RE implementation - PV installation program in University of Yangon

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Outline

- **Collaborative research title**:
  WP2: Energy and Environment - RE implementation
  - PV installation program in University of Yangon
- National Electrification Plan (NEP)
- Brief of Myanmar Energy Policy
- UY PV project
- Future Plan

National Electrification Plan

Objective

The Myanmar National Electrification Plan aims to achieve 100% electrification by 2030.

Leading Ministries

- **MOEE** **Grid Extension (310 Mil USD)**

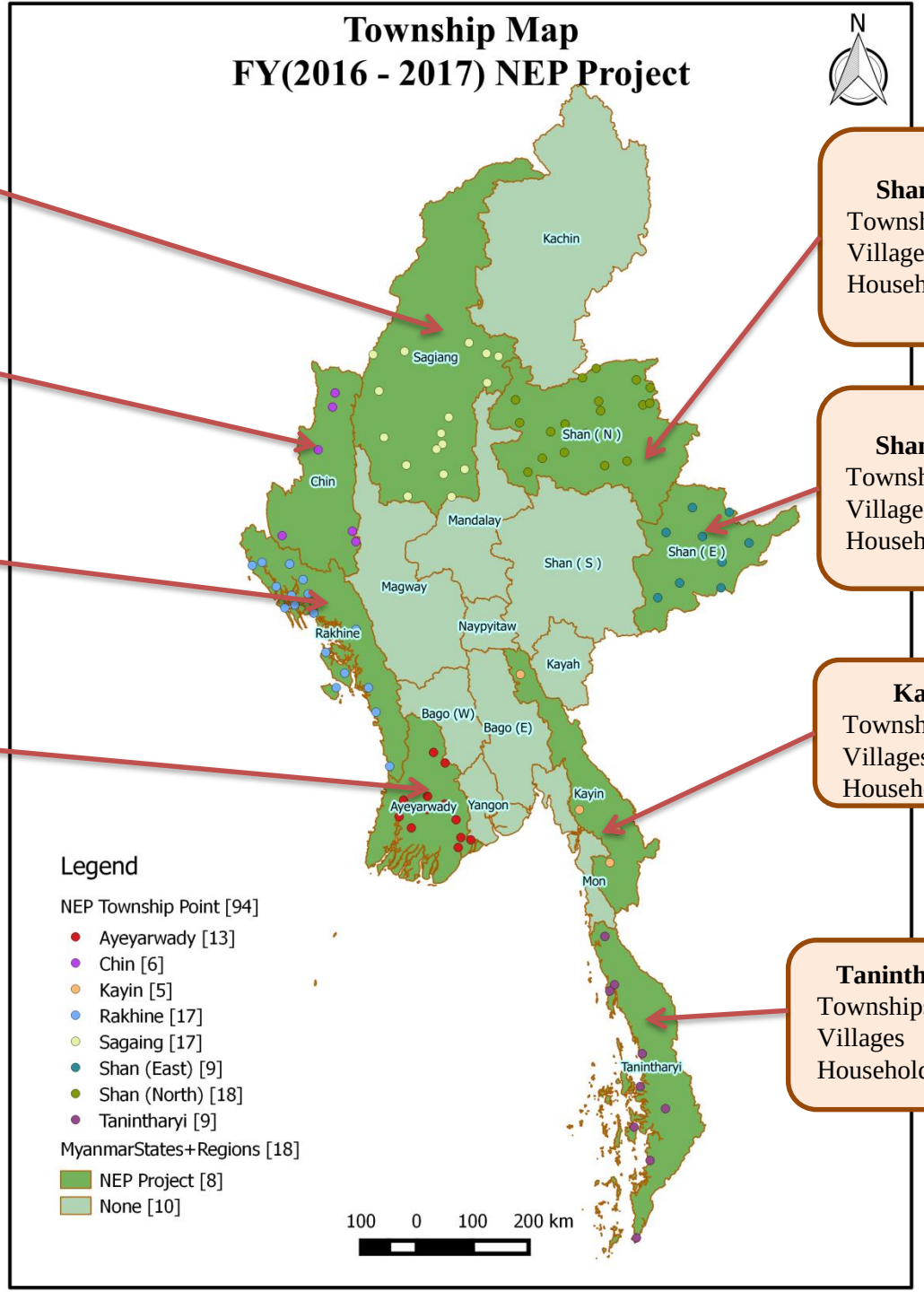
  Dense areas (**Phase 1, 2 and 3)** require less MV per connection and will be connected first.

- **MOALI** **Off-grid** **(90 Mil USD)**

  Remote communities areas (**Phase 4, 5)** have higher cost per connections and will be connected later.

- According to the Ministry of Energy and Electrical Power (MOEE), full electrification would require more than 7.2 million households to be connected over the next 16 years.

