)၊ အပိုဒ်ခွဲ(ဇ)နှင့် အပိုဒ်(၇၇)တို့နှင့်အညီ ရေးဆွဲ၍ သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာနသို့ တင်ပြအတည်ပြုချက်ရယူရန်၊

(ခ) ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ် ရေးဆွဲရာတွင် နေရောင်ခြည်သုံးလျှပ်စစ်ဓာတ်အားထုတ်လုပ်ခြင်း လုပ်ငန်းကြောင့် ဖြစ်ပေါ်လာနိုင်သော ပတ်ဝန်းကျင်နှင့် လူမှုရေးဆိုင်ရာ သက်ရောက်မှုများဖြစ်သော ဂေဟစနစ်နှင့် ဇီဝမျိုးစုံမျိုးကွဲ၊ မြေအသုံးချမှု၊ စွန့်ပစ်ပစ္စည်း (အစိုင်အခဲ/အရည်)စီမံခန့်ခွဲခြင်း၊ လူမှုစီးပွားရေး၊ လုပ်ငန်းခွင်ကျန်းမာရေးနှင့် ဘေးအန္တရာယ်ကင်းရှင်းရေးစသည့် နယ်ပယ်များနှင့်ပတ်သက်သော ကျွမ်းကျင်ပညာရှင်များဖြင့် ပြည့်စုံစွာရေးဆွဲတင်ပြရန်၊

၃

(ဂ) အဆိုပါ (၂၀) မဂ္ဂါဝပ်နေရောင်ခြည်သုံး လျှပ်စစ်ဓာတ်အားထုတ်လုပ်ခြင်းလုပ်ငန်း ဆိုင်ရာ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်အား တင်ပြရာတွင် လျှပ်စစ်ဓာတ်အား ထုတ်လုပ်ရေးလုပ်ငန်းမှတဆင့် တင်ပြရန်။

(လှမောင်သိန်း)
ညွှန်ကြားရေးမှူးချုပ်

မိတ္တူကို
ပြည်ထောင်စုဝန်ကြီးရုံး၊ သယံဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာန၊ ရုံးအမှတ်(၂၈)။
ဦးဆောင်ညွှန်ကြားရေးမှူး၊လျှပ်စစ်ဓါတ်အားထုတ်လုပ်ရေးလုပ်ငန်း၊နေပြည်တော်။
ရုံးလက်ခံ၊ မျှောစာတွဲ။

(2) Project proponent's company registration card

ကုမ္ပဏီမှတ်ပုံတင်လက်မှတ်

Certificate of Incorporation

GREEN POWER ENERGY COMPANY LIMITED

Company Registration No. 132210330

မြန်မာနိုင်ငံကုမ္ပဏီများဥပဒေ၂၀၁၇ အရ

GREEN POWER ENERGY COMPANY LIMITED

အား ၂၀၂၂ ခုနှစ် ဇန်နဝါရီလ ၂၈ ရက်နေ့တွင်

အစုရှယ်ယာအားဖြင့် တာဝန်ကန့်သတ်ထား သည့် အများနှင့်မသက်ဆိုင်သောကုမ္ပဏီ

အဖြစ် ဖွဲ့စည်းမှတ်ပုံတင်ခွင့်ပြုလိုက်သည်။

This is to certify that

GREEN POWER ENERGY COMPANY LIMITED

was incorporated under the Myanmar Companies Law 2017 on 28 January 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

(ကြားကာလအကြံပေးလုပ်ကိုင်သူမှတ်ပုံတင်ခြင်းအထောက်အထားလက်မှတ်)

No. 00028 Date 15 JAN 2017

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 သယ်ဇာတနှင့် သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာနသည် ဤအထောက်အထားလက်မှတ်ကို အဖွဲ့အစည်းအား ထုတ်ပေးလိုက်သည်။)

(a)	Name of Organization (အဖွဲ့အစည်းအမည်)	E Guard Environmental Services Co., Ltd.
(b)	Name of the representative in the organization (အဖွဲ့အစည်းကိုယ်စားလှယ်၏အမည်)	U Aye Thiha
(c)	Citizenship of the representative in the organization (အဖွဲ့အစည်းကိုယ်စားလှယ်၏နိုင်ငံသား)	Myanmar
(d)	Identity Card /Passport Number of the representative person in the organization (အဖွဲ့အစည်းကိုယ်စားလှယ်၏ 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
သက်တမ်းတိုးမြှင့်ခြင်း
The VALIDITY of this certificate is extended for one year from (1.4.2018) to (31.3.2019)
ဤလက်မှတ်သက်တမ်း (၁-၄-၂၀၁၈) ရက်စွဲမှ (၃၁-၃-၂၀၁၉) ရက်စွဲအထိ တစ်နှစ်သက်တမ်း တိုးမြှင့်လိုက်သည်။
12-1-2018
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. 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 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 nine months from (1.4.2019) to (31.12.2019)
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

EXTENSION
Environmental Conservation Department

REPUBLIC OF THE UNION OF MYANMAR

Ministry of Natural Resources and Environmental Conservation

CERTIFICATE FOR TRANSITIONAL CONSULTANT REGISTRATION

(ကြားကာလအကြေးလုပ်ကိုင်သူမှတ်ပုံတင်ခြင်းအထောက်အထားလက်မှတ်)

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 (အကြေးပုဂ္ဂိုလ်အမည်)	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 (အကြေးလုပ်ကိုင်မှုအမျိုးအစား)	Person
(g)	Duration of validity (သက်တမ်းကုန်ဆုံးရက်)	31 March 2018

EXTENSION
သက်တမ်းတိုးခြင်း
The VALIDITY of this certificate is extended for one year from (1.4.2018) to (31.3.2019)
ဤလက်မှတ်သက်တမ်း (၁-၄-၂၀၁၈) ရက်နေ့မှ (၃၁.၃.၂၀၁၉) ရက်နေ့အထိ တိုးမြှင့်သည်။
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
သက်တမ်းတိုးမြှင့်ခြင်း
The VALIDITY of this certificate is extended for one year from (1.1.2020) to (31.12.2020)
ဤလက်မှတ်အား (၁-၁-၂၀၂၀) ရက်နေ့မှ (၃၁-၁၂-၂၀၂၀) ရက်နေ့အထိ တစ်နှစ်သက်တမ်းတိုးမြှင့်သည်။
Soe Naing 29.1.2020
For Director General
(Soe Naing, Director)
Environmental Conservation Department

EXTENSION
သက်တမ်းတိုးမြှင့်ခြင်း
The VALIDITY of this certificate is extended for nine months from (1.4.2019) to (31.12.2019)
ဤလက်မှတ်အား (၁-၄-၂၀၁၉) ရက်နေ့မှ (၃၁-၁၂-၂၀၁၉) ရက်နေ့အထိ (၉)လသက်တမ်း တိုးမြှင့်သည်။
Soe Naing 17.6.19
For Director General
(Soe Naing, Director)
Environmental Conservation Department

EXTENSION
သက်တမ်းတိုးမြှင့်ခြင်း
The VALIDITY of this certificate is extended for six month from (1.1.2021) to (30.6.2021)
ဤလက်မှတ်အား (၁-၁-၂၀၂၁) ရက်နေ့မှ (၃၀-၆-၂၀၂၁) ရက်နေ့အထိ (၆)လသက်တမ်းတိုးမြှင့်သည်။
Soe Naing
For Director General
(Soe Naing, Director)
Environmental Conservation Department

EXTENSION
သက်တမ်းတိုးမြှင့်ခြင်း
The VALIDITY of this certificate is extended for six months from (1.7.2021) to (31.12.2021)
ဤလက်မှတ်အား (၁-၇-၂၀၂၁) ရက်နေ့မှ (၃၁-၁၂-၂၀၂၁) ရက်နေ့အထိ (၆)လသက်တမ်းတိုးမြှင့်သည်။
Soe Naing
For Director General
(Soe Naing, Director)
Environmental Conservation Department

EXTENSION (သက်တမ်းတိုးမြှင့်ခြင်း)
The VALIDITY of this certificate is extended for one year from (1.1.2022) to (31.12.2022)
ဤလက်မှတ်အား (၁-၁-၂၀၂၂) ရက်နေ့မှ (၃၁-၁၂-၂၀၂၂) ရက်နေ့အထိ တစ်နှစ်သက်တမ်းတိုးမြှင့်သည်။
Soe Naing
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. 10099 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)	U Aung Myint Myat
(b)	Citizenship (နိုင်ငံသား)	Myanmar
(c)	Identity Card / Passport Number (မှတ်ပုံတင်/ နိုင်ငံကူးလက်မှတ် အမှတ်)	9/ Ka Pa Ta (Naing) 214545
(d)	Address (ဆက်သွယ်ရန်လိပ်စာ)	Mudita lane, Loklatyae Quarter, Kyaukpadaung Township, Mandalay Region. aungmyintmyat@eguardservices.com , 09 797005168 , 09 794555989
(e)	Organization (အဖွဲ့အစည်း)	E Guard Environmental Services Co., Ltd.
(f)	Type of Consultancy (အကြံပေးလုပ်ကိုင်မှုအမျိုးအစား)	Person
(g)	Duration of validity (သက်တမ်းကုန်ဆုံးရက်)	31 March 2018

EXTENSION
သက်တမ်းတိုးမြှင့်ခြင်း
The VALIDITY of this certificate is extended for one year from (1.4.2018) to (31.3.2019)
ဤလက်မှတ်သက်တမ်း (၀၁-၄-၂၀၁၈) ရက်နေ့မှ (၃၁.၃.၂၀၁၉) ရက်နေ့အထိ တစ်နှစ်တာကာလအတွက် တိုးမြှင့်လိုက်သည်။
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

EXTENSION
သက်တမ်းတိုးခြင်း
The VALIDITY of this certificate is extended for one year from (1.1.2020) to (31.12.2020)
ဤလက်မှတ်သက်တမ်းကို (၁-၁-၂၀၂၀) ရက်နေ့မှ (၃၁-၁၂-၂၀၂၀) ရက်နေ့အထိ တစ်နှစ်သက်တမ်းတိုးပြင်းသည်။
For Director General
(Soe Naing, Director)
Environmental Conservation Department

EXTENSION
သက်တမ်းတိုးခြင်း
The VALIDITY of this certificate is extended for nine months from (1.4.2019) to (31.12.2019)
ဤလက်မှတ်သက်တမ်းကို (၁-၄-၂၀၁၉) ရက်နေ့မှ (၃၁-၁၂-၂၀၁၉) ရက်နေ့အထိ (၉)လသက်တမ်း တိုးပြင်းသည်။
For Director General
(Soe Naing, Director)
Environmental Conservation Department

EXTENSION
သက်တမ်းတိုးခြင်း
The VALIDITY of this certificate is extended for six month from (1.1.2021) to (30.6.2021)
ဤလက်မှတ်သက်တမ်းကို (၁-၁-၂၀၂၁) ရက်နေ့မှ (၃၀-၆-၂၀၂၁) ရက်နေ့အထိ (၆)လ သက်တမ်းတိုးပြင်းသည်။
For Director General
(Soe Naing, Director)
Environmental Conservation Department

EXTENSION
သက်တမ်းတိုးခြင်း
The VALIDITY of this certificate is extended for six months from (1.7.2021) to (31.12.2021)
ဤလက်မှတ်သက်တမ်းကို (၁-၇-၂၀၂၁) ရက်နေ့မှ (၃၁-၁၂-၂၀၂၁) ရက်နေ့အထိ (၆)လ သက်တမ်းတိုးပြင်းသည်။
For Director General
(Soe Naing, Director)
Environmental Conservation Department

EXTENSION (သက်တမ်းတိုးခြင်း)
The VALIDITY of this certificate is extended for one year from (1.1.2022) to (31.12.2022)
ဤလက်မှတ်သက်တမ်းကို (၁-၁-၂၀၂၂) ရက်နေ့မှ (၃၁-၁၂-၂၀၂၂) ရက်နေ့အထိ တစ်နှစ်သက်တမ်းတိုးပြင်းသည်။
For Director General
(Soe Naing, Director)
Environmental Conservation Department

(4) Public consultation meeting's attendance lists

မန္တလေးတိုင်းဒေသကြီး၊ ကျောက်ဆည်ခရိုင်၊ မြစ်သားမြို့နယ်၊ တေစိုးကျေးရွာအုပ်စုတွင်အကောင်အထည်ဖော်ဆောင်ရွက်မည့်
၂၀ မဂ္ဂါဝပ် နေရောင်ခြည်စွမ်းအင်သုံးလျှပ်စစ်ဓာတ်အားထုတ်လုပ်ခြင်းစီမံကိန်းအတွက် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်ရေးဆွဲခြင်းလုပ်ငန်းနှင့်ပတ်သက်၍
ရှင်းလင်းတင်ပြခြင်းနှင့် အများပြည်သူသဘောထားရယူပွဲ အခမ်းအနားသို့တက်ရောက်လာသူများစာရင်း

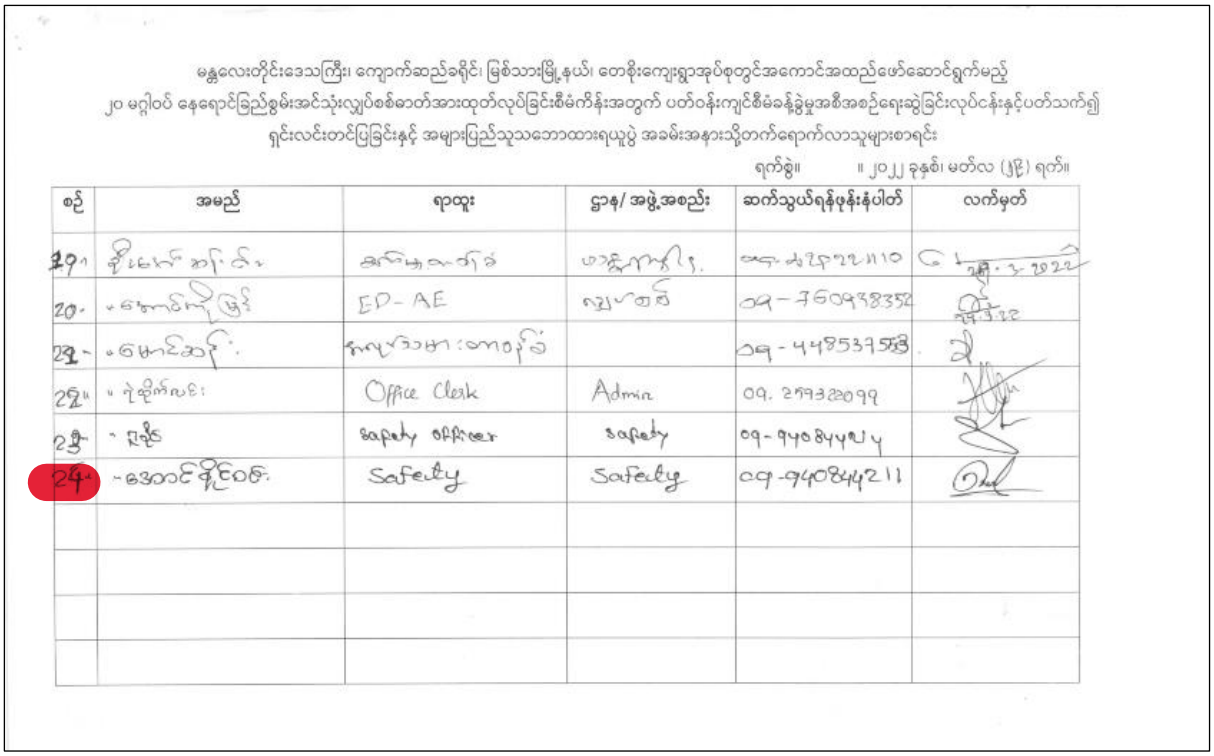
ရက်စွဲ။ ။ ၂၀၂၂ ခုနှစ်၊ မတ်လ (၂၉) ရက်။

စဉ်	အမည်	နေရပ်လိပ်စာ	အလုပ်အကိုင်	ဆက်သွယ်ရန်ဖုန်းနံပါတ်	လက်မှတ်
1	ဦးအောင်ကြည်	အမှတ် ၃ ရွာ	ရပ်ကွက်အုပ်ချုပ်ရေးမှူး	09756023062	
2	ဦးရန်ထွန်း	တောင်ရွာ	တောင်သူ	-	
3	ဦးရွှေသန်း	"	"	09953672155	
4	ဦးသန်းထွန်း	အမှတ် ၃ ရွာ	"	09767950961	
5	ဦးမြင့်ဆွေ	တောင်ရွာ	လယ်သမား	-	
6	မဒီဝဲ	အမှတ် ၃	မှီခို	09425912198	
7	မသင်းမာထွန်း	အမှတ် ၃	မှီခို	09-257 462 720	
8	မကေခိုင်	"	"	09-754299843	
9	မချစ်ချစ်	"	မှီခို	09-668972779	
10	မသော်အောင်	"	"	09 ~~400[illegible]441~~ 400696441	