Township Map
FY(2016 - 2017) NEP Project



Sagaing Region
Townships - 17
Villages - 151
Households - 9770

Chin State
Townships - 6
Villages - 290
Households - 11289

Rakhaing State
Townships - 17
Villages - 525
Households - 27471

Ayeyarwady Region
Townships – 13
Villages - 388
Households - 25324

Shan (N)State
Townships - 18
Villages - 543
Households - 20198

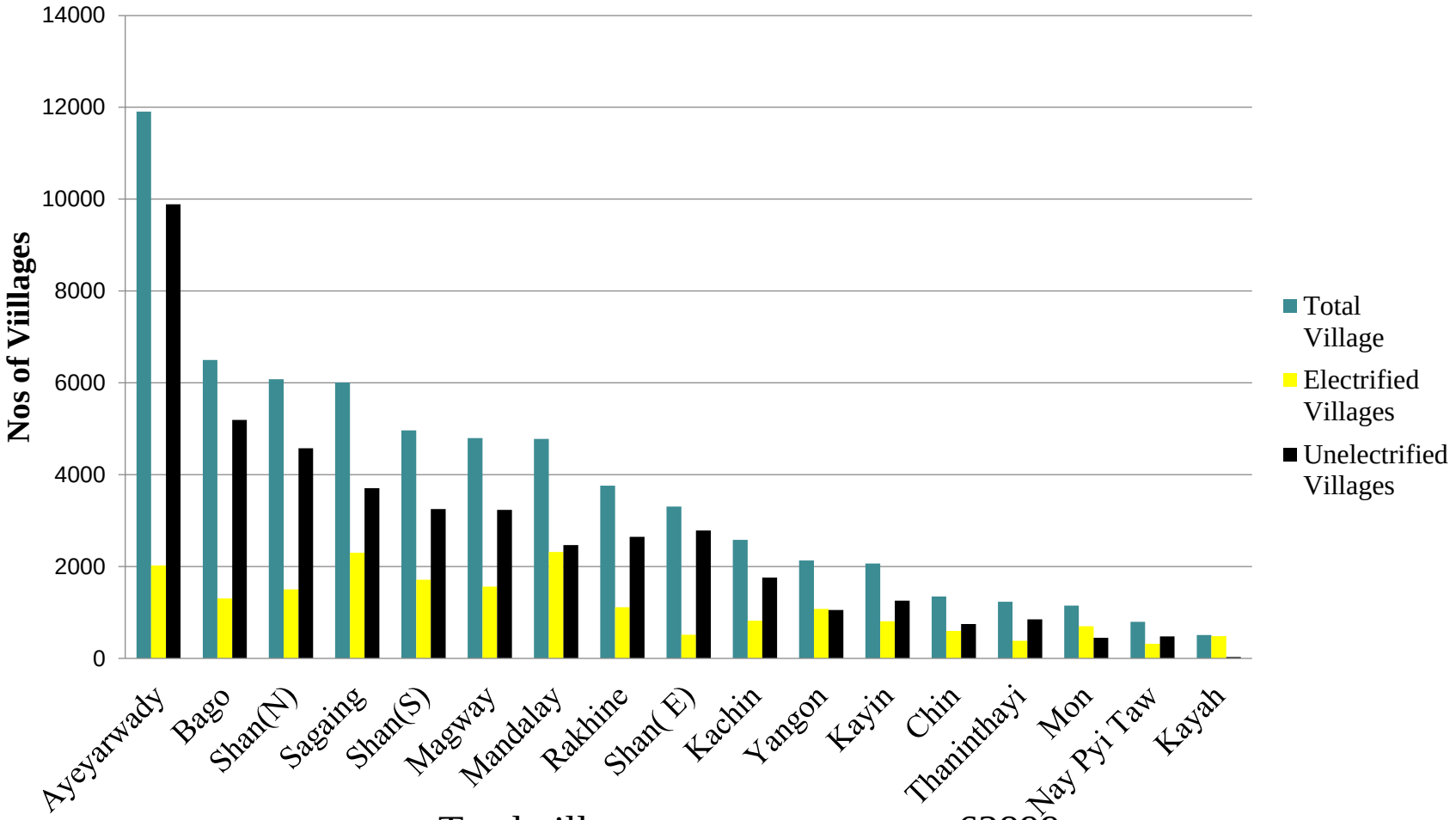
Shan (E)State
Townships - 9
Villages - 266
Households - 7400

Kayin State
Townships - 5
Villages - 143
Households - 11442

Tanintharyi Region
Townships - 9
Villages - 288
Households - 18649

- ❖ State/ Region - 7
- ❖ Township - 94
- ❖ Village - 2743
- ❖ Households - 145191

Current Electrified Villages



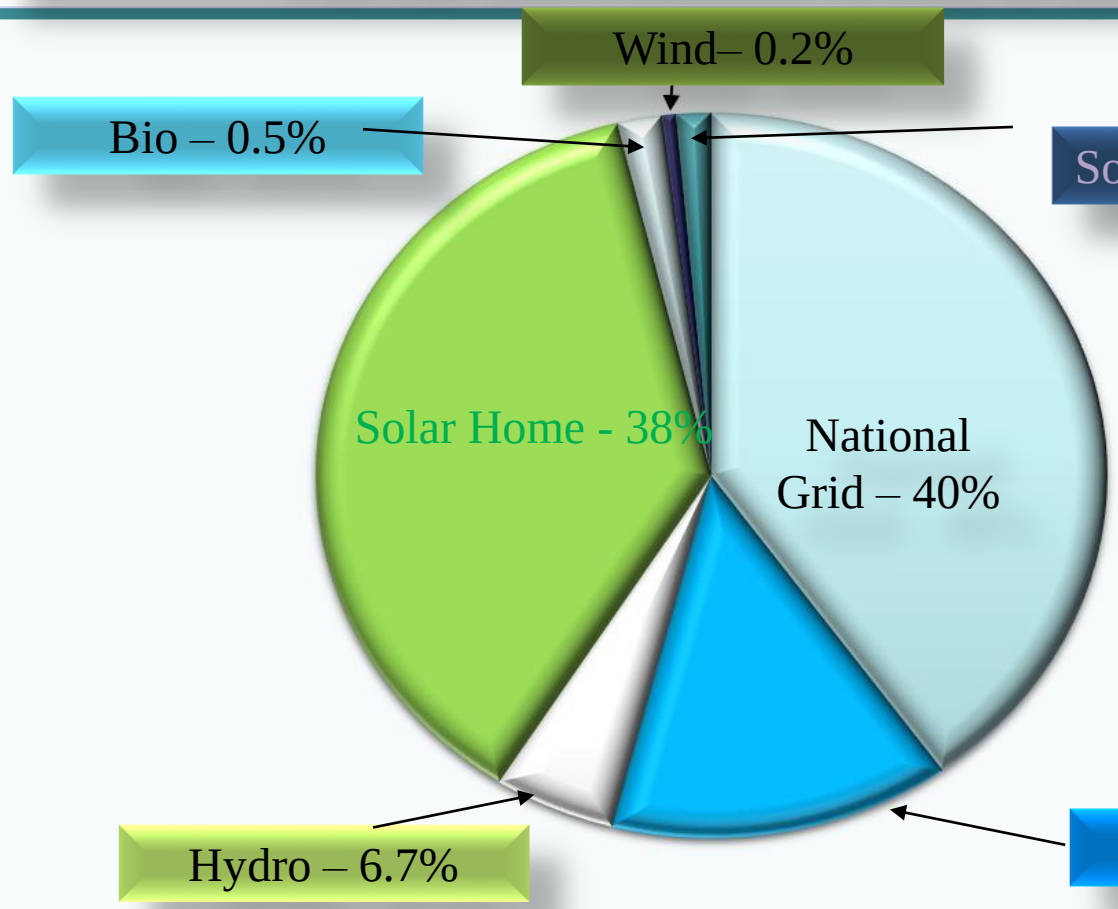
Total villages - 63899

Electrified villages -20807

Unelectrified villages - 43092

Base on 70% electrified HH in Villages

Current Electrification System in Rural Area



Total Electrification	Grid Line	Diesel	Mini-Hydro	SHS	Mini-Solar	Wind	Bio
20815	8562	2971	1063	7943	134	40	102