မန္တလေးတိုင်းဒေသကြီး၊ ကျောက်ဆည်ခရိုင်၊ မြစ်သားမြို့နယ်၊ တေစိုးကျေးရွာအုပ်စုတွင်အကောင်အထည်ဖော်ဆောင်ရွက်မည့်
၂၀ မဂ္ဂါဝပ် နေရောင်ခြည်စွမ်းအင်သုံးလျှပ်စစ်ဓာတ်အားထုတ်လုပ်ခြင်းစီမံကိန်းအတွက် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်ရေးဆွဲခြင်းလုပ်ငန်းနှင့်ပတ်သက်၍
ရှင်းလင်းတင်ပြခြင်းနှင့် အများပြည်သူသဘောထားရယူပွဲ အခမ်းအနားသို့တက်ရောက်လာသူများစာရင်း

ရက်စွဲ။ ။ ၂၀၂၂ ခုနှစ်၊ မတ်လ (၂၉) ရက်။

စဉ်	အမည်	နေရပ်လိပ်စာ	အလုပ်အကိုင်	ဆက်သွယ်ရန်ဖုန်းနံပါတ်	လက်မှတ်
11	မနှင်းနွယ်ဦး	အမှတ် ၃ ရွာ	မှီခို	09-459817514	
12	မအိအိမြင့်	"	"	09-747995402	
13	မနှင်းအိကြာ	"	"	09-963587903	
14	မအိအိမြင့်	"	"	09-771752028	
15	မောင်ပြည့်ဖြိုးအောင်	တောရိုး	မှီခို	09-781073198	
16	ဦးသန်းထွန်းဦး	အမှတ် ၃ ရွာ	အုပ်ချုပ်ရေးမှူး	09-767891559	
17	ဦးခင်မောင်	ပ ၃/၁၂ ၈၇	ကျောင်းသား	09 [illegible]	
18	ဦးကျော်	၁၈ တောရိုး	လယ်သမား	09-799422897	



မန္တလေးတိုင်းဒေသကြီး၊ ကျောက်ဆည်ခရိုင်၊ မြစ်သားမြို့နယ်၊ တောစိုးကျေးရွာအုပ်စုတွင်အကောင်အထည်ဖော်ဆောင်ရွက်မည့်
၂၀ မဂ္ဂါဝပ် နေရောင်ခြည်စွမ်းအင်သုံးလျှပ်စစ်ဓာတ်အားထုတ်လုပ်ခြင်းစီမံကိန်းအတွက် ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်ရေးဆွဲခြင်းလုပ်ငန်းနှင့်ပတ်သက်၍
ရှင်းလင်းတင်ပြခြင်းနှင့် အများပြည်သူသဘောထားရယူပွဲ အခမ်းအနားသို့တက်ရောက်လာသူများစာရင်း

ရက်စွဲ။ ။ ၂၀၂၂ ခုနှစ်၊ မတ်လ (၂၄) ရက်။

စဉ်	အမည်	ရာထူး	ဌာန/ အဖွဲ့အစည်း	ဆက်သွယ်ရန်ဖုန်းနံပါတ်	လက်မှတ်
19	[illegible]	[illegible]	[illegible]	[illegible]	
20	[illegible]	ED- AE	[illegible]	09-760938352	
21	[illegible]	[illegible]		09-448537583	
22	[illegible]	Office Clerk	Admin	09. 2793280 99	
23	[illegible]	Safety officer	Safety	09-940844941	
24	[illegible]	Safety	Safety	09-940844211	

(5) Public consultation meeting's meeting minutes

E Guard Environmental Services Co., Ltd. Meeting Minutes	
Subject: Public Consultation Meeting for Environmental Management Plan (EMP) of 20 MW Ground Mounted Solar Power Plant Project Connected to Taungdawgwin Substation	**Date:** 29th March, 2022.
Venue: Yezin Agricultural University (Kyaukse Branch), Taysoe Village, Myitthar Township	**Time:** 04:00 PM to 5:30 PM
Attendees: Total: 27 Local People from Tay Soe Village: 5 Local People from No (3) Village: 12 Local People from Padonma Village: 1 Representatives of project proponents: 6 Representatives of E Guard Environmental Services: 3	
Note Taker: U Zaw Ye Naung	

Agenda:

1) Opening the ceremony
2) Presentation of Project Information by U Aung Ko Myint (Electrical Engineer, Green Power Energy Co., Ltd.)
3) Presentation of Environmental Management Plan (EMP) for construction and operation of 20 MW ground mounted solar power plant project connected to Taungdawgwin Substation by U Aung Si Thu Thein (Associate Consultant, E Guard Environmental Services Co., Ltd.)
4) Questions, Comments and Suggestions from the attendees.
5) Closing the ceremony

1. Opening Ceremony

2. Presentation of Project Information by U Aung Ko Myint (Electrical Engineer, Green Power Energy Co., Ltd.)

U Aung Ko Myint briefly explained briefly explained the project information, project proponent information and project description with regards to the project.

3. Presentation of Environmental Management Plan (EMP) including impacts and mitigations for construction, operation and decommission of 20 MW ground mounted solar power plant project connected to Taungdawgwin Substation by U Aung Si Thu Thein (Associate Consultant, E Guard Environmental Services Co., Ltd.)

U Aung Si Thu Thein 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 during the site visit.

4. Questions, Comments and Suggestions from the Attendees

Question: U Min Aung (Padonma Village) discussed that he would like to thank for economic development of the country due to the project implementation. He wants to know the impacts on environment both pros and cons? He also wants to request to slow down vehicular movement in the area of villages.

Answer: U Aung Ko Myint (Electrical Assistant Engineer, Green Power Energy Co., Ltd.) answered that the project proponent has the regulations for the workers and staffs, they will make penalties for the offenders who do not obey the regulations among their workers. Mitigation measures for vehicle accidents have already applied for project just like limitation for vehicle speed not more than 10 miles per hour in the vicinity of project and near villages.

U Aung Si Thu Thein (Assistant Consultant, E Guard Environmental Services Co., Ltd.) also answered that there are both positive and negative impacts due to project implementation. However, negative impacts can be reduced by implementing mitigation measures, Environmental Management Plans and Environmental Monitoring Plans.

Question: U Than Tun (No 3 Village) discussed that sudden and potential weather changes can be occurred due to solar panel uses in this area.

Answer: U Aung Si Thu Thein (Assistant Consultant, E Guard Environmental Services Co., Ltd.) answered that it was nearly zero chances to effect on weather due to project implementation as using renewable energy for electricity generation. The company has already prepared on impact assessment and mitigation measures for potential impacts on environment.

Question: U Aung Kyi (No 3 Village) asked that he was worrying electrical hazards in period of raining and flooding?

Answer: U Aung Ko Myint (Electrical Assistant Engineer, Green Power Energy Co., Ltd.) answered it was not likely to happen electrical hazards in raining and flooding period because of the quality of the electrical equipment, 24-hour surveillance on operation and emergency response plans.

Question: Daw Zin Mar Tun (No 3 Village) asked that nearby village can get electricity from operation of solar project or not?

Answer: U Aung Ko Myint (Electrical Assistant Engineer, Green Power Energy Co., Ltd.) answered that generated electricity will be distributed according to the government plan and project proponent has no authority to supply electricity as their own decision. Electricity generation from solar energy by this project will connect to Taungdawgwin Substation and go to national grid.

5. Closing the Ceremony

(6) Public consultation meeting's photos

Meeting with Township Administrator at Myitthar Township GAD Office

Meeting with Township Administrator at Myitthar Township GAD Office

Presented by U Aung Ko Myint (Electrical Assistant Engineer of the Project)

Presented by U Aung Si Thu Thein (E Guard Environmental Services)

Questions, Comments and Suggestions from the Attendees

Questions, Comments and Suggestions from the Attendees

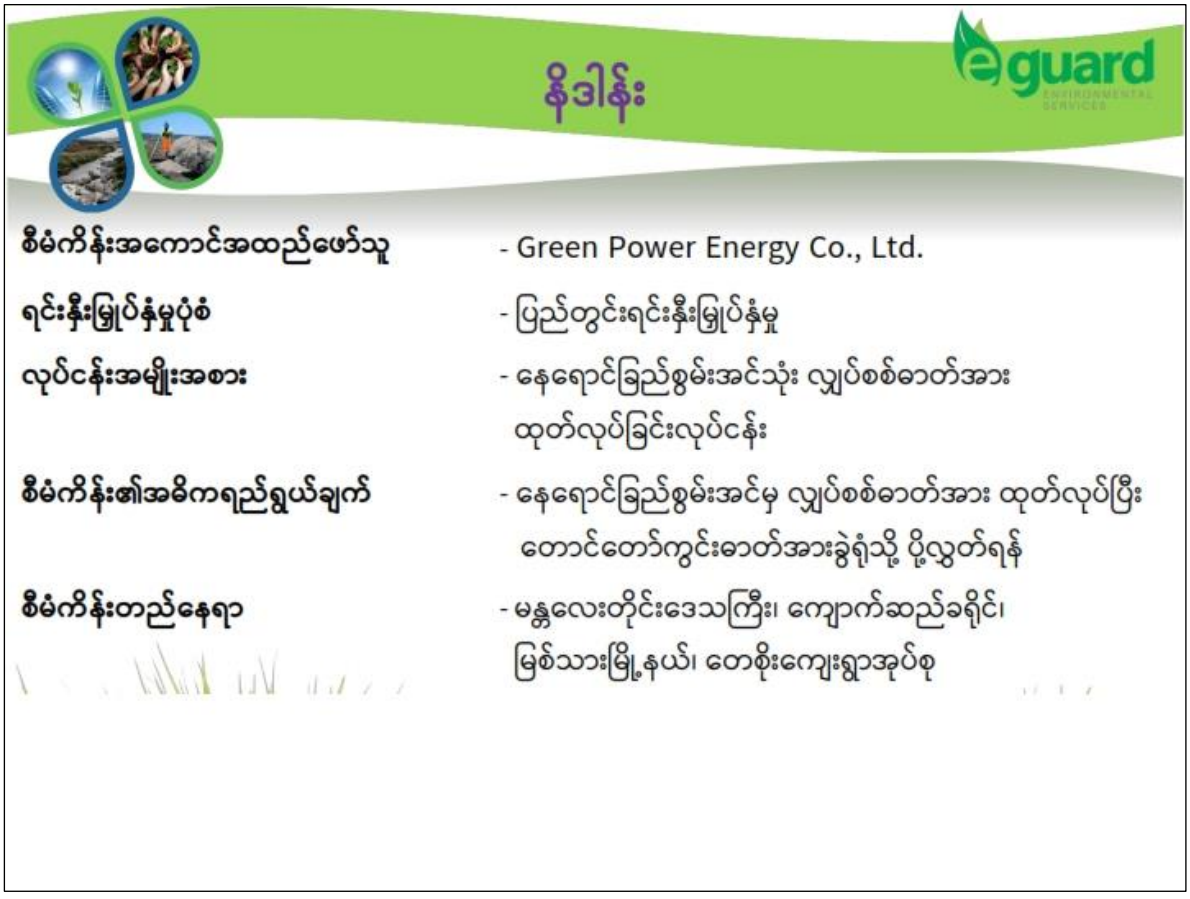
Questions, Comments and Suggestions from the Attendees

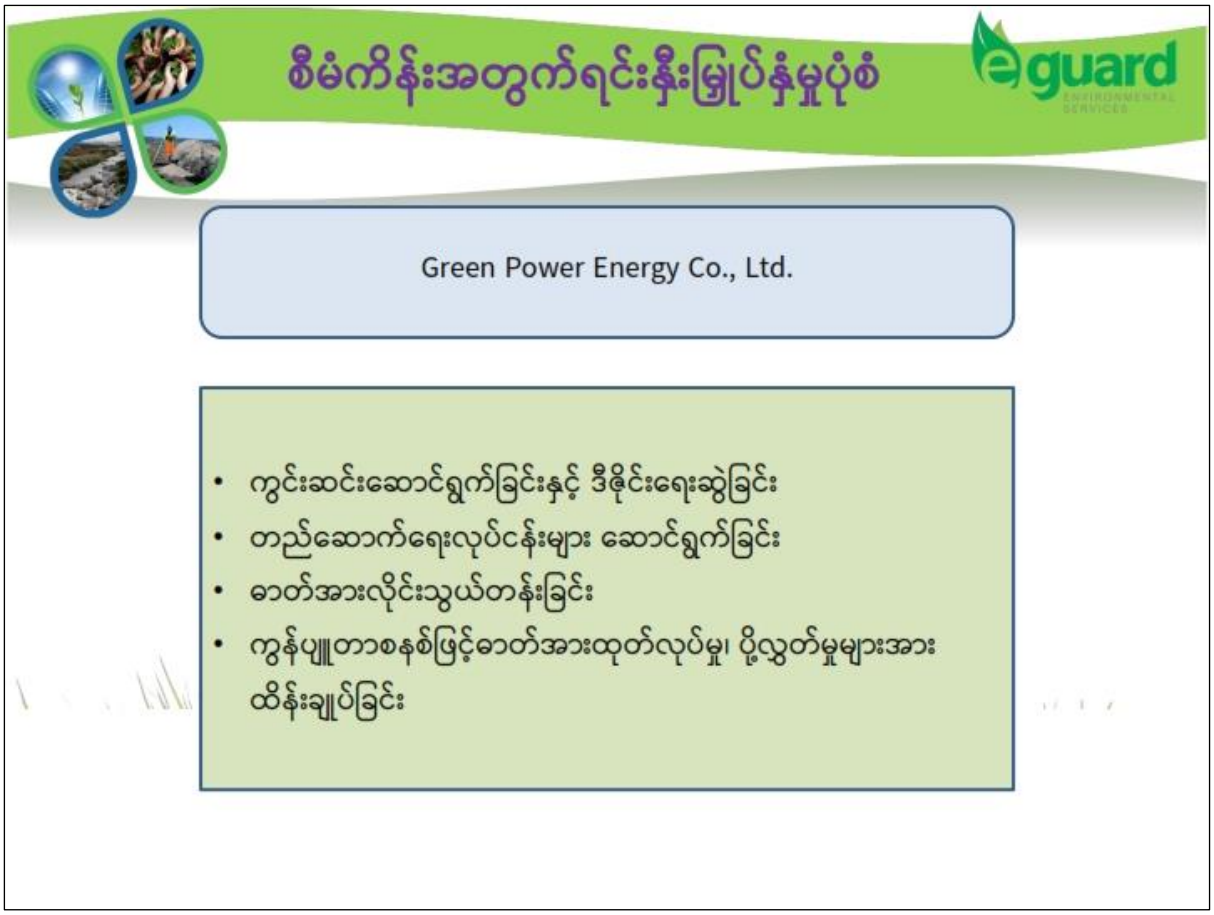
Questions, Comments and Suggestions from the Attendees

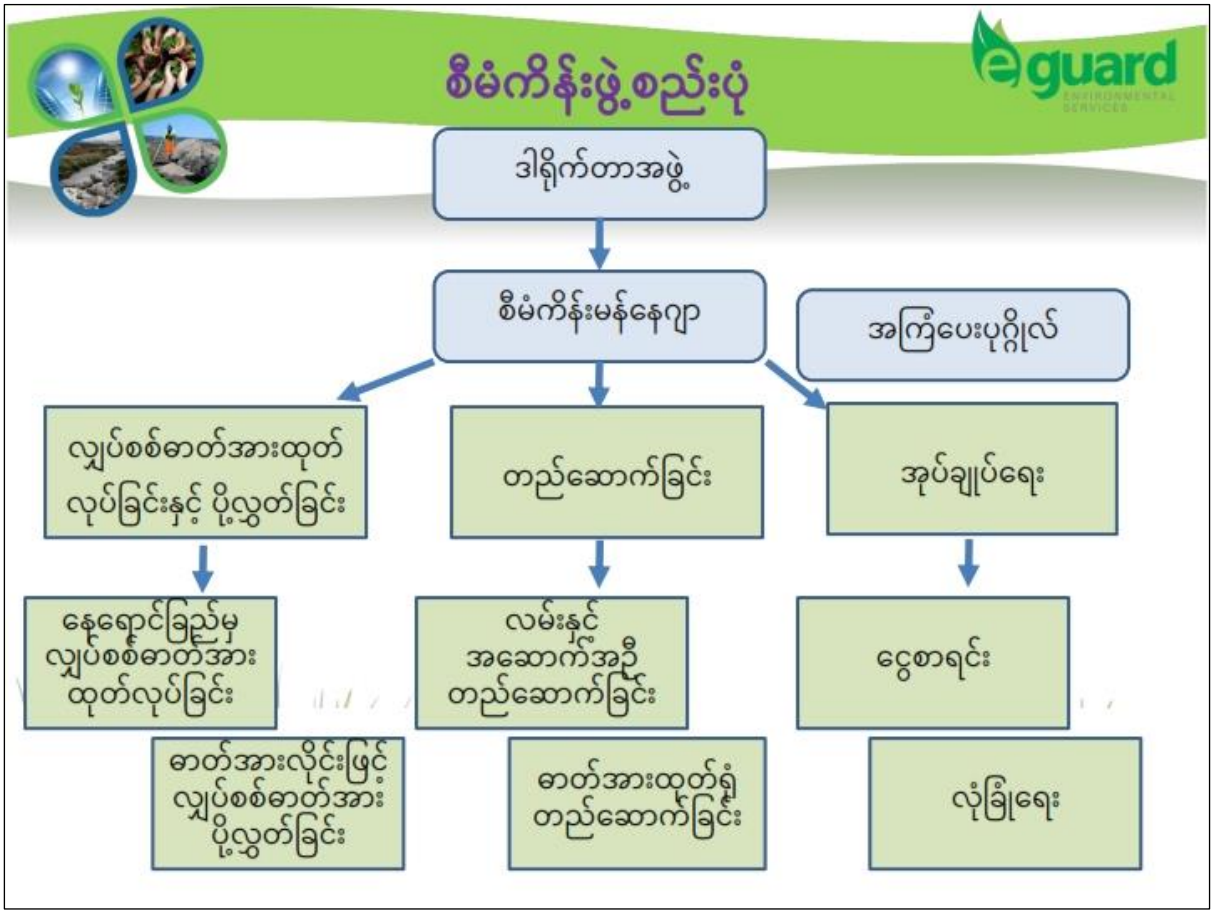
Attendees

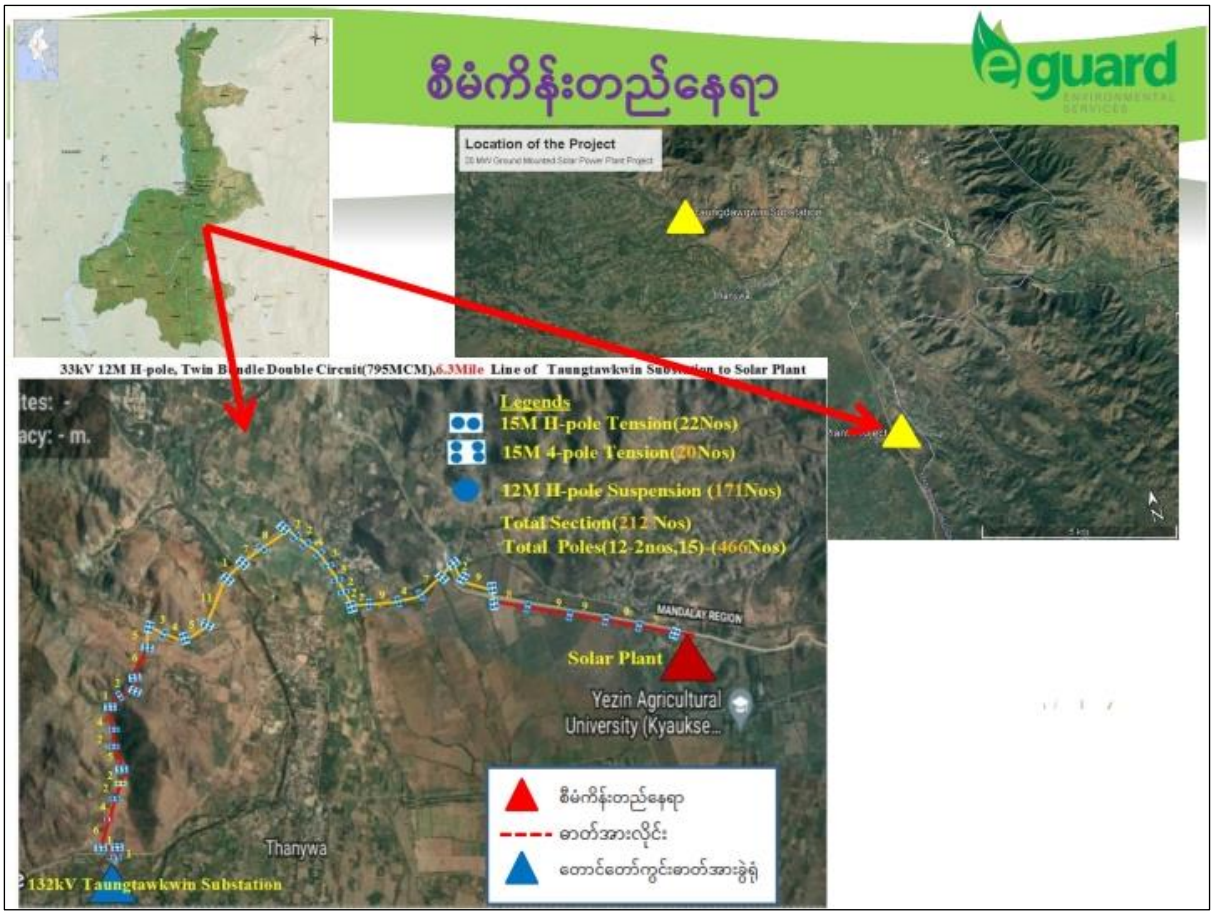
Attendees

(7) Presentation file of public consultation meeting




စီမံကိန်းအတွက်ရင်းနှီးမြှုပ်နှံမှုပုံစံ
eguard
Green Power Energy Co., Ltd.
• ကွင်းဆင်းဆောင်ရွက်ခြင်းနှင့် ဒီဇိုင်းရေးဆွဲခြင်း
• တည်ဆောက်ရေးလုပ်ငန်းများ ဆောင်ရွက်ခြင်း
• ဓာတ်အားလိုင်းသွယ်တန်းခြင်း
• ကွန်ပျူတာစနစ်ဖြင့်ဓာတ်အားထုတ်လုပ်မှု၊ ပို့လွှတ်မှုများအား ထိန်းချုပ်ခြင်း


စီမံကိန်းဖွဲ့စည်းပုံ
eguard
ဒါရိုက်တာအဖွဲ့
စီမံကိန်းမန်နေဂျာ
အကြံပေးပုဂ္ဂိုလ်
လျှပ်စစ်ဓာတ်အားထုတ်လုပ်ခြင်းနှင့် ပို့လွှတ်ခြင်း
တည်ဆောက်ခြင်း
အုပ်ချုပ်ရေး
နေရောင်ခြည်မှလျှပ်စစ်ဓာတ်အားထုတ်လုပ်ခြင်း
လမ်းနှင့်အဆောက်အဦတည်ဆောက်ခြင်း
ငွေစာရင်း
ဓာတ်အားလိုင်းဖြင့်လျှပ်စစ်ဓာတ်အားပို့လွှတ်ခြင်း
ဓာတ်အားထုတ်ရုံတည်ဆောက်ခြင်း
လုံခြုံရေး


စီမံကိန်းတည်နေရာ
eguard
Location of the Project
33kV 12M H-pole, Twin Bundle Double Circuit(795MCM),6.3Mile Line of Taungtawkwin Substation to Solar Plant
Legends
15M H-pole Tension(22Nos)
15M 4-pole Tension(20Nos)
12M H-pole Suspension (171Nos)
Total Section(212 Nos)
Total Poles(12-2nos,15)-(466Nos)
MANDALAY REGION
Solar Plant
Yezin Agricultural University (Kyaukse...
Thanywa
132kV Taungtawkwin Substation
စီမံကိန်းတည်နေရာ
မော်တော်အားလိုင်း
တောင်တော်ကွင်းမော်တော်အားခွဲရုံ

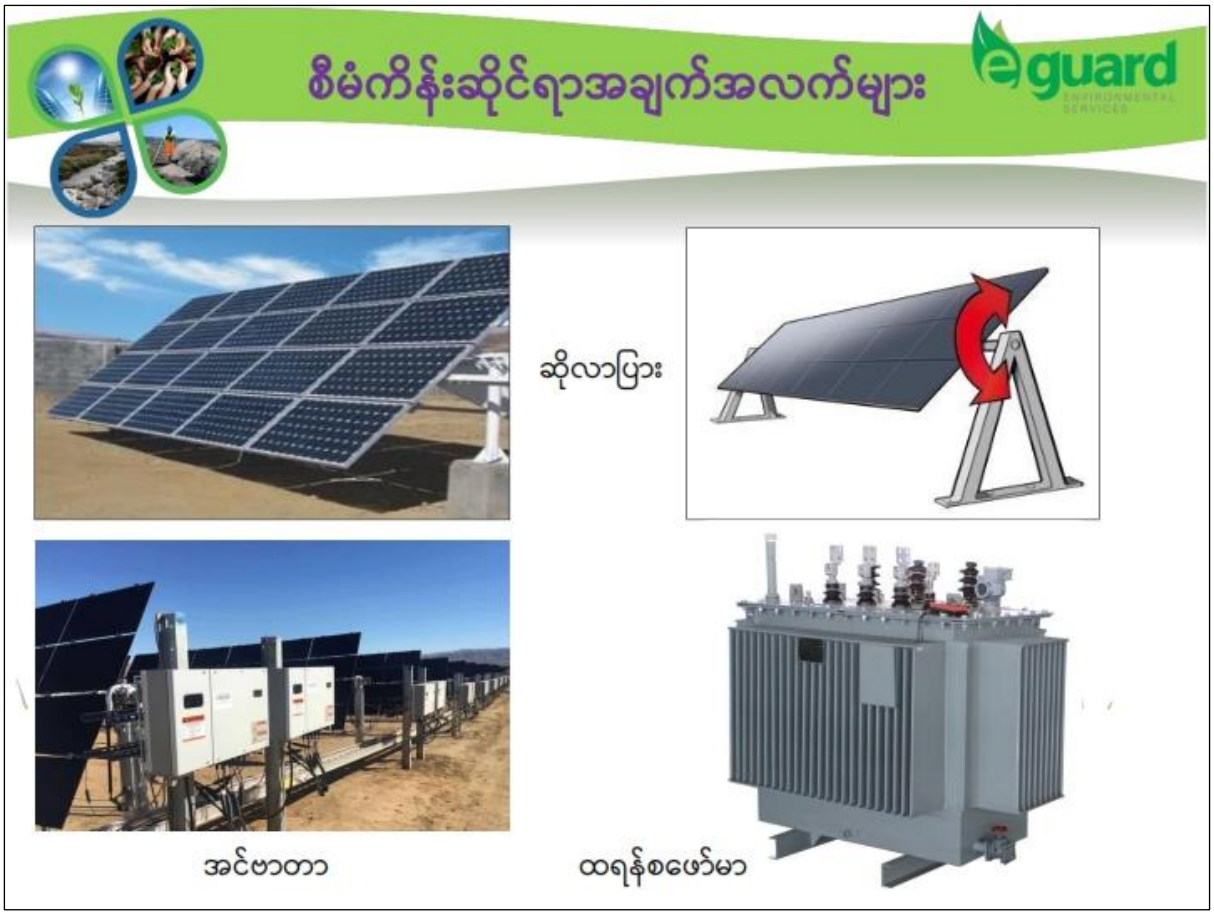

စီမံကိန်းဆိုင်ရာအချက်အလက်များ
eguard
မော်တော်အားစတင်ပို့လွှတ်မည့်နေရာ
ဆိုလာပြားများတပ်ဆင်ထားသည့်ဧရိယာ
A1
A2
A3
A4
A5
A6
B1
B2
B3
B4
C1
C2
C3
C4
C5
D1
D2
D3
D4
STORE
TAUNGTAW HILL

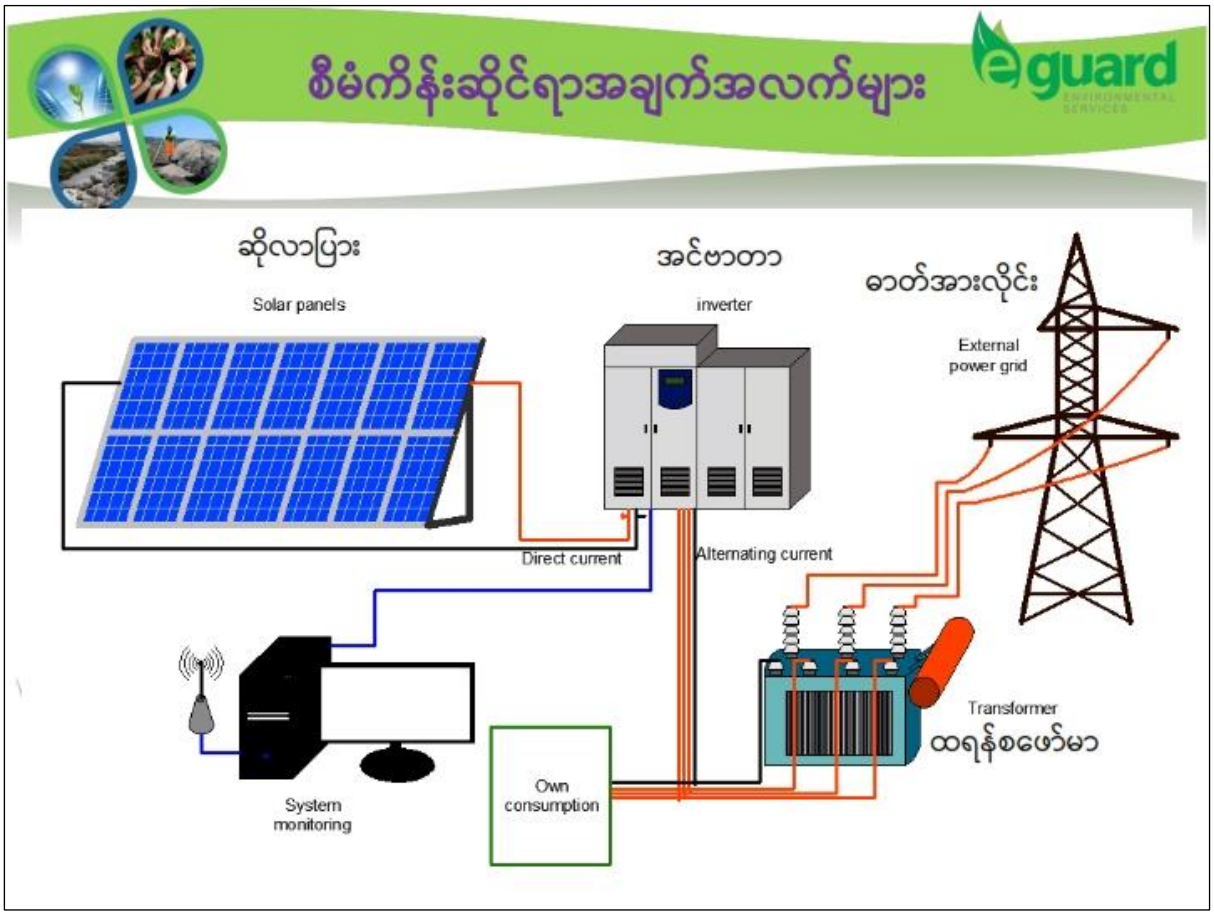
စီမံကိန်းဆိုင်ရာအချက်အလက်များ

စီမံကိန်းတည်ဆောက်မည့်ကာလ	- (၆) လ
စီမံကိန်းလည်ပတ်မည့်ကာလ	- နှစ် (၂၀)
စီမံကိန်းအကျယ်အဝန်း	- (၂၀၀) ဧက
ဓာတ်အားလိုင်းမှပို့လွှတ်နိုင်သည့်ပမာဏ	- (၃၃) ကေဗီအေ
ဓာတ်အားလိုင်းအရှည်	- (၉.၆၀) ကီလိုမီတာခန့်
ဘက်စုံသုံးအဆောက်အဦအကျယ်	- (၇၆၂) စတုရန်းမီတာ
ဘက်စုံသုံးအဆောက်အဦအမျိုးအစား	- သံကူကွန်ကရစ်အဆောက်အဦ
ဘက်စုံသုံးအဆောက်အဦတွင်ပါဝင်မည့်အထပ်အရေအတွက်	- (၂) ထပ်