Brief of National Energy Policy

- 5.To implement programs on a wider scale, utilizing renewable energy resources
- 6. To promote Energy Efficiency and Energy Conservation
- 7.To establish R, D, D&D (Research, Development, Design and Dissemination) Institution
- 8.To promote international collaboration in energy matters

Research Project for PV Installation Program in UY

19.44kW Grid-Tied PV System

High quality PV system for **electricity cost reduction**.

with

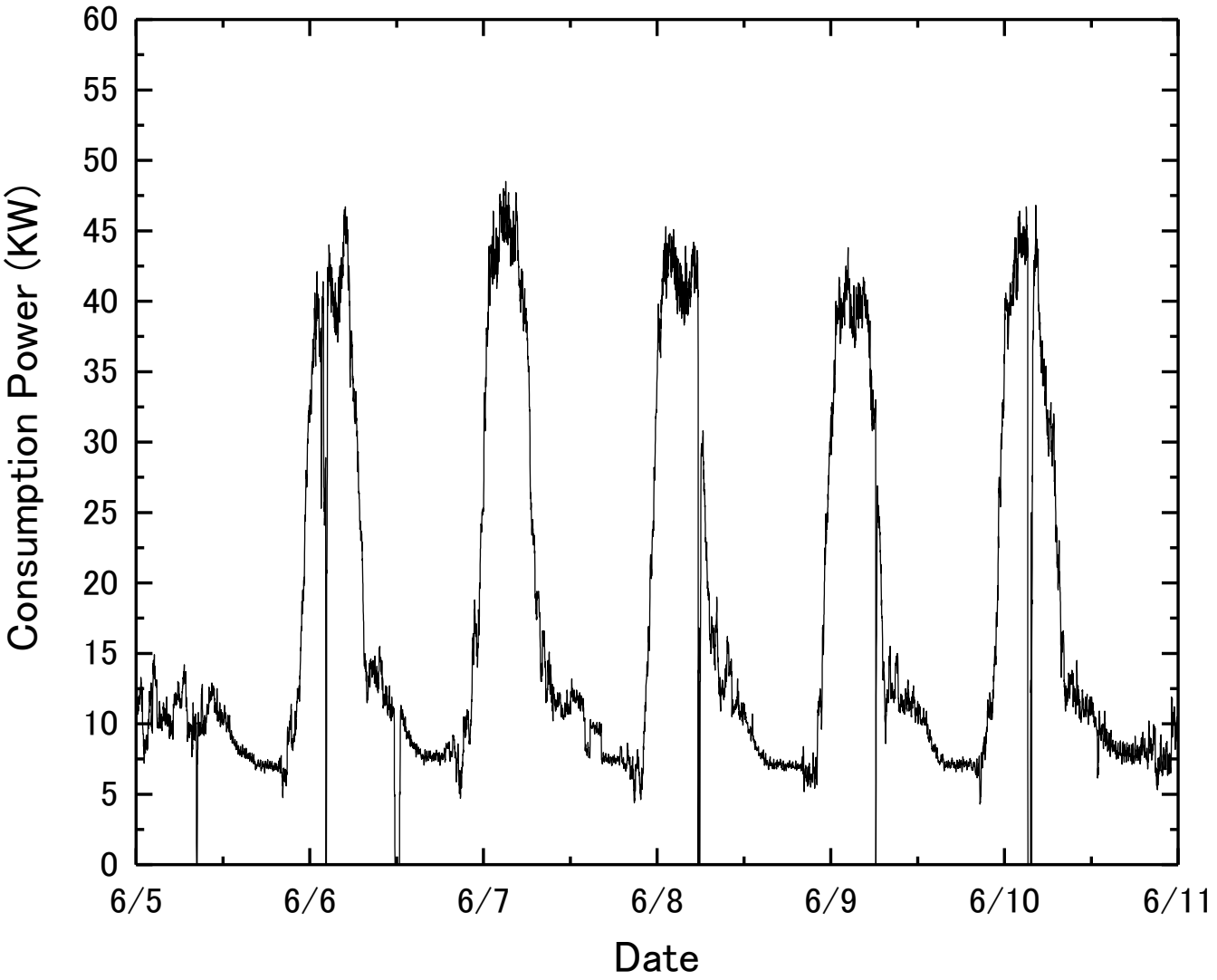
9.6kWh 3Phase Battery System

Li-ion battery system for **emergency power supply**.

- ***Objectives:***
- *University of Yangon is famous and leading university in Myanmar.*
- *to supply stable electricity by using renewable energy.*
- *Electricity requirement of our university is about 2 MW.*
- *A pilot project has been launched for installation of 100kW PV system for a basic research and education in University of Yangon.*

- **Process**
- We started a basic data collection of the electricity consumption of the science building from March, 2016 by using power logger PW 3365A, Hioki. Fig.2 shows a typical electricity consumption pattern from June 5 to 11, 2016.
- It is clear that there were black-outs almost once in a day. However, the duration of the black-out was less than 10 minutes. The longest duration of the black-out was 40 minutes at June 6 to June 7.
- The diesel back-up generator (750 kW) has been installed in the power distribution station and it has been operated by manual. Therefore, the black-out of the grid power line could be longer than the observed one.
- Currently the peak electricity consumption does not exceed 50 kW, but it should be larger in the new research building. Therefore 100 kW PV system should be prepared. However, the limitation of the budget, the designed system is targeting only partial equipment, emergency lights which requires about 3 kW.