စီမံကိန်းဆိုင်ရာအချက်အလက်များ

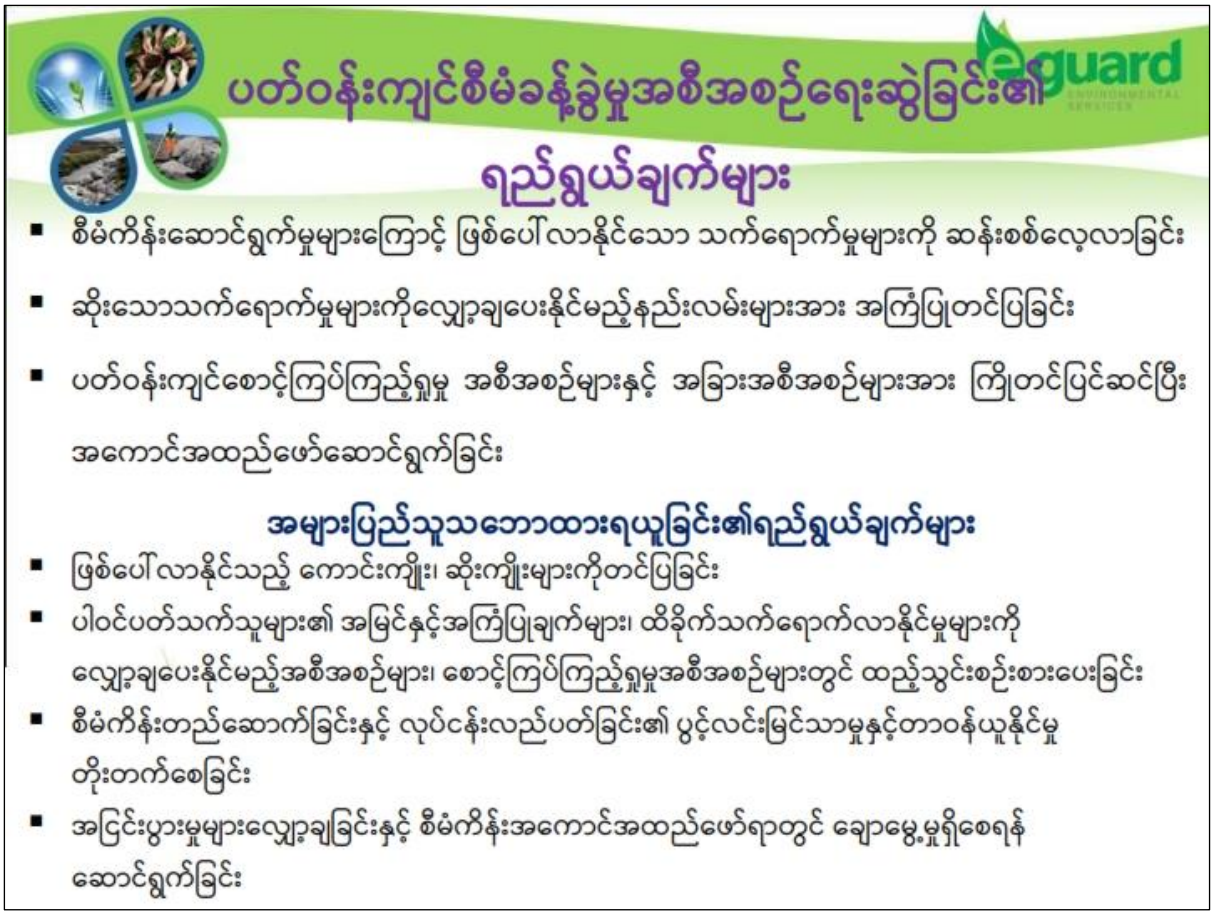
ဆိုလာပြားအမျိုးအစားနှင့် အရေအတွက်	- ၅၅၅ Wp ရှိ မျက်နှာပြင်နှစ်ဖက်ပါသော မိုနိုခရစ်စတယ်လိုင်း ဆီလီကွန် ဆိုလာပြား (၄၅၉၈၀ ခု)
ဆိုလာပြားအောက်ရှိထောက်တိုင်အမျိုးအစားနှင့် အရေအတွက်	- အရှေ့အရပ်မှအနောက်အရပ်သို့ ရေပြင်ညီအတိုင်းလှည့်နိုင်သော ထောက်တိုင် (၆၀၅ ခု)
အင်ဗာတာအမျိုးအစားနှင့် အရေအတွက်	- String inverter (24 in and 1 out, 250 kW) (၉၁ လုံး)
ထရန်စဖော်မာအမျိုးအစားနှင့် အရေအတွက်	- Box type double split transformer (၃ လုံး) နှင့် double winding transformer (၁ လုံး)
ဓာတ်အားလိုင်းတွင်ပါဝင်မည့်ဓာတ်တိုင်အမျိုးအစား စုစုပေါင်း • တိုင်နှစ်ခုပါသော H ပုံစံရှိဓာတ်တိုင် (၁၅ မီတာ) • တိုင်လေးခုပါသောကြိုးတင်းအားထိန်းဓာတ်တိုင် • တိုင်နှစ်ခုပါသော H ပုံစံရှိဓာတ်တိုင် (၁၂ မီတာ)	- (၃) မျိုး • (၂၂) တိုင် • (၂၀) တိုင် • (၁၇၁) တိုင်


စီမံကိန်းဆိုင်ရာအချက်အလက်များ
eguard
ENVIRONMENTAL SERVICES
ဆိုလာပြား
အင်ဗာတာ
ထရန်စဖော်မာ


စီမံကိန်းဆိုင်ရာအချက်အလက်များ
eguard
ENVIRONMENTAL SERVICES
ဆိုလာပြား
Solar panels
အင်ဗာတာ
inverter
ဓာတ်အားလိုင်း
External power grid
Direct current
Alternating current
Transformer
ထရန်စဖော်မာ
System monitoring
Own consumption

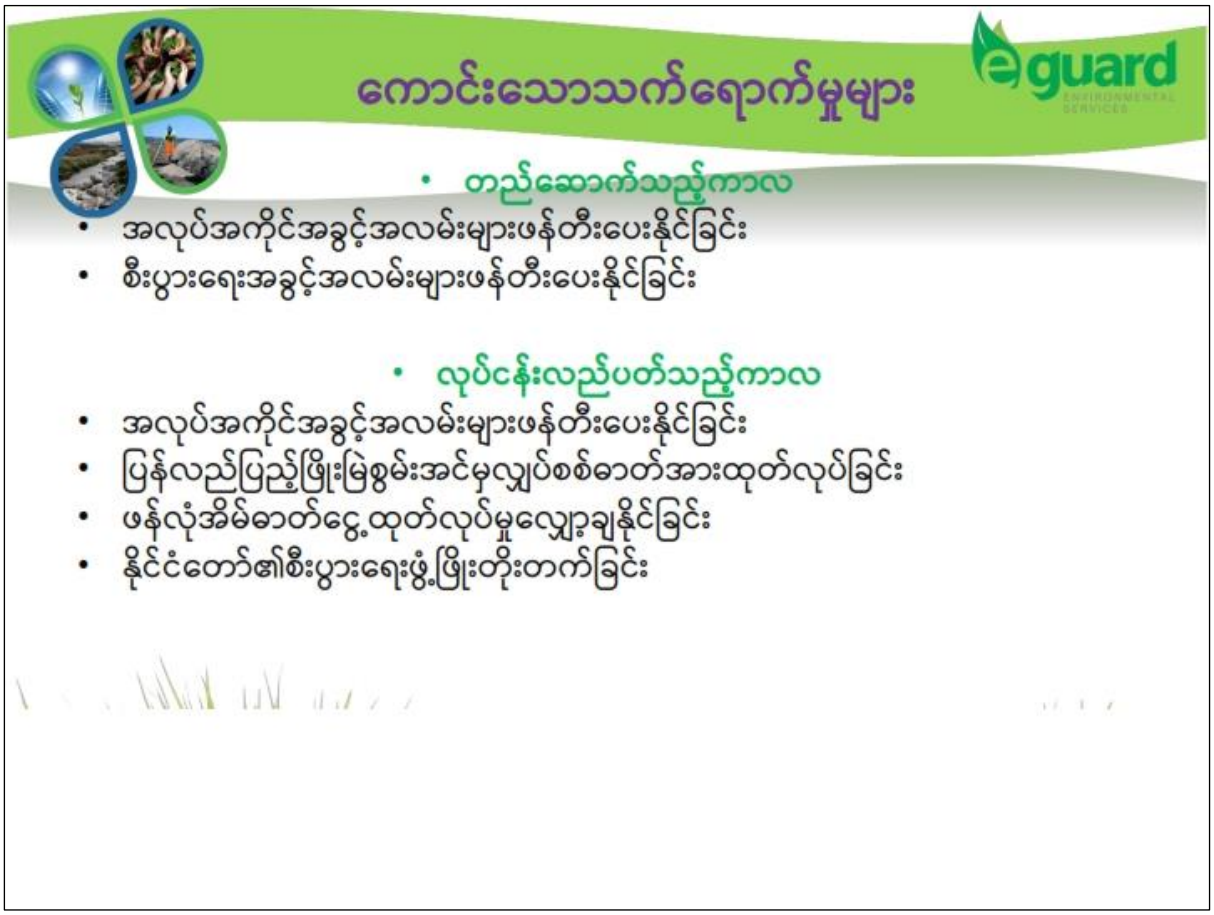

ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်ရေးဆွဲခြင်း
(Environmental Management Plan)
E Guard Environmental Services
11

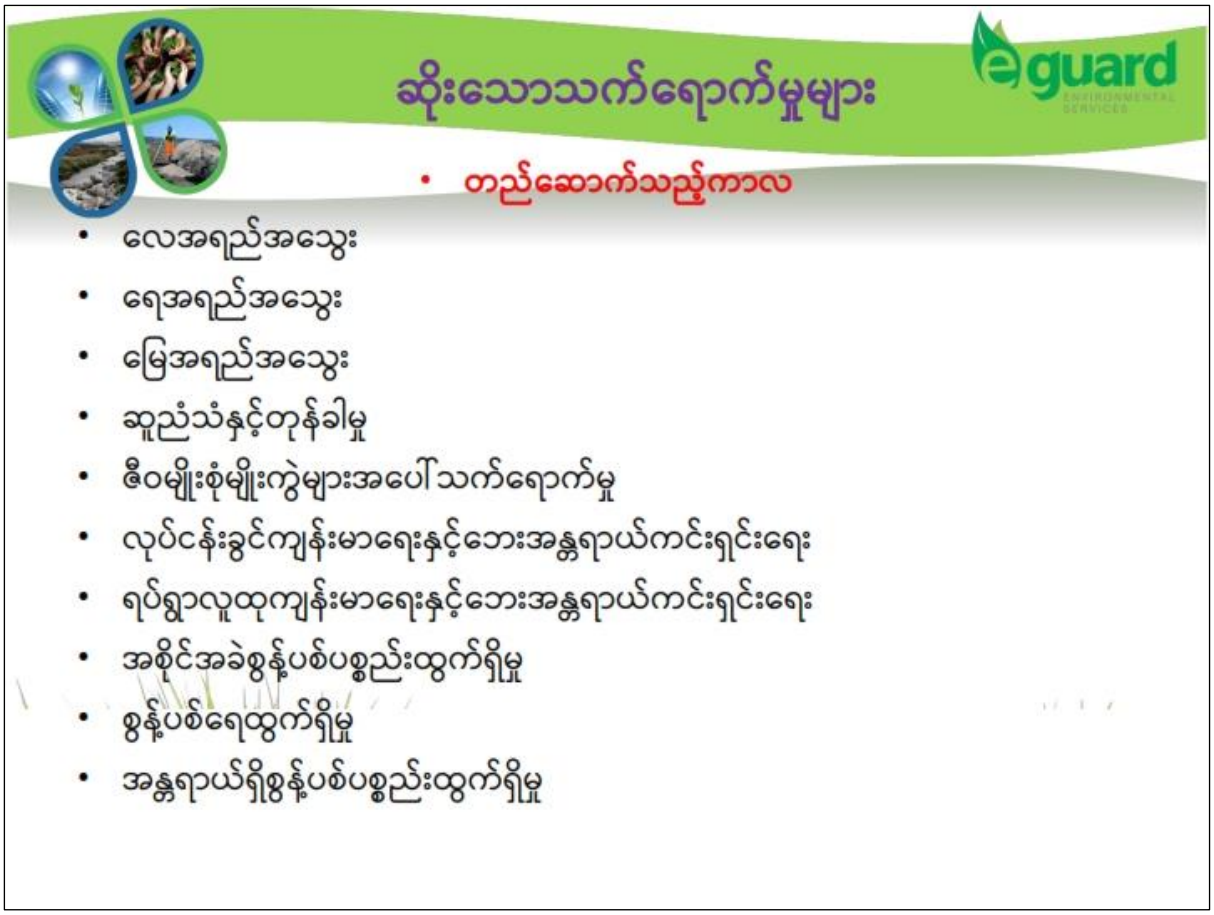

ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်ရေးဆွဲခြင်း
စီမံကိန်း၏ဖြစ်နိုင်ခြေရှိသော သက်ရောက်မှုများ
စစ်ဆေးခြင်း
✓ သိသာထင်ရှားမှုရှိ၊မရှိ
✓ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း ဆောင်ရွက်ရန် လိုအပ်ခြင်းရှိ၊မရှိ
✓ သတ်မှတ်ထားသော အထောက်အထားများ ပြုစုတင်ပြရန်လိုအပ်ခြင်းရှိ၊မရှိ
ဆောင်ရွက်သည့်အဖွဲ့အစည်း - E Guard Environmental Services Co., Ltd.
စိစစ်ခွင့်ပြုမည့်အဖွဲ့အစည်း - သယံဇာတနှင့်သဘာဝပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဝန်ကြီးဌာန၊ ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဦးစီးဌာန
လိုက်နာရမည့်ဥပဒေ၊ နည်းဥပဒေနှင့် စည်းမျဉ်းစည်းကမ်းများ
ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော် ဖွဲ့စည်းပုံအခြေခံဥပဒေ (၂၀၀၈)
ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဥပဒေ၊ နည်းဥပဒေနှင့် စည်းမျဉ်း စည်းကမ်းများ၊
ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း၊ အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များ
3

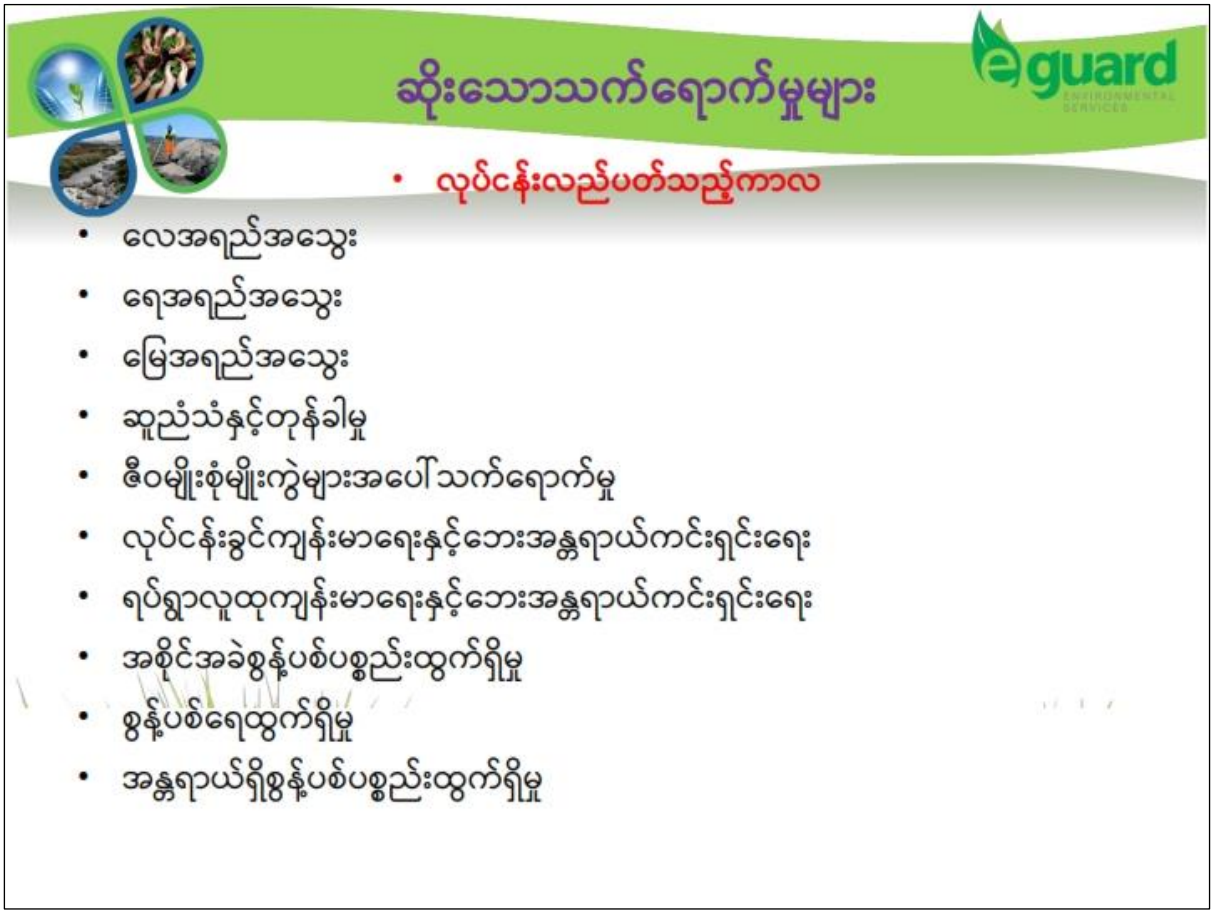

ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်ရေးဆွဲခြင်း၏
ရည်ရွယ်ချက်များ
eguard
ENVIRONMENTAL SERVICES
စီမံကိန်းဆောင်ရွက်မှုများကြောင့် ဖြစ်ပေါ်လာနိုင်သော သက်ရောက်မှုများကို ဆန်းစစ်လေ့လာခြင်း
ဆိုးသောသက်ရောက်မှုများကိုလျှော့ချပေးနိုင်မည့်နည်းလမ်းများအား အကြံပြုတင်ပြခြင်း
ပတ်ဝန်းကျင်စောင့်ကြပ်ကြည့်ရှုမှု အစီအစဉ်များနှင့် အခြားအစီအစဉ်များအား ကြိုတင်ပြင်ဆင်ပြီး အကောင်အထည်ဖော်ဆောင်ရွက်ခြင်း
အများပြည်သူသဘောထားရယူခြင်း၏ရည်ရွယ်ချက်များ
ဖြစ်ပေါ်လာနိုင်သည့် ကောင်းကျိုး၊ ဆိုးကျိုးများကိုတင်ပြခြင်း
ပါဝင်ပတ်သက်သူများ၏ အမြင်နှင့်အကြံပြုချက်များ၊ ထိခိုက်သက်ရောက်လာနိုင်မှုများကို လျှော့ချပေးနိုင်မည့်အစီအစဉ်များ၊ စောင့်ကြပ်ကြည့်ရှုမှုအစီအစဉ်များတွင် ထည့်သွင်းစဉ်းစားပေးခြင်း
စီမံကိန်းတည်ဆောက်ခြင်းနှင့် လုပ်ငန်းလည်ပတ်ခြင်း၏ ပွင့်လင်းမြင်သာမှုနှင့်တာဝန်ယူနိုင်မှု တိုးတက်စေခြင်း
အငြင်းပွားမှုများလျှော့ချခြင်းနှင့် စီမံကိန်းအကောင်အထည်ဖော်ရာတွင် ချောမွေ့မှုရှိစေရန် ဆောင်ရွက်ခြင်း

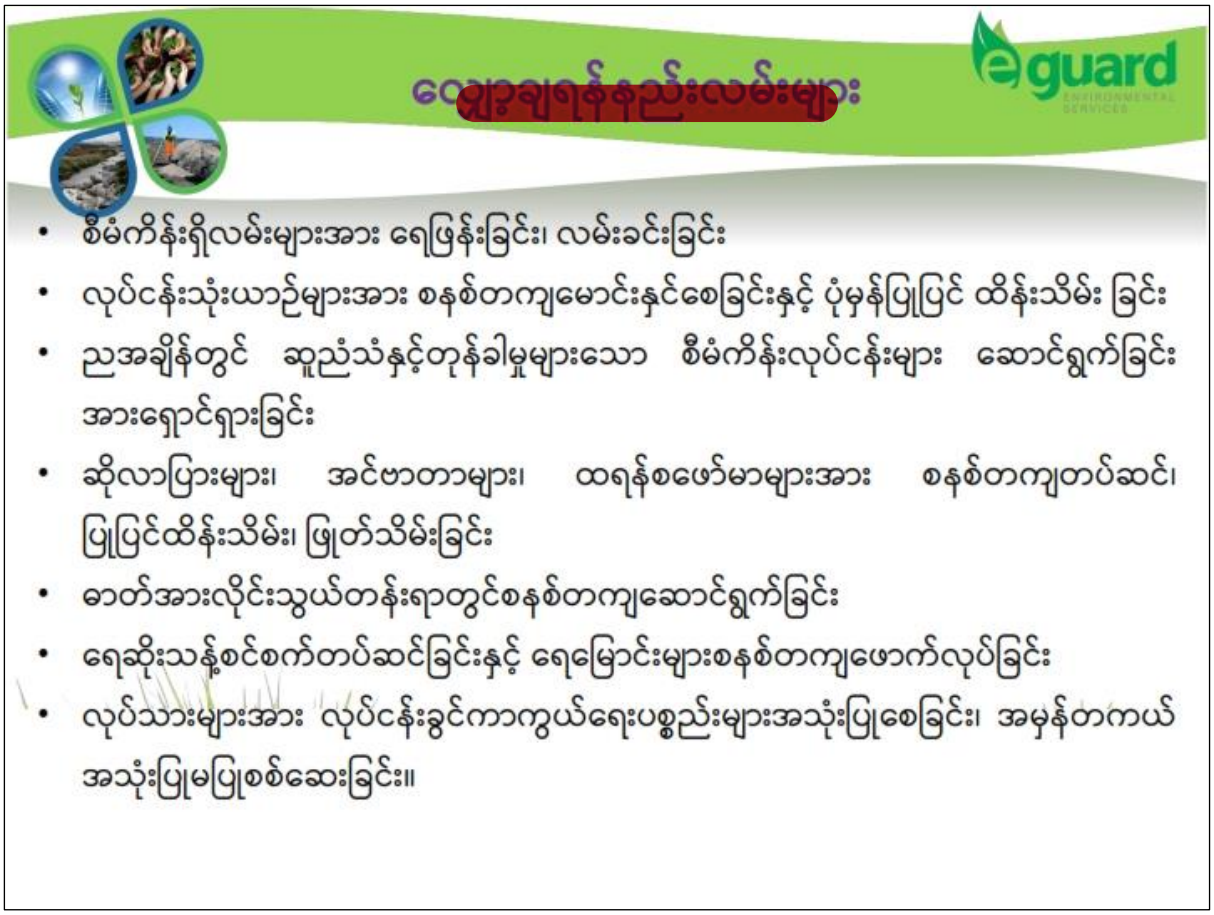

ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်
eguard
ENVIRONMENTAL SERVICES
အဆောက်အဦနှင့် လမ်းတည်ဆောက်ခြင်း၊ ဆိုလာပြားများ၊ အင်ဗာတာများ၊ ထရန်စဖော်မာများတပ်ဆင်ခြင်း၊ ဓာတ်အားလိုင်းသွယ်တန်းခြင်း (တည်ဆောက်သည့်ကာလ)
နေရောင်ခြည်စွမ်းအင်မှ လျှပ်စစ်ဓာတ်အားထုတ်လုပ်ပြီး တောင်တော်ကွင်းဓာတ်အားခွဲရုံသို့ ဓာတ်အားပို့လွှတ်ခြင်း (လုပ်ငန်းလည်ပတ်သည့်ကာလ)
စီမံကိန်းပိတ်သိမ်းခြင်း (စီမံကိန်းဖျက်သိမ်းသည့်ကာလ)
ဆိုးကျိုးသက်ရောက်ခြင်းမှ
ကာကွယ်ရန်
ရှောင်လွှဲရန်
လျှော့နည်းစေရန်
နည်းလမ်းနှင့်အစီအစဉ်များ ဖော်ပြသည့်စီမံချက်
လုပ်ငန်းလည်ပတ်သည့်ကာလ ပြီးဆုံးပါက စီမံကိန်းအား သက်တမ်းတိုးပြီး ဆက်လက်ဆောင်ရွက်မည်ဖြစ်သောကြောင့် စီမံကိန်းဖျက်သိမ်းသည့်ကာလအား ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်တွင် ထည့်သွင်းစဉ်းစားခြင်းမရှိပါ။

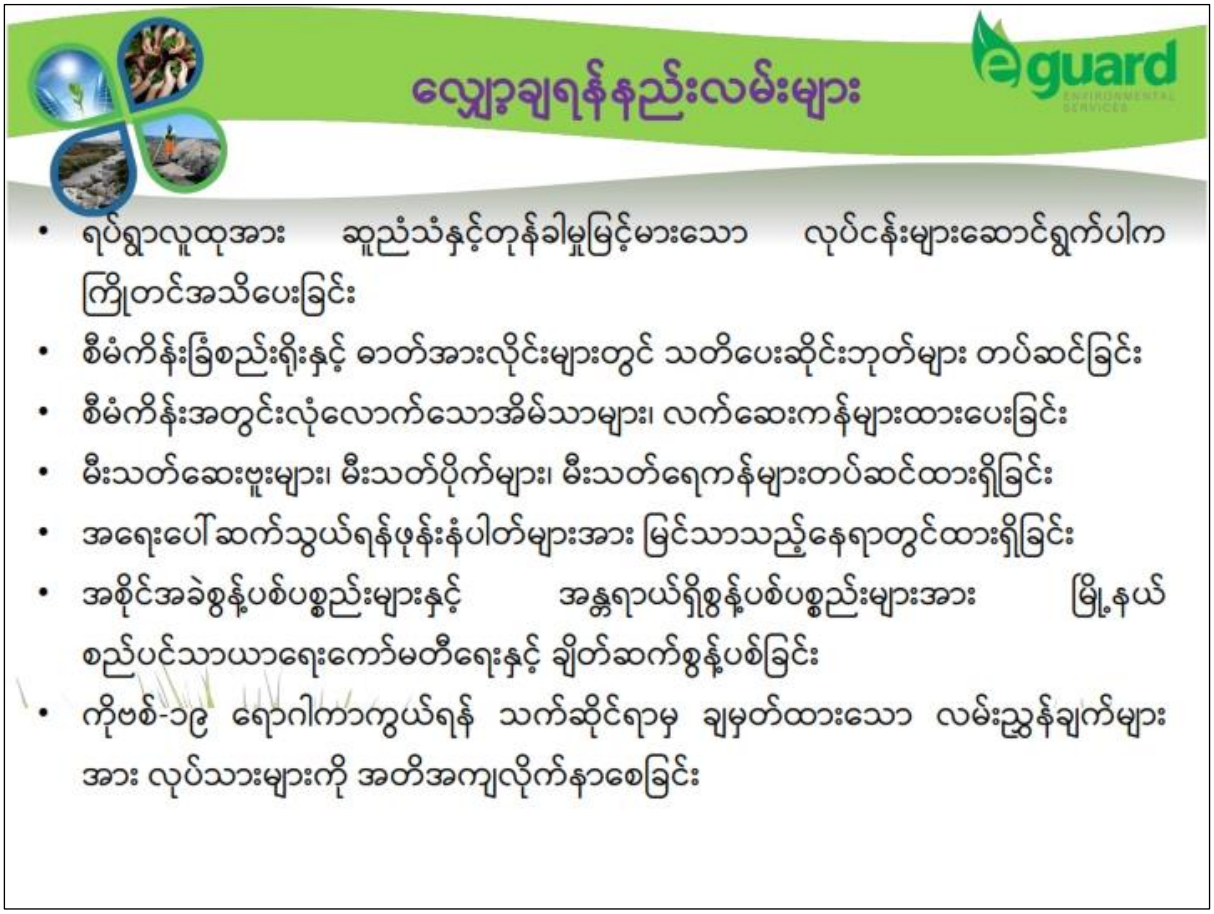

ဖြစ်ပေါ်လာနိုင်သည့်သက်ရောက်မှုများ
eguard
• ကောင်းသောသက်ရောက်မှုများ
• ဆိုးသောသက်ရောက်မှုများ


ကောင်းသောသက်ရောက်မှုများ
eguard
• တည်ဆောက်သည့်ကာလ
• အလုပ်အကိုင်အခွင့်အလမ်းများဖန်တီးပေးနိုင်ခြင်း
• စီးပွားရေးအခွင့်အလမ်းများဖန်တီးပေးနိုင်ခြင်း
• လုပ်ငန်းလည်ပတ်သည့်ကာလ
• အလုပ်အကိုင်အခွင့်အလမ်းများဖန်တီးပေးနိုင်ခြင်း
• ပြန်လည်ပြည့်ဖြိုးမြဲစွမ်းအင်မှလျှပ်စစ်ဓာတ်အားထုတ်လုပ်ခြင်း
• ဖန်လုံအိမ်ဓာတ်ငွေ့ထုတ်လုပ်မှုလျော့ချနိုင်ခြင်း
• နိုင်ငံတော်၏စီးပွားရေးဖွံ့ဖြိုးတိုးတက်ခြင်း


ဆိုးသောသက်ရောက်မှုများ
eguard
• တည်ဆောက်သည့်ကာလ
• လေအရည်အသွေး
• ရေအရည်အသွေး
• မြေအရည်အသွေး
• ဆူညံသံနှင့်တုန်ခါမှု
• ဇီဝမျိုးစုံမျိုးကွဲများအပေါ် သက်ရောက်မှု
• လုပ်ငန်းခွင်ကျန်းမာရေးနှင့်ဘေးအန္တရာယ်ကင်းရှင်းရေး
• ရပ်ရွာလူထုကျန်းမာရေးနှင့်ဘေးအန္တရာယ်ကင်းရှင်းရေး
• အစိုင်အခဲစွန့်ပစ်ပစ္စည်းထွက်ရှိမှု
• စွန့်ပစ်ရေထွက်ရှိမှု
• အန္တရာယ်ရှိစွန့်ပစ်ပစ္စည်းထွက်ရှိမှု


ဆိုးသောသက်ရောက်မှုများ
eguard
• လုပ်ငန်းလည်ပတ်သည့်ကာလ
• လေအရည်အသွေး
• ရေအရည်အသွေး
• မြေအရည်အသွေး
• ဆူညံသံနှင့်တုန်ခါမှု
• ဇီဝမျိုးစုံမျိုးကွဲများအပေါ် သက်ရောက်မှု
• လုပ်ငန်းခွင်ကျန်းမာရေးနှင့်ဘေးအန္တရာယ်ကင်းရှင်းရေး
• ရပ်ရွာလူထုကျန်းမာရေးနှင့်ဘေးအန္တရာယ်ကင်းရှင်းရေး
• အစိုင်အခဲစွန့်ပစ်ပစ္စည်းထွက်ရှိမှု
• စွန့်ပစ်ရေထွက်ရှိမှု
• အန္တရာယ်ရှိစွန့်ပစ်ပစ္စည်းထွက်ရှိမှု