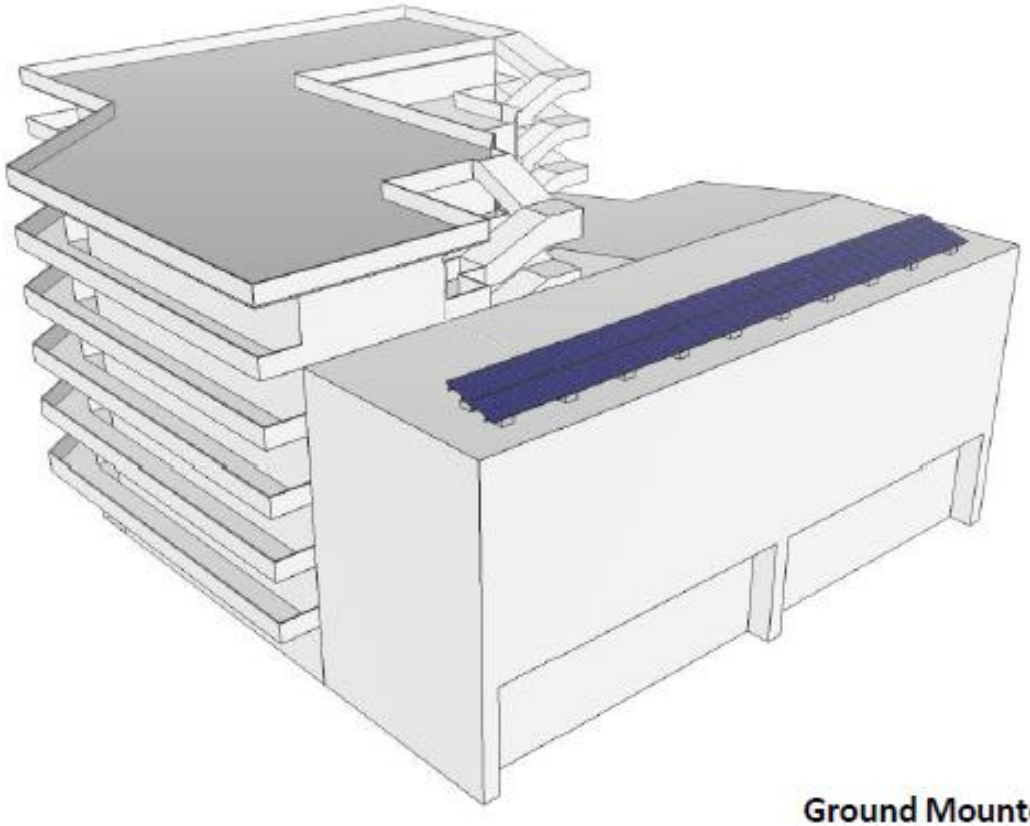
Electricity consumption in the Science Building of University of Yangon

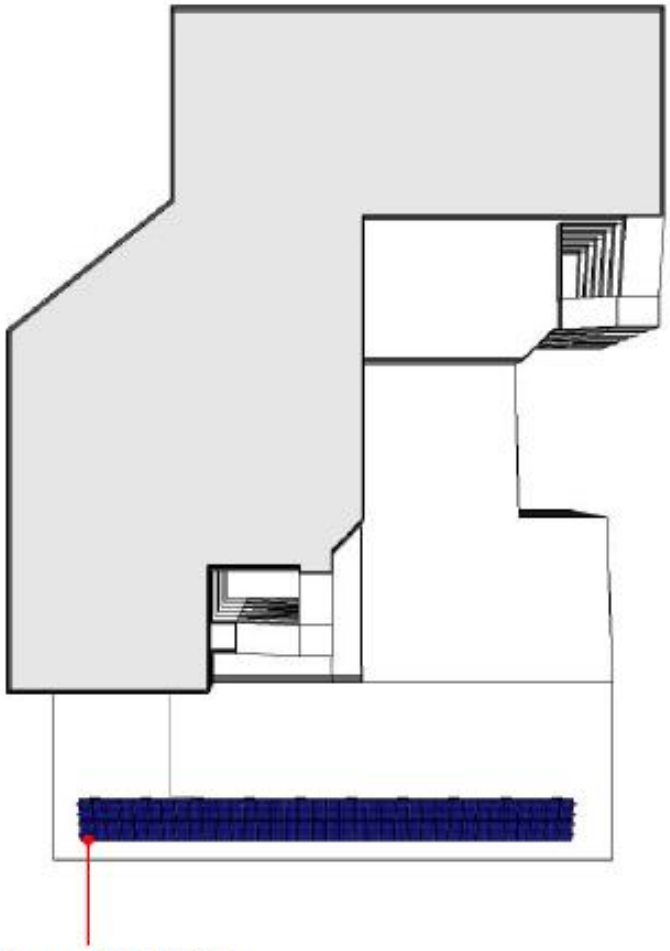


- a typical electricity consumption pattern from June 5 to 11, 2016. It is clear that there were black-outs almost once in a day. However, the duration of the black-out was less than 10 minutes.

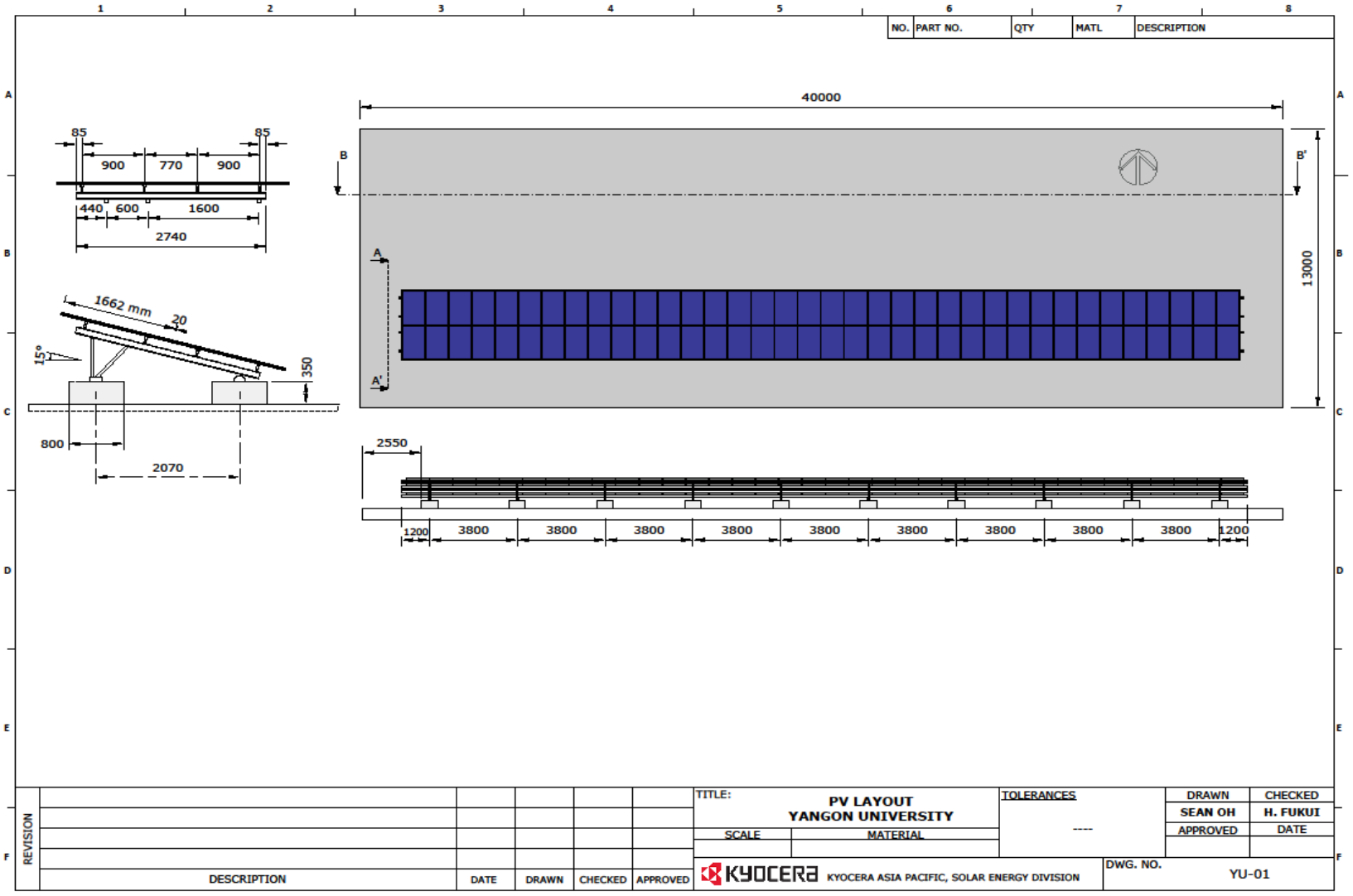
PV Capacity : 270W x 72pcs. = **19.44kW**