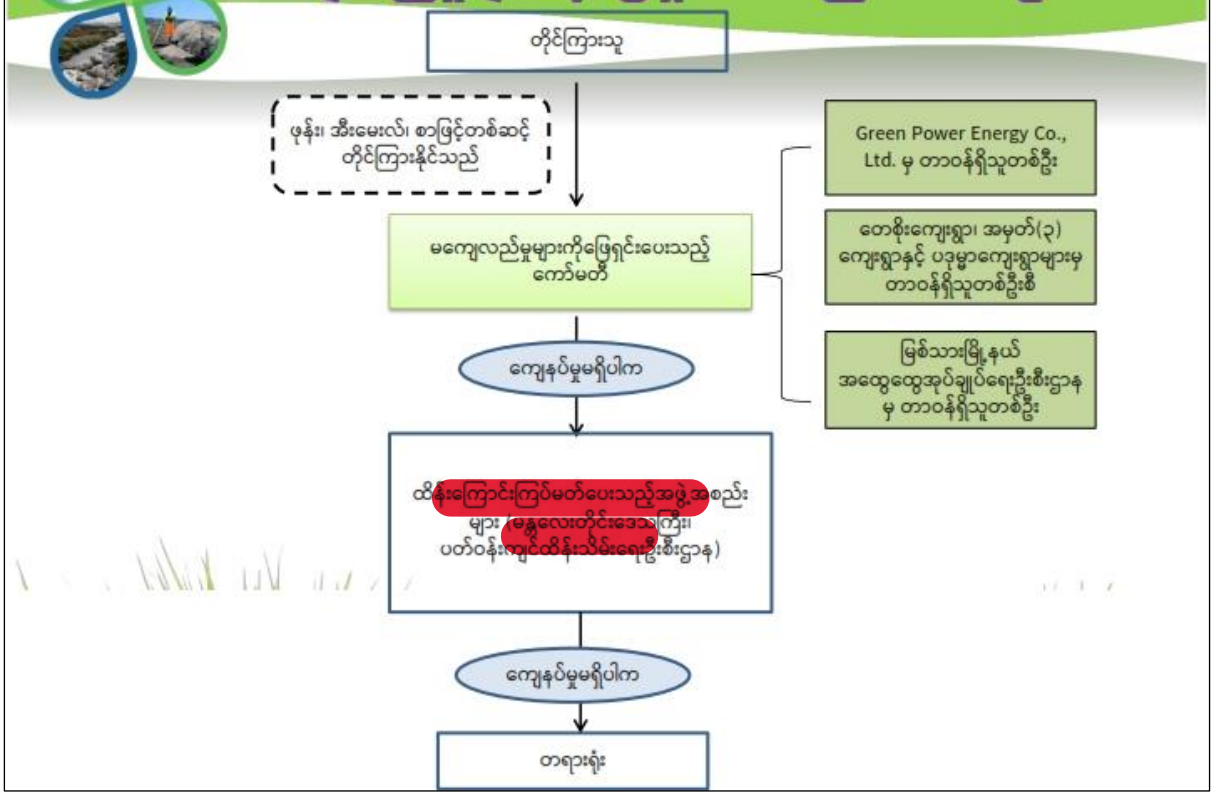

လျော့ချရန်နည်းလမ်းများ
eguard
ENVIRONMENTAL SERVICES
• စီမံကိန်းရှိလမ်းများအား ရေဖြန်းခြင်း၊ လမ်းခင်းခြင်း
• လုပ်ငန်းသုံးယာဉ်များအား စနစ်တကျမောင်းနှင်စေခြင်းနှင့် ပုံမှန်ပြုပြင် ထိန်းသိမ်း ခြင်း
• ညအချိန်တွင် ဆူညံသံနှင့်တုန်ခါမှုများသော စီမံကိန်းလုပ်ငန်းများ ဆောင်ရွက်ခြင်း အားရှောင်ရှားခြင်း
• ဆိုလာပြားများ၊ အင်ဗာတာများ၊ ထရန်စဖော်မာများအား စနစ်တကျတပ်ဆင်၊ ပြုပြင်ထိန်းသိမ်း၊ ဖြုတ်သိမ်းခြင်း
• ဓာတ်အားလိုင်းသွယ်တန်းရာတွင်စနစ်တကျဆောင်ရွက်ခြင်း
• ရေဆိုးသန့်စင်စက်တပ်ဆင်ခြင်းနှင့် ရေမြောင်းများစနစ်တကျဖောက်လုပ်ခြင်း
• လုပ်သားများအား လုပ်ငန်းခွင်ကာကွယ်ရေးပစ္စည်းများအသုံးပြုစေခြင်း၊ အမှန်တကယ် အသုံးပြုမပြုစစ်ဆေးခြင်း။


လျော့ချရန်နည်းလမ်းများ
eguard
ENVIRONMENTAL SERVICES
• ရပ်ရွာလူထုအား 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

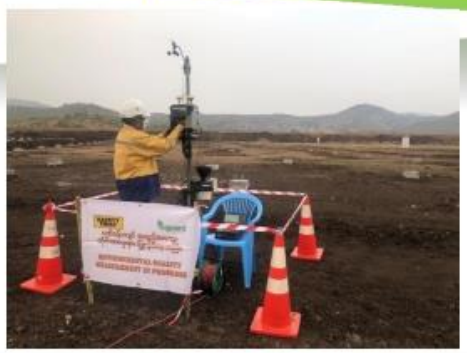
အခြားအစီအစဉ်များ

- ပတ်ဝန်းကျင်စောင့်ကြပ်ကြည့်ရှုမှုအစီအစဉ် (၆လတစ်ကြိမ်)
  - လေအရည်အသွေး
  - ရေအရည်အသွေး
  - ဆူညံသံပမာဏ
- မီးဘေးအန္တရာယ်ကင်းရှင်းရေးအစီအစဉ်
- အရေးပေါ်ကိစ္စရပ်များအတွက်ကြိုတင်ပြင်ဆင်မှုနှင့်တုန့်ပြန်မှုအစီအစဉ်
- လုပ်ငန်းခွင်ကျန်းမာရေးနှင့်ဘေးအန္တရာယ်ကင်းရှင်းရေးအစီအစဉ်
- လူမှုစီးပွားတာဝန်ယူမှုအစီအစဉ်
- မကျေလည်မှုများကိုဖြေရှင်းပေးမည့်အစီအစဉ်

မကျေလည်မှုများကိုဖြေရှင်းပေးမည့်အစီအစဉ်



ပတ်ဝန်းကျင်အရည်အသွေးတိုင်းတာမှုများ



လေအရည်အသွေးတိုင်းတာခြင်း

ဆူညံသံပမာဏတိုင်းတာခြင်း

လွတ်လပ်စွာပါဝင်ဆွေးနွေးမေးမြန်းနိုင်ပါသည်

ကျေးဇူးတင်ပါသည်

(8) CSR plan

Corporate Social Responsibilities Plan

၁။ နိဒါန်း

Green Power Energy Co,Ltd သည် စီးပွားရေးလုပ်ငန်းများဆောင်ရွက်ရာ၌ မိမိတို့အနေဖြင့် နိုင်ငံတကာ နှင့် မြန်မာနိုင်ငံ၏ ပြဋ္ဌာန်းသတ်မှတ်ထားသည့် ဥပဒေများနှင့်အညီ လိုက်နာ ဆောင်ရွက်ခြင်း၊ လူကျင့်ဝတ်နှင့်လျော်ညီစွာ စီးပွားရေးလုပ်ငန်းများကို ဆောင်ရွက်ခြင်းတို့ဖြင့် မိမိတို့၏ လုပ်ငန်းတိုးတက် အောင်မြင်မှုနှင့် အတူ ပတ်ဝန်းကျင်ဒေသများ၏ ကျန်းမာရေး၊ ပညာရေး၊ လူမှုဘဝဖွံ့ဖြိုးတိုးတက်ရေး၊ နိုင်ငံသား တို့၏ ကျန်းမာရေး၊ ပညာရေး၊ လူမှုဘဝပိုမိုတိုးတက်ရေး အခန်းကဏ္ဍများအတွက် တတ်အားသမျှဦးစားပေး အကောင်အထည်ဖော် ဆောင်ရွက်သွားမည်ဖြစ်ပါသည်။

၂။ ရည်ရွယ်ချက်

မိမိတို့၏ လုပ်ငန်းတိုးတက်မှုများနှင့်အတူ Corporate Social Responsibilities ဆိုင်ရာ အကျိုးပြု လုပ်ငန်းစဉ်များအား အစဉ်တစိုက် အောင်မြင်စွာဆောင်ရွက်သွားနိုင်ရေးအတွက် ယခု CSR Plan အားရေးဆွဲ ခြင်းဖြစ်ပါသည်။

၃။ စီမံချက်

Green Power Energy Co,Ltd သည် Gold Energy Co,Ltd ၏ လက်အောက်ခံ ကုမ္ပဏီ ဖြစ်သဖြင့် ကုမ္ပဏီ၏ရေရှည်ရည်မှန်းချက်များအပေါ် အခြေခံ၍ CSR လုပ်ငန်းစဉ်များ ဆက်လက်ချ မှတ်ဆောင်ရွက်ရန်အတွက် နှစ်စဉ် အမြတ်အစွန်း၏ (2%) အား CRS Budget အဖြစ် အသုံးပြု သွားမည်ဖြစ်ပါသည်။ Green Power Energy Co,Ltd သည် Solar Power Plant စီမံကိန်း တည်ရှိရာနေရာ အနီးရှိ တောစိုးကျေးရွာအုပ်စု နှင့် ပါတ်ဝန်းကျင် ကျေးရွာဖွံ့ဖြိုး တိုးတက်ရေးအတွက် CSR လုပ်ငန်းများကို အောက်ပါအတိုင်းဆောင်ရွက်သွားမည်ဖြစ်ပါသည်။

(၃.၁) ပညာရေးကဏ္ဍ

အကောင်အထည်ဖော်ဆောင်ရွက်သွားမည့် လုပ်ငန်းစဉ်များ

(၁) ပညာရေးကဏ္ဍ၏ အဓိကလိုအပ်ချက် ဖြစ်သော ကျောင်းဆောင် ဆောက်လုပ်လှူဒါန်းခြင်းအတွက် နှင့် ကျောင်းအဆောက်အအုံများ ပြန်လည်ပြုပြင်ရန်အတွက် ရန်ပုံငွေထောက်ပံ့ခြင်း ဆောင်ရွက်ချက်များ။

(၂) ထူးချွန်သောအထက်တန်းကျောင်းသား/သူ (၁၀)ဦးနှင့် အလယ်တန်း ကျောင်းသား/သူ (၁၀)ဦးအား ရွေးချယ်ပြီးပညာ သင်ဆုချီးမြှင့်ခြင်း။

(၃) ပညာရေးကဏ္ဍအခြေခံလိုအပ်ချက်ဖြစ်သော နှစ်စဉ်အခြေခံ ကျောင်းသုံး စာရေးကရိယာများ။ ကျောပိုးအိတ်များနှင့် ထီးများလှူဒါန်းပေးအပ်ခြင်း။

(၄) စာသင်ကျောင်းများ သောက်သုံးရေ လုံလောက်စွာရရှိရေးအတွက် လိုအပ်သော ရေတွင်း၊ ရေကန်တူးဖော်ဆောင်ရွက်ပေးခြင်း။

(၅) တာဝန်ကျဆရာ/ဆရာမ အင်အားနည်းပါးသည့် စာသင်ကျောင်းများအတွက် ဆရာ/ဆရာမ လစာငွေထောက်ပံ့ပေးအပ်ခြင်း။

(၆) ပညာရေးသင်ထောက်ကူပစ္စည်းများအား ထောက်ပံ့ကူညီပေးအပ်ခြင်း။

(၃.၂) ကျန်းမာရေးကဏ္ဍ

အကောင်အထည်ဖော်ဆောင်ရွက်သွားမည့်လုပ်ငန်းစဉ်များ

(၁) ဆေးပေးခန်းထားရှိ၍ ဒေသခံပြည်သူများအားကျန်းမာရေး စောင့်ရှောက်မှု ပေးအပ်ခြင်း။

(၂) မြို့နယ်ကျန်းမာရေး၊ သက်ဆိုင်ရာအစိုးရဌာနများနှင့်ပူးပေါင်း၍ ကျန်းမာရေးကဏ္ဍ အသိပညာ ပေးဆွေးနွေးပွဲ ဟောပြောပွဲများ ကျင်းပပေးခြင်း။

(၃) သက်ဆိုင်ရာခရိုင် မြို့နယ်ဆေးပေးခန်းနှင့် ဆေးရုံများအတွက်လိုအပ်သည့် ခေတ်မီစမ်းသပ် ပစ္စည်း စက်ကရိယာများ ဖြည့်တင်းလှူဒါန်းခြင်း။

(၄) ဒေသခံများအတွက်လိုအပ်သော ရေသန့်စက်၊ ရေလှောင်ကန်များ လှူဒါန်းပေးခြင်း။

(၃.၃) လူနေမှုဖွံ့ဖြိုးရေးကဏ္ဍ

အကောင်အထည်ဖော်ဆောင်ရွက်သွားမည့် လုပ်ငန်းစဉ်များ

(၁) ကျေးရွာများအတွက်လမ်းပန်းဆက်သွယ်ရေး ပိုမိုကောင်းမွန်စေရန် ရည်ရွယ်၍ လမ်းများ ဖောက်လုပ်လျှဒါန်းပေးခြင်း။

(၂) သဘာဝဘေးအန္တရာယ် ကျရောက်ခဲ့သည့်ဒေသများ၏ ကယ်ဆယ်ရေးနှင့် ပြန်လည်ထူထောင်ရေးလုပ်ငန်းစဉ်များအတွက် ဒေသခံအဖွဲ့အစည်းများနှင့် တွေ့ဆုံပြီး လိုအပ်သော ထောက်ပံ့ကူညီ ဆောင်ရွက်မှုများပေးခြင်း။

(၃) ကျေးရွာအခြေခံအဆောက်အအုံဆောက်လုပ်လျှဒါန်းခြင်း၊ လွတ်လပ်ရေးနေ့အား ကစားပြိုင်ပွဲ၊ မီးဘေးအန္တရာယ်ကင်းရှင်းရေးသင်တန်း၊ ကထိန်သင်္ကန်းကပ်ပွဲ၊ သံဃာတော်များစာမေးပွဲဖြေဆိုခြင်းနှင့် စာအောင်သံဃာတော်များအား ဝတ္ထုဒွေ ဆပ်ကပ်လှူဒါန်းခြင်း အစရှိသည့် လူမှုရေး၊ ဘာသာရေး တို့တွင်ကူညီထောက်ပံ့ခြင်း။

(၄) လျှပ်စစ်မီးမရရှိသေးသည့် ဒေသများအတွက် သက်ဆိုင်ရာ ကျေးရွာမီးလင်းရေး ကော်မတီနှင့် ပူးပေါင်းဆောင်ရွက်၍ ကူညီပံ့ပိုးပေးခြင်း။

(၅) ဒေသခံများအတွက် အလုပ်အကိုင်အခွင့်အလမ်းများရရှိစေခြင်း။

(၃.၄) ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးကတ္တရာ

အကောင်အထည်ဖော်ဆောင်ရွက်သွားမည့် လုပ်ငန်းစဉ်များ

(၁) ကမ္ဘာ့ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးနှေ့ အပါအဝင် ပတ်ဝန်းကျင်စဉ် ဆက်မပြတ် ထိန်းသိမ်းရေး အသိပညာပေးဟောပြောပွဲများနှင့် သဘာဝပတ်ဝန်း ကျင်စိမ်းလန်း စိုပြေစေရေးအတွက် ရည်ရွယ်၍ နှစ်စဉ်သစ်ပင်စိုက်ပျိုးခြင်းလုပ်ငန်းစဉ်များ။

(၂) စနစ်တကျအမှိုက်စွန့်ပြုခြင်းနှင့် စွန့်ပစ်ပစ္စည်းများ ဖျက်ဆီးခြင်းစနစ်ကို အကောင်အထည် ဖော်ဆောင်ရွက်ရန် သက်ဆိုင်ရာအဖွဲ့အစည်းများနှင့် ဆွေးနွေးဆောင်ရွက်သွားရန်။

(9) Firefighting, emergency preparedness and response plan

မီးဘေးကြိုတင်ကာကွယ်ရေးစီမံချက်

၁။ နိဒါန်း

မီးလောင်မှုဖြစ်စဉ်များကိုကြည့်လျှင် နွေရာသီနှင့် ပွင့်လင်းရာသီများတွင် မီးလောင်မှုအမျိုးမျိုး ဖြစ်ပွားခဲ့ကြောင်းသာဓကများရှိပါသည်။ ပေါ့ဆမီးမတော်တဆမီး ရှိုမီးဟူ၍ မီးလောင်မှုပုံစံအမျိုးမျိုး ရှိရာ ပေါ့ဆမီးနှင့် မတော်တဆမီးလောင်မှုများ မကြာခဏဖြစ်ပွားလေ့ရှိပါသည်။ ထို့ပြင် လျှပ်စစ်ဝါယာကြိုးများဆွေးမြေပေါက်ပြဲခြင်း၊ ဝါယာလျှော့ဖြစ်ခြင်းနှင့် ဝန်အားမမျှ မီးသုံးစွဲခြင်းတို့ကြောင့်လည်း ဖြစ်ပွားလေ့ရှိပါသည်။

မည်သည့်မီးလောင်မှုမျိုးကိုမဆို ဖြစ်ပွားမှုမရှိစေရန်နှင့် မီးလောင်မှု၏နောက်ဆက်တွဲရင်ဆိုင်ကြုံတွေ့ရသည့် လူမှုရေး၊ စီးပွားရေးဆိုင်ရာအခက်အခဲများ မဖြစ်ပေါ်စေရန်အတွက် သတိထားကြိုတင်ကာကွယ်မှုများပြုလုပ်ရန် အထူးအရေးကြီးသဖြင့် ယခုသပြေဝဆိုလာပါဝါစီမံကိန်းတစ်ခုလုံးအတွက်လည်း မီးဘေးအန္တရာယ်ကြိုတင်ကာကွယ်ရေး စီမံချက်အားရေးဆွဲရခြင်းဖြစ်ပါသည်။

၂။ ရည်ရွယ်ချက်

သပြေဝဆိုလာပါဝါစီမံကိန်းနှင့် ဆက်စပ်အဆောက်အဦးများအားလုံးအတွက် မီးဘေးအန္တရာယ်ကာကွယ်ရန် မီးဘေးကြိုတင်ကာကွယ်ရေးစီမံချက်ကို ရေးဆွဲဆောင်ရွက်ရခြင်းဖြစ်ပါသည်။

၃။ စီမံချက်

တောင်တော်ကွင်းဆိုလာပါဝါကုမ္ပဏီသည် ဆိုလာပါဝါစီမံကိန်းအား မန္တလေးတိုင်းဒေသကြီး၊ မြစ်သားမြို့နယ်၊ တစိုးကျေးရွာအုပ်စုအနီးရှိ မြေဧရိယာ ၂၀၀ ဧကပေါ်တွင် Ground Mounted Solar Power Plant Project (တောင်တော်ကွင်းဓာတ်အားခွဲရုံ) အား တည်ဆောက်အကောင်အထည်ဖော်ဆောင်ရွက်မည် ဖြစ်ပါသည်။ တောင်တော်ကွင်းဓာတ်အားခွဲရုံအတွက် မီးဘေးအန္တရာယ်ကြိုတင်ကာကွယ်မှု လုံခြုံရေးစီမံချက်ကို အကောင်အထည်ဖော်ဆောင်ရွက်ရန် အောက်ပါအဖွဲ့အစည်း များဖြင့် ဖွဲ့စည်းထားပါသည်။

(၃.၁) မီးဘေးကြိုတင်ကာကွယ်ရေးအဖွဲ့
(၃.၂) မီးငြိမ်းသတ်ရေးအဖွဲ့
(၃.၃) ပစ္စည်းသယ်ယူရေးအဖွဲ့
(၃.၄) သူနာပြုနှင့် ကယ်ဆယ်ရေးအဖွဲ့

အထက်ပါအဖွဲ့(၄)ဖွဲ့အား စက်ရုံစီမံကိန်းရှိ ဝန်ထမ်းများနှင့် တာဝန်ခွဲဝေဆောင်ရွက်သွားမည်ဖြစ်ပါ သည်။

(၃.၁) မီးဘေးကြိုတင်ကာကွယ်ရေးအဖွဲ့မှအောက်ပါတို့အား ဆောင်ရွက်ထားရှိရမည်ဖြစ်ပါသည်။

(၁) Solar Power Plant စီမံကိန်း၏ ပရဝဏ်အတွင်း ဆေးလိပ်သောက်ခြင်းနှင့် အမှိုက်များ မီးရှို့ခြင်းကိုတားမြစ်ရန်။

(၂) Solar Power Plant စီမံကိန်းဝန်းအတွင်း Fire Alarm System ကိုထားရှိရန်။

(၃) Solar Power Plant အတွင်း သတ်မှတ်နေရာများတွင် မီးငြိမ်းသတ်ရေး ကိရိယာများ၊ မီးသတ်ဆေးဘူးများထားရန်။

(၄) Solar Power Plant စီမံကိန်းအတွင်းတွင် ရေလှောင်ကန်များထားရှိရန်။

(၅) မီးလောင်မှုဖြစ်ပွားတတ်သည့်နေရာများတွင် မီးသတိပြုစာတမ်းများ၊ ဆေးလိပ်မသောက်ရ Signage ချိတ်ဆွဲခြင်းများ ပြုလုပ်ထားရန်။

(၆) Solar Power Plant ရှိ လျှပ်စစ်ဝါယာကြိုးများအားကောင်းမွန်မှု. ရှိမရှိအမြဲမပျက် စစ်ဆေးရန်။

(၇) မီးသတ်ဆေးဘူးများ မီးငြိမ်းသတ်ရေးကိရိယာများ၏ အခြေအနေအား အစီအစဉ်ရေးဆွဲပြီး အမြဲမပြတ် စစ်ဆေးရန်။

(၈) မီးငြိမ်းသတ်ခြင်းနှင့် မီးသတ်ဆေးဘူးများ အသုံးပြုပုံနည်းပညာရပ်များကို တတ်သိနားလည်ကျွမ်းကျင်မှုရှိစေရန် သင်တန်းများတက်ရောက်ထားရှိခြင်းနှင့် ဆင့်ပွားသင်တန်း ပြုလုပ်ခြင်းများ စီစဉ်ဆောင်ရွက်ရန်။

(၉) အရေးပေါ်မီးဘေးကာကွယ် ကယ်ဆယ်ရေးဆောင်ရွက်မှုလုပ်ငန်းစဉ်များအတွက် အမြဲအဆင်သင့်ဖြစ်နေစေရန် Fire Drill အားအနည်းဆုံး(၆)လ တစ်ကြိမ်ပြုလုပ်ရန်။

(၁၀) မီးတားလမ်းများဖောက်လုပ်ထားရှိရန်။

(၁၁) မီးသတ်ယာဉ်ရပ်ရန်နေရာနှင့် မီးသတ်ယာဉ်ပတ်လမ်းတွင် အတားအဆီးများနှင့် ပစ္စည်းများစုပုံထားခြင်းမရှိစေရန်။

(၁၂) မီးသတ်ရေတင်ပိုက်များ အရေးပေါ်ရေပက်ပိုက်လိပ်ခွေနှင့် မီးသတ်ရေထုတ်ပိုက်စနစ်များကို တပ်ဆင်ရမည်။

(၃.၂) မီးငြိမ်းသတ်ရေးအဖွဲ့

မီးငြိမ်းသတ်ရေးအဖွဲ့ကို လုံခြုံရေးအဖွဲ့များမှ ဦးဆောင်၍ လုပ်ကိုင်ဆောင်ရွက်သွားမည်။

(က)	အဖွဲ့ခေါင်းဆောင်	(၁)ဦး
(ခ)	ဒု-အဖွဲ့ခေါင်းဆောင်	(၃)ဦး
(ဂ)	အဖွဲ့ဝင်	(၁၀)ဦး
	စုစုပေါင်းအဖွဲ့ဝင်	(၁၄)ဦး

အထက်ပါမီးငြိမ်းသတ်ရေးအဖွဲ့သည် မီးလောင်မှုဖြစ်ပွားပါက မီးငြိမ်းသတ်ခြင်းလုပ်ငန်းကိုဦးဆောင်၍ လုပ်ကိုင်သွားမည်ဖြစ်ပြီး အရံအင်အားများသည် မိတ်ဖက်အင်အားများနှင့်အတူ ပူးပေါင်း၍ မီးလောင်မှုဖြစ်ပွားခြင်းကို ရပ်တန့်သွားသည်အထိ အဓိကထားငြိမ်းသတ်ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။

(၃.၃) ပစ္စည်းသယ်ယူရေးအဖွဲ့

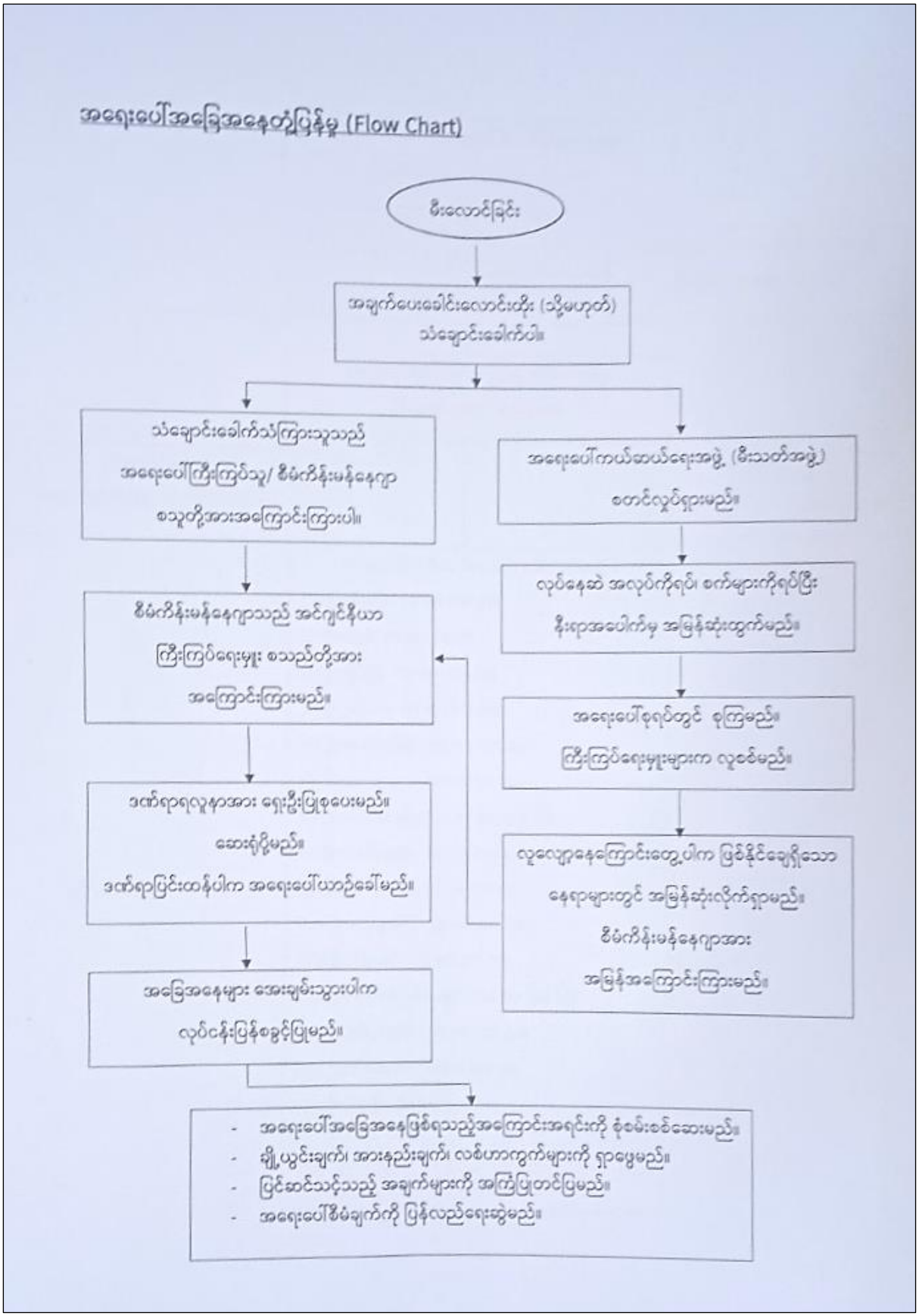
ပစ္စည်းသယ်ယူရေးအဖွဲ့ကို အောက်ပါအတိုင်း ဖွဲ့စည်းဆောင်ရွက်သွားမည်ဖြစ်ပါသည်။

(က)	အဖွဲ့ခေါင်းဆောင်	(၁)ဦး
(ခ)	ဒု-အဖွဲ့ခေါင်းဆောင်	(၃)ဦး
(ဂ)	အဖွဲ့ဝင်	(၁၀)ဦး
	စုစုပေါင်းအဖွဲ့ဝင်	(၁၄)ဦး

ပစ္စည်းသယ်ယူရေးအဖွဲ့သည် စက်ရုံတွင် မီးလောင်မှုဖြစ်ပွားပါက ဦးစားပေးအဆင့်အလိုက် သတ်မှတ်ထားသော ပစ္စည်းများကို မီးလွတ်ရာနေရာသို့ စနစ်တကျ အချိန်မီ ပြောင်းရွှေ့ပေးရန်ဖြစ်သည်။

(၃.၄) သူနာပြုနှင့်ကယ်ဆယ်ရေးအဖွဲ့

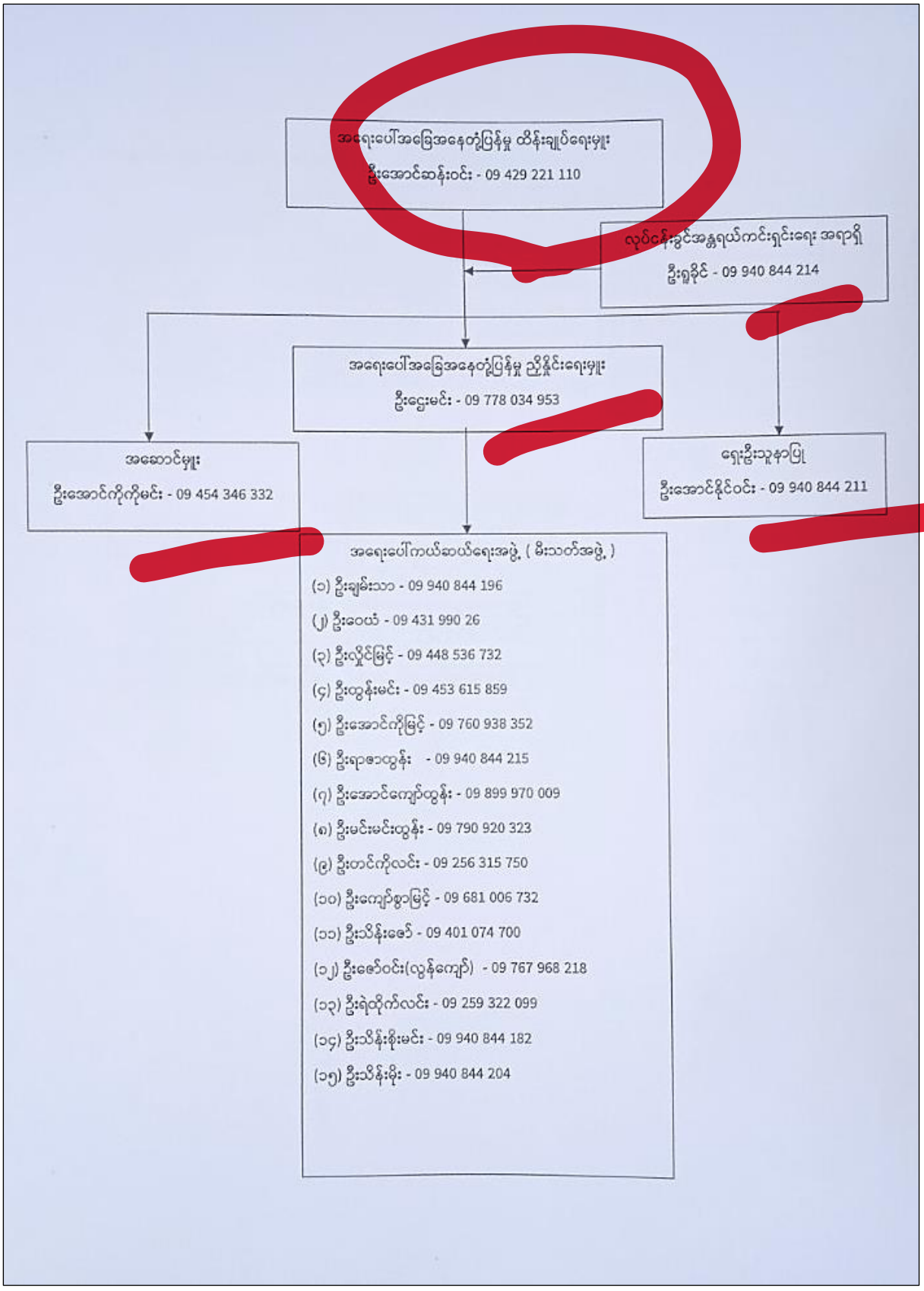
၎င်းအဖွဲ့ကို Solar Power Plant စီမံကိန်းရှိ ရှေးဦးသူနာပြုစုနည်း၊ ကျန်းမာရေးနှင့်ပတ်သက်ပြီး အတွေ့အကြုံရှိဝန်ထမ်းများ၊ ကျန်းမာရေးဝန်ထမ်း၊ သူနာပြုများ နှင့် အခြားအဖွဲ့ဝင်များပါဝင်၍ ဖွဲ့စည်းထားရှိမည်ဖြစ်သည်။ မီးလောင်မှု ဖြစ်ပွားပါက မတော်တဆထိခိုက်ဒဏ်ရာရရှိသည့် သူများ၊ မီးလောင်ခံရသည့် သူများအား ပထမဦးစွာရှေးဦးသူနာပြုစုနည်းဖြင့် လိုအပ်သော ဆေးဝါးများ ပြုလုပ်ပေးရန်လိုအပ်သည်။