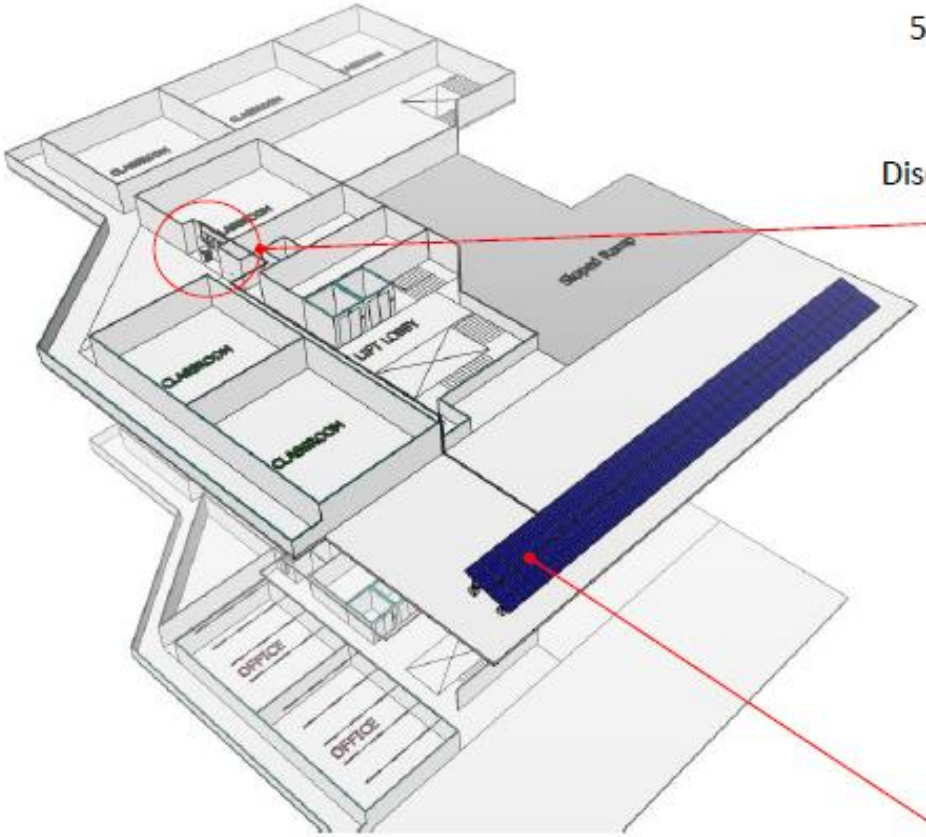
Storage Battery : Li-ion($LiFePO_4$), **9.6kWh**



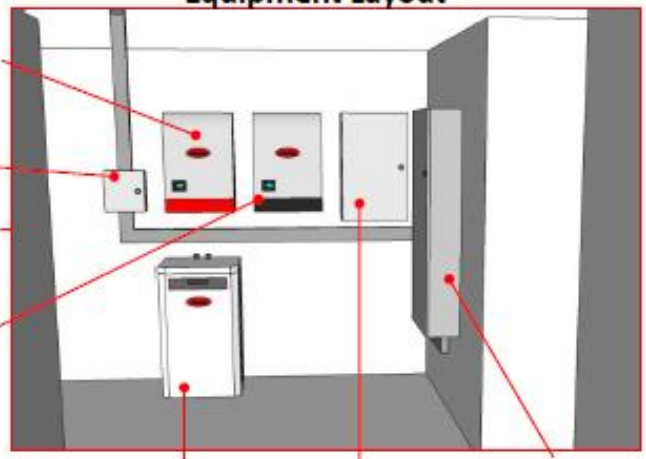


PV lay out plan for 20 kW module in UY





Equipment Layout



5kW Hybrid Inverter

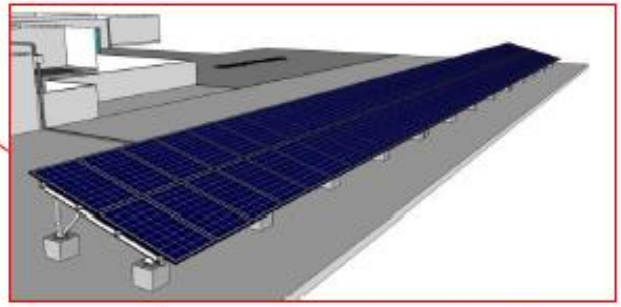
DC Disconnect

10kW Inverter

12kWh Li-Ion Battery for Storage

Emergency Switchover Panel

Existing AC Distribution Board

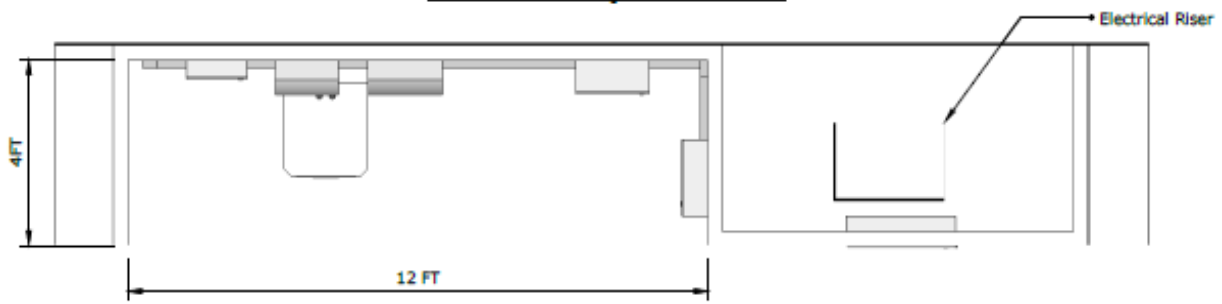


Ground Mounted PV Array, 19.44kW

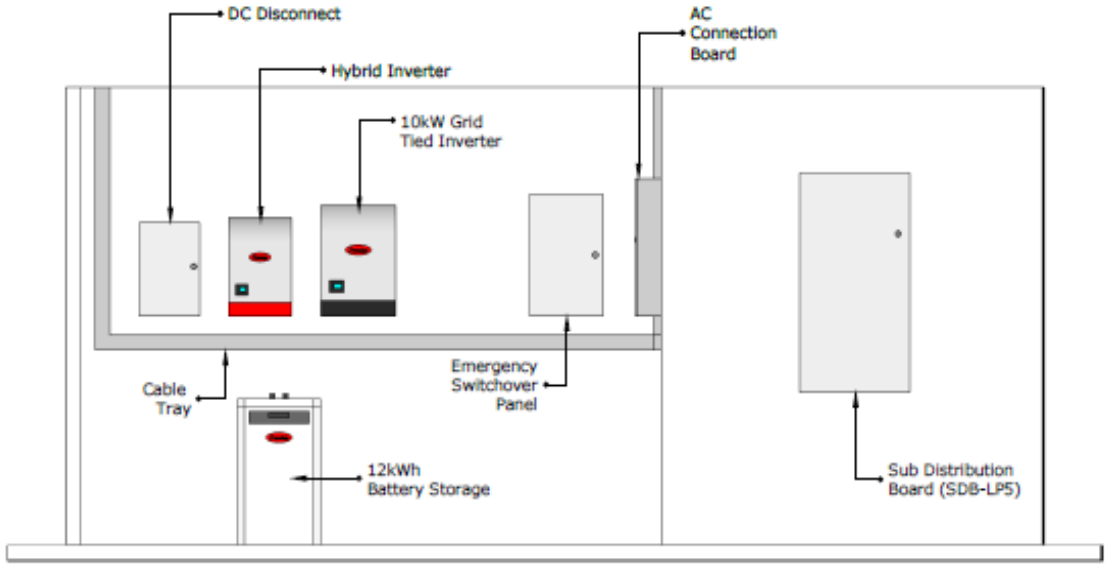
Proposed Layout (6th Floor)