အရေးပေါ်အခြေအနေတံငြပ်နှံမှု (Flow Chart)
မီးလောင်ခြင်း
အချက်ပေးခေါင်းလောင်းတီး (သို့မဟုတ်)
သံချောင်းခေါက်ပါ။
သံချောင်းခေါက်သံကြားသူသည်
အရေးပေါ်ကြီးကြပ်သူ/ စီမံကိန်းမန်နေဂျာ
စသူတို့အားအကြောင်းကြားပါ။
အရေးပေါ်ကယ်ဆယ်ရေးအဖွဲ့ (မီးသတ်အဖွဲ့)
စတင်လှုပ်ရှားမည်။
စီမံကိန်းမန်နေဂျာသည် အင်ဂျင်နီယာ
ကြီးကြပ်ရေးမှူး စသည်တို့အား
အကြောင်းကြားမည်။
လုပ်နေဆဲ အလုပ်ကိုရပ်၊ စက်များကိုရပ်ဖြိုး
နိုးရာအပေါက်မှ အမြန်ဆုံးထွက်မည်။
အရေးပေါ်စုရုပ်တွင် စုကြမည်။
ကြီးကြပ်ရေးမှူးများက လူစစ်မည်။
ဒဏ်ရာရလူနာအား ရှေးဦးပြုစုပေးမည်။
ဆေးရုံပို့မည်။
ဒဏ်ရာပြင်းထန်ပါက အရေးပေါ်ယာဉ်ခေါ်မည်။
လူလေ့ကျနေကြောင်းတွေ့ပါက ပြစ်နိုင်ချေရှိသော
နေရာများတွင် အမြန်ဆုံးလိုက်ရှာမည်။
စီမံကိန်းမန်နေဂျာအား
အမြန်အကြောင်းကြားမည်။
အခြေအနေများ အေးချမ်းသွားပါက
လုပ်ငန်းပြန်စခွင့်ပြုမည်။
- အရေးပေါ်အခြေအနေဖြစ်ရသည့်အကြောင်းအရင်းကို စုံစမ်းစစ်ဆေးမည်။
- ချို့ယွင်းချက်၊ အားနည်းချက်၊ လစ်ဟာကွက်များကို ရှာဖွေမည်။
- ဖြည့်ဆည်သင့်သည့် အချက်များကို အကြံပြုတင်ပြမည်။
- အရေးပေါ်စီမံချက်ကို ပြန်လည်ရေးဆွဲမည်။

အရေးပေါ်အခြေအနေတွဲပြန်မှု အစီအစဉ်

စီမံကိန်းလုပ်ငန်းအတွင်းမှ အရေးကြီး ဆက်သွယ်ရမည့် ဖုန်းနံပါတ်များ		
အမည်	ရာထူး	ဖုန်းနံပါတ်
ဦးမြင့်ထွေး	စီမံကိန်းမန်နေဂျာ	09 2000286
ဦးမိုးနိုင်	လုပ်ငန်းခွင်အန္တရာယ်ကင်းရှင်းရေးအရာရှိ	09 940 844 214
ဦးဆောင်လင်း	စီမံကိန်း အင်ဂျင်နီယာ	09 259 176 460
ဦးခန့်နိုင်လင်း	ကြီးကြပ်ရေးမှူး	09 203 9895
ဦးဆောင်နိုင်ဝင်း	ဂျင်္ဂီးသူနာပြု	09 940 844 211
ဦးဆောင်ဆန်းဝင်း	အရေးပေါ်အခြေအနေ ထိန်းချုပ်ရေးမှူး	09 429 221 110

အရေးကြီးဆက်သွယ်ရမည့် ဒေသတွင်းဖုန်းနံပါတ်များ		
အမည်(ဌာန)	အကြောင်းအရာ	ဖုန်းနံပါတ်
မြို့နယ်မီးသတ်ဌာန	မီးလောင်းခြင်းအတွက်	09 267 780 853
တိုက်နယ်ရဲစခန်း	လုံခြုံရေးကိစ္စများအတွက်	09 757 757 042
အနီးဆုံးဆေးခန်း (သံရွာ/အာရောဂျ)	ထိခိုက်ဒဏ်ရာရသူများအတွက်	09 780 573 818
အနီးဆုံးဆေးရုံ (သံရွာ)	ထိခိုက်ဒဏ်ရာရသူများအတွက်	09 421 209 833
မြို့နယ်လျှပ်စစ်ဌာန	လျှပ်စစ်မီးကိစ္စ	09 661 906 744
မြို့နယ်အထွေထွေအုပ်ချုပ်ရေးဌာန	အထွေထွေ အုပ်ချုပ်ရေးကိစ္စ	


အရေးပေါ်အခြေအနေတုံ့ပြန်မှု ထိန်းချုပ်ရေးမှူး
ဦးအောင်ဆန်းဝင်း - 09 429 221 110
လုပ်ငန်းခွင်အန္တရယ်ကင်းရှင်းရေး အရာရှိ
ဦးရှခိုင် - 09 940 844 214
အရေးပေါ်အခြေအနေတုံ့ပြန်မှု ညှိနှိုင်းရေးမှူး
ဦးဌေးမင်း - 09 778 034 953
အဆောင်မှူး
ဦးအောင်ကိုကိုမင်း - 09 454 346 332
ရှေးဦးသူနာပြု
ဦးအောင်နိုင်ဝင်း - 09 940 844 211
အရေးပေါ်ကယ်ဆယ်ရေးအဖွဲ့ (မီးသတ်အဖွဲ့)
(၁) ဦးချမ်းသာ - 09 940 844 196
(၂) ဦးဝေယံ - 09 431 990 26
(၃) ဦးလှိုင်မြင့် - 09 448 536 732
(၄) ဦးတွန်းမင်း - 09 453 615 859
(၅) ဦးအောင်ကိုမြင့် - 09 760 938 352
(၆) ဦးရာဇာတွန်း - 09 940 844 215
(၇) ဦးအောင်ကျော်တွန်း - 09 899 970 009
(၈) ဦးမင်းမင်းတွန်း - 09 790 920 323
(၉) ဦးတင်ကိုလင်း - 09 256 315 750
(၁၀) ဦးကျော်စွာမြင့် - 09 681 006 732
(၁၁) ဦးသိန်းဇော် - 09 401 074 700
(၁၂) ဦးဇော်ဝင်း(လွန်ကျော်) - 09 767 968 218
(၁၃) ဦးရဲထိုက်လင်း - 09 259 322 099
(၁၄) ဦးသိန်းစိုးမင်း - 09 940 844 182
(၁၅) ဦးသိန်းမိုး - 09 940 844 204

(10) Water quality's laboratory results and on-site measurement result of groundwater

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 1 of 2

W0322 1172

WATER QUALITY TEST RESULTS FORM

Client	Taungdowgwin Solar Power Plant Project
Nature of Water	Ground Water
Location	မြင်သာမြို့နယ်၊ ဓနုဆောင်းမြို့
Date and Time of collection	30.3.2022
Date and Time of arrival at Laboratory	31.3.2022
Date and Time of commencing examination	1.4.2022
Date and Time of completing	6.4.2022

Results of Water Analysis			WHO Drinking Water Guideline (Geneva - 1993)
pH			6.5 - 8.5
Colour (True)		TCU	15 TCU
Turbidity		NTU	5 NTU
Conductivity		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	19	mg/l	
Total Dissolved Solids		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		ppt	

Remark: This certificate is issued only for the receipt of the test sample.

Tested by
Signature:
Name: Zaw Hein Oo
Chemist
ISO Tech Laboratory

Approved by
Signature:
Name: Thinzar Theint Theint
Assistant 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, 01-644508, 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)

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Issue Date - 01-1-2016
Effective Date - 01-1-2016
Issue No - 1.0/Page 1 of 1

M0322 058

WATER QUALITY TEST (MICROBIOLOGY) RESULTS FORM

Client	Taungdowgwin Solar Power Plant Project
Nature of Water	Ground Water
Location	မြင်သာမြို့နယ်၊ မန္တလေးမြို့
Date and Time of collection	30.3.2022
Date and Time of arrival at Laboratory	31.3.2022
Date and Time of commencing examination	31.3.2022
Date and Time of completing	1.4.2022

Results of Water Analysis

			WHO Drinking Water Guideline (Geneva - 1993)
Total Coliform Count	6	CFU/100ml	Not detected
Thermotolerant (fecal) Coliform Count	Not detected (<1)	CFU/100ml	Not detected
pH	7.8		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 Oo

...mist

ISO Tech Laboratory

Approved by

Signature:

Name: Thinzar Theint Theint

Assistant 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

W0322 1172

WATER QUALITY TEST RESULTS FORM

Client	Taungdowgwin Solar Power Plant Project
Nature of Water	Ground Water
Location	မြင်သာမြို့နယ်၊ မန္တလေးမြို့
Date and Time of collection	30.3.2022
Date and Time of arrival at Laboratory	31.3.2022
Date and Time of commencing examination	1.4.2022
Date and Time of completing	6.4.2022

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)		mg/l	
Chemical Oxygen Demand (COD)	32	mg/l	
Biochemical Oxygen Demand (BOD) (5 days at 20 °C)	2	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
Chemist
ISO Tech Laboratory

Approved by
Signature:
Name: Thinzar Theint Theint
Assistant 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

SGS

ORIGINAL

Report No. : 22520-00039
Job Ref. : 5000107
Date : 6-Apr-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 : Thaungdawgwin Solar Power Plant (Ground Water)

Sampling Date & Time : 30-Mar-22 & 12:00

Sample Condition : Glass and Plastic Bottle at Ambient Temperature

Lab Code : W-039

Date Sample(s) Received : 31-Mar-22

Testing Period : 1-Apr-22 TO 4-Apr-22

No.	Test Items	Methods	Results	Units
1	Potassium	APHA 3500-K B (Flame Photometric Method) (23rd Edition)	0.88	mg/L
2	Nitrogen(Kjeldahl)	APHA 4500-NorgB (Macro Kjeldahl Method) (23rd Edition) (In-house Method)	1.12	mg/L
3	Phosphorus	APHA 4500-P E (Ascorbic Acid Method) (23rd Edition)	<0.01	mg/L

********** End of Report **********

M.C.Z

SGS (MYANMAR) LIMITED

SGS (Myanmar) Limited | Natural Resources, 79/D, Bo Chein Street, 6 ½ Mile, Hlaing Township, Yangon, Myanmar
t +95(1) 654 795, 654 796, 654 864, 654 865 e sgs.myanmar@sgs.com
Member of SGS Group(SGS SA)

SGS

Report No. : 22520-00039
Job Ref. : 5000107
Date : 6-Apr-21
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 : Thaungdawgwin Solar Power Plant (Ground Water)

Sampling Date & Time : 30-Mar-22 & 12:00

Sample Condition : Glass and Plastic Bottle at Ambient Temperature

Lab Code : W-039

Date Sample(s) Received : 31-Mar-22

Testing Period : 1-Apr-22 TO 4-Apr-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
(Thae Thin Maw)
Laboratory Manager

eguard	Operation Department Environmental Quality Baseline Sampling/Survey Field Notes	E Guard-OD-EQ-F-10 Version :01	Approved by MD On Date: 2/15/2019 Page 5 of 11

Water Quality Baseline Sampling/Survey Field Notes (GW)

Surveyor: Khun Zaw Min	Date: 29.3.2022
Location: Taungdawgwin	Time: 8:30Am
Lat. & Long.: 21°26'31.46312"N 96°17' 8.90002"E	Instrument: Horiba
Weather: Sunny	Sample/Location ID: GW GPS Waypoint no: Temperature: 28.7°C Time: 8.30Am

Surface/Ground/Effluent Water

Sr. No.	pH	Electrical Conductivity			DO (mg/l)	Turbidity (NTU)	ORP	Flow Rate (m/sec)	Depth (m)	Remarks
		EC (ms/cm)	TDS (g/l)	Salinity (ppt)						
	6.80	0.06	0.493	0.3	5.43	12.3	363		300	

Aim of Sampling

- Quality, Consistency, Representative Sample, Prevent Deterioration, Prevent Contamination Suitable sampling techniques; Accurate field measurement; Transportation; Time; Preparation:
- Monitoring Schedule; Review previous field sheets; Equipment checklist; Correct bottles and
- Preservatives; Check bottle types required with lab; Add preservatives_ if required
- Sampling Bottles
- Preferable to use NEW bottles; If not-new then rigorous cleaning before re-use, Store in clean, dry dust free environment before use; Adequate for volume required.

Notes

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Checked by:

Aung Zayar

Copy Document

(11) Water quality's laboratory results and on-site measurement result of surface water

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)

W0322 1173

WTL-RE-001
Issue Date - 01-12-2012
Effective Date - 01-12-2012
Issue No - 1.0/Page 2 of 2

WATER QUALITY TEST RESULTS FORM

Client: Taungdowgwin Solar Power Plant Project
Nature of Water: Surface Water
Location: မြင်သာမြို့နယ်၊ မန္တလေးမြို့၊
Date and Time of collection: 30.3.2022
Date and Time of arrival at Laboratory: 31.3.2022
Date and Time of commencing examination: 1.4.2022
Date and Time of completing: 6.4.2022

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)		mg/l	
Chemical Oxygen Demand (COD)	32	mg/l	
Biochemical Oxygen Demand (BOD) (5 days at 20 °C)	2	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
ISO Tech Laboratory

Approved by
Signature:
Name: Thinzar Theint Theint
Assistant Technical Officer
ISO Tech Laboratory

(a division of WEG Co.,Ltd.)

No.18, Lanthit Road, Nanthargone Quarter, Insein Township, Yangon, Myanmar.
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WTL-RE-001
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Issue No - 1.0/Page 1 of 2

W0322 1173

WATER QUALITY TEST RESULTS FORM

Client	Taungdowgwin Solar Power Plant Project
Nature of Water	Surface Water
Location	မြင်းသာမြို့နယ်၊ မန္တလေးမြို့
Date and Time of collection	30.3.2022
Date and Time of arrival at Laboratory	31.3.2022
Date and Time of commencing examination	1.4.2022
Date and Time of completing	6.4.2022

Results of Water Analysis			**WHO Drinking Water Guideline (Geneva - 1993)**
pH			6.5 - 8.5
Colour (True)		TCU	15 TCU
Turbidity		NTU	5 NTU
Conductivity		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	8	mg/l	
Total Dissolved Solids		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		ppt	

Remark: This certificate is issued only for the receipt of the test sample.

Tested by
Signature:
Name: Zaw Hein Oo
Chemist
ISO Tech Laboratory

Approved by
Signature:
Name: Thinzar Theint Theint
Assistant 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, 01-644508, E-mail: isotechlaboratory@gmail.com, Website: weg-myanmar.com

ORIGINAL

SGS

Report No. : 22520-00040
Job Ref. : 5000107
Date : 6-Apr-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 : Thaungdawgwin Solar Power Plant (Surface Water)

Sampling Date & Time : 30-Mar-22 & 12:10

Sample Condition : Glass and Plastic Bottle at Ambient Temperature

Lab Code : W-040

Date Sample(s) Received : 31-Mar-22

Testing Period : 1-Apr-22 TO 4-Apr-22

No.	Test Items	Methods	Results	Units
1	Potassium	APHA 3500-K B (Flame Photometric Method) (23rd Edition)	1.66	mg/L
2	Nitrogen(Kjeldahl)	APHA 4500-NorgB (Macro Kjeldahl Method) (23rd Edition) (In-house Method)	1.12	mg/L
3	Phosphorus	APHA 4500-P E (Ascorbic Acid Method) (23rd Edition)	<0.01	mg/L

********** End of Report **********

M.C.Z

SGS (MYANMAR) LIMITED Oil, Gas & Chemicals

SGS

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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
(Thae Thin Maw)
Laboratory Manager

eguard	Operation Department Environmental Quality Baseline Sampling/Survey Field Notes	E Guard-OD-EQ-F-10 Version :01	Approved by MD On Date: 03/25/2021 Page 5 of 11

Water Quality Baseline Sampling/Survey Field Notes (SW)

Surveyor:	Khan Zaw Min	Date:	29.3.2022
Location:	Taungdaung Kwin	Time:	9:00 Am
Lat. & Long.:	21° 26' 25.4639" N	Instrument:	Horiba
Weather:	96° 17' 20.2709" E Sunny	Sample/Location ID: SW GPS Waypoint no: Temperature: 27.53°C Time: 9:00 Am	

Surface/Ground/Effluent Water

Sr. No.	pH	Electrical Conductivity			DO (mg/l)	Turbidity (NTU)	ORP	Flow Rate (m/sec)	Depth (m)	Remarks
		EC (ms/cm)	TDS (g/l)	Salinity (ppt)						
	6.09	0.001	0.001	0.0	10.13	347	408			

Aim of Sampling

- Quality, Consistency, Representative Sample, Prevent Deterioration, Prevent Contamination Suitable sampling techniques; Accurate field measurement; Transportation; Time; Preparation:
- Monitoring Schedule; Review previous field sheets; Equipment checklist; Correct bottles and
- Preservatives; Check bottle types required with lab; Add preservatives_ if required
- Sampling Bottles
- Preferable to use NEW bottles; If not new then rigorous cleaning before re-use, Store in clean, dry dust free environment before use; Adequate for volume required.

Notes

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Checked by:

Aung Zaya

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EFFECTIVE DATE: 04/01/2021