NO.	PART NO.	QTY	MATL	DESCRIPTION

PLAN VIEW PV EQUIPMENT ROOM



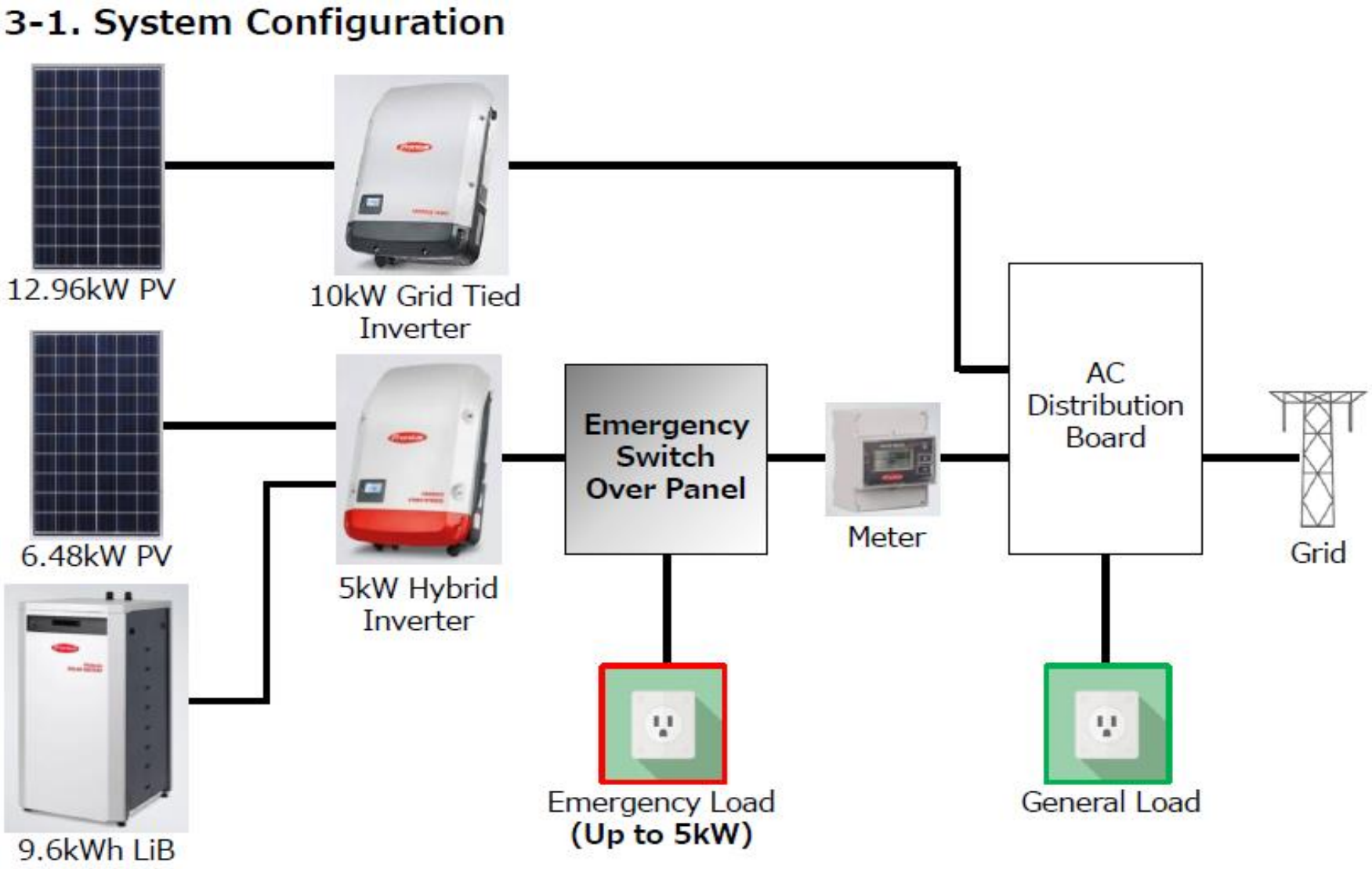
FRONT VIEW PV EQUIPMENT ROOM



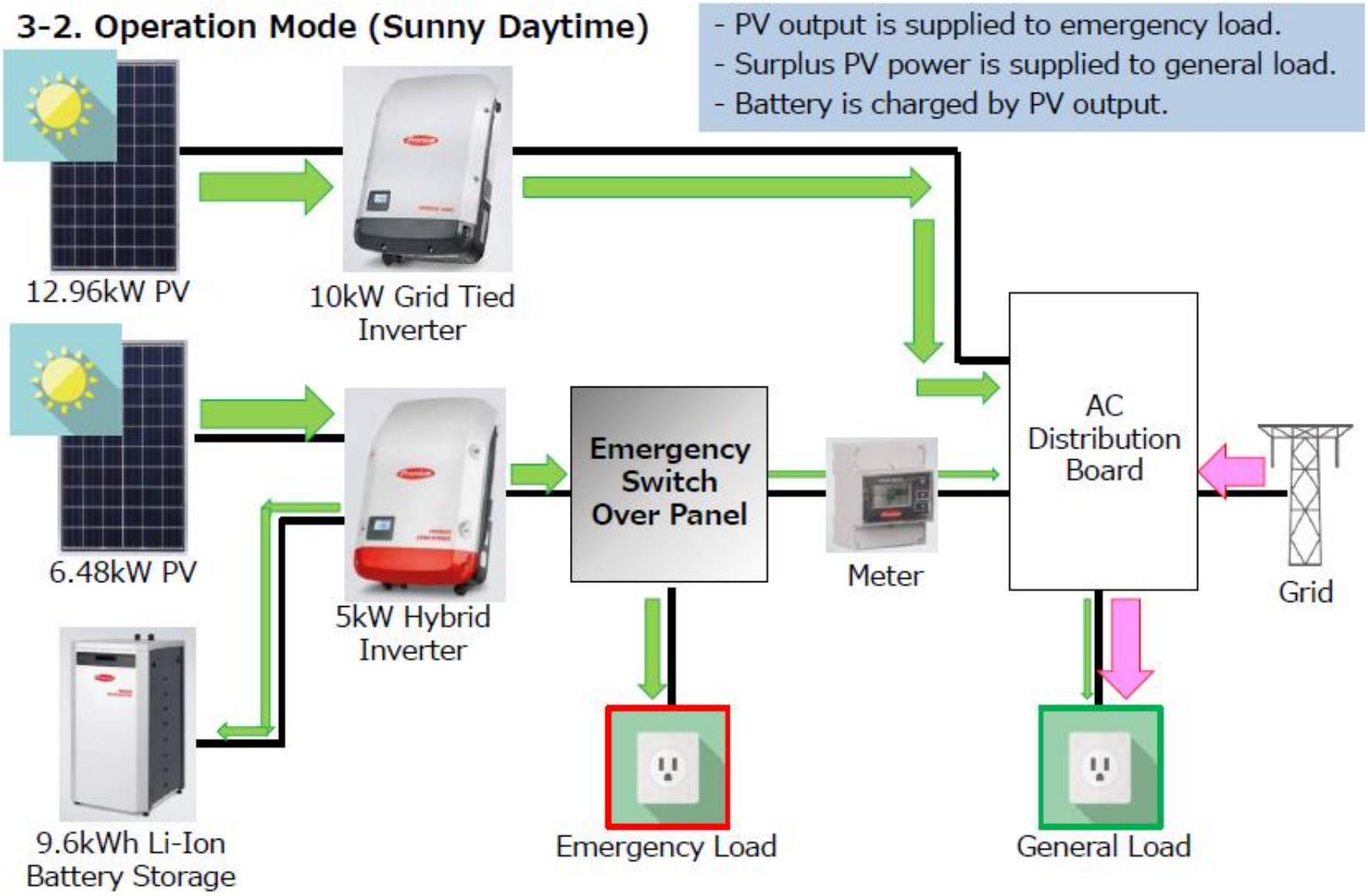
REVISION					
DESCRIPTION	DATE	DRAWN	CHECKED	APPROVED	

TITLE: PV EQUIPMENT LAYOUT YANGON UNIVESRITY		TOLERANCES	DRAWN: SEAN OH / CHECKED: H. FUKUI
SCALE: FREE	MATERIAL	----	APPROVED / DATE
KYOCERA KYOCERA ASIA PACIFIC, SOLAR ENERGY DIVISION		DWG. NO.	YU-03

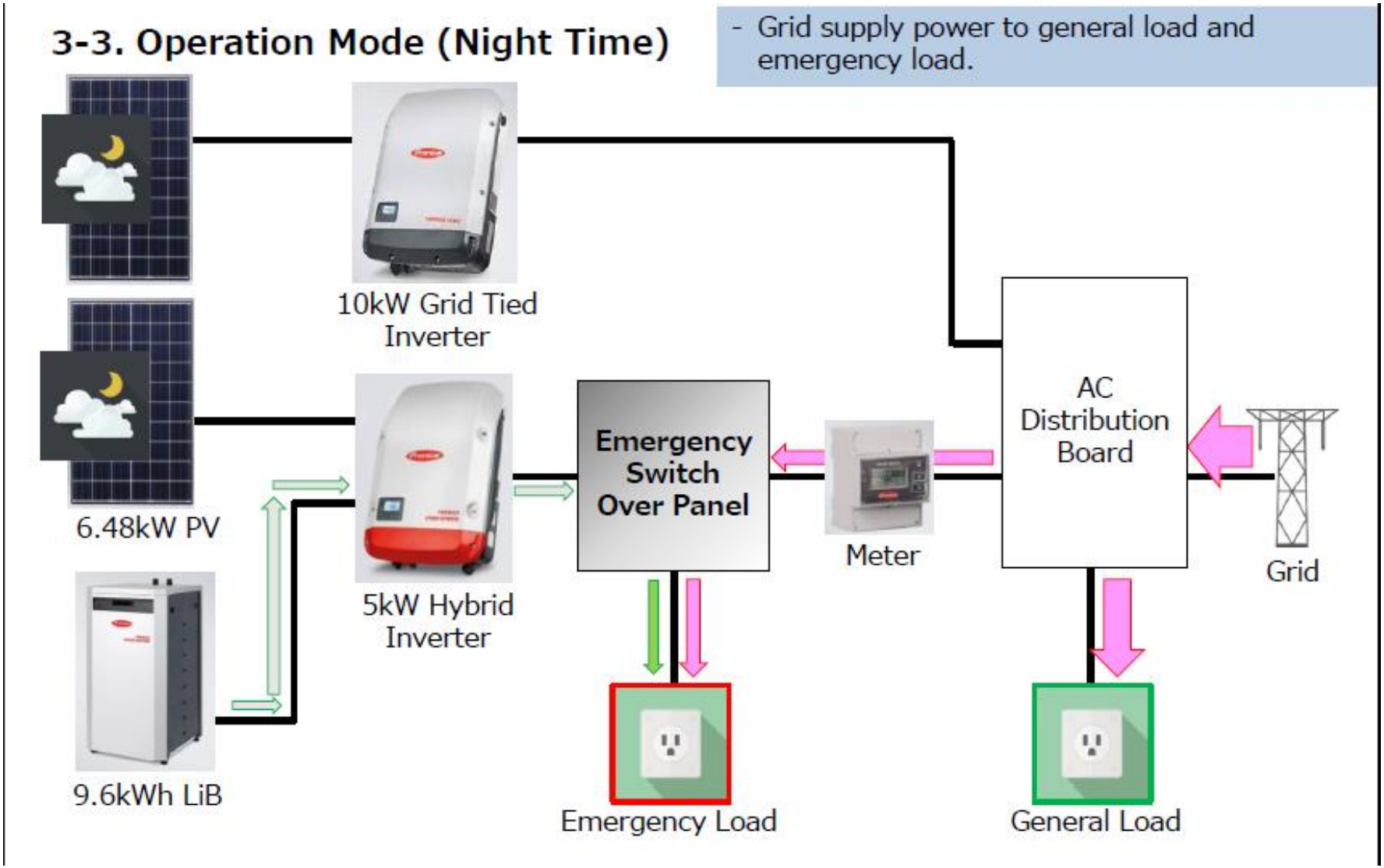
PV system configuration



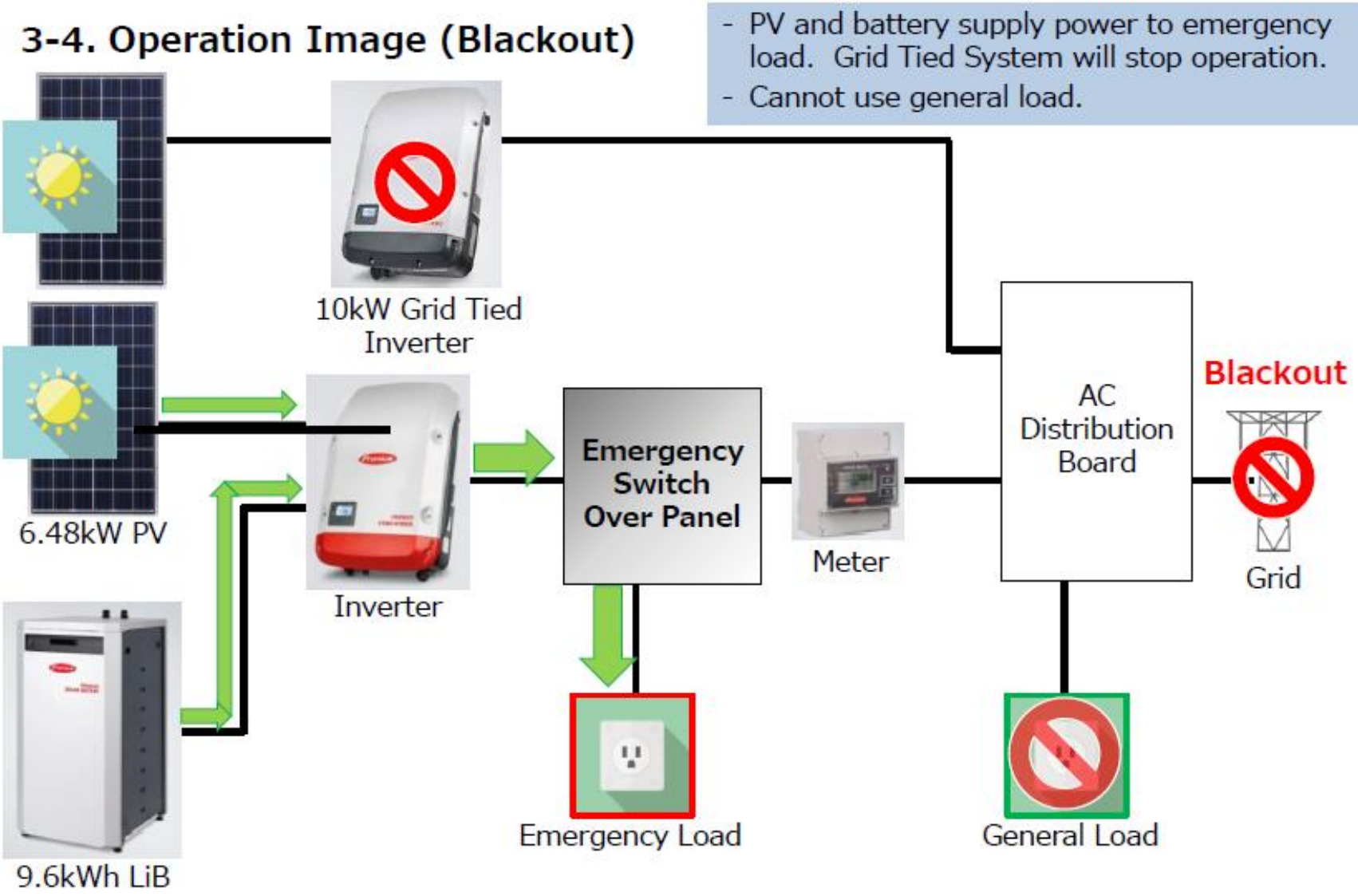
- PV system operation mode in sunny day time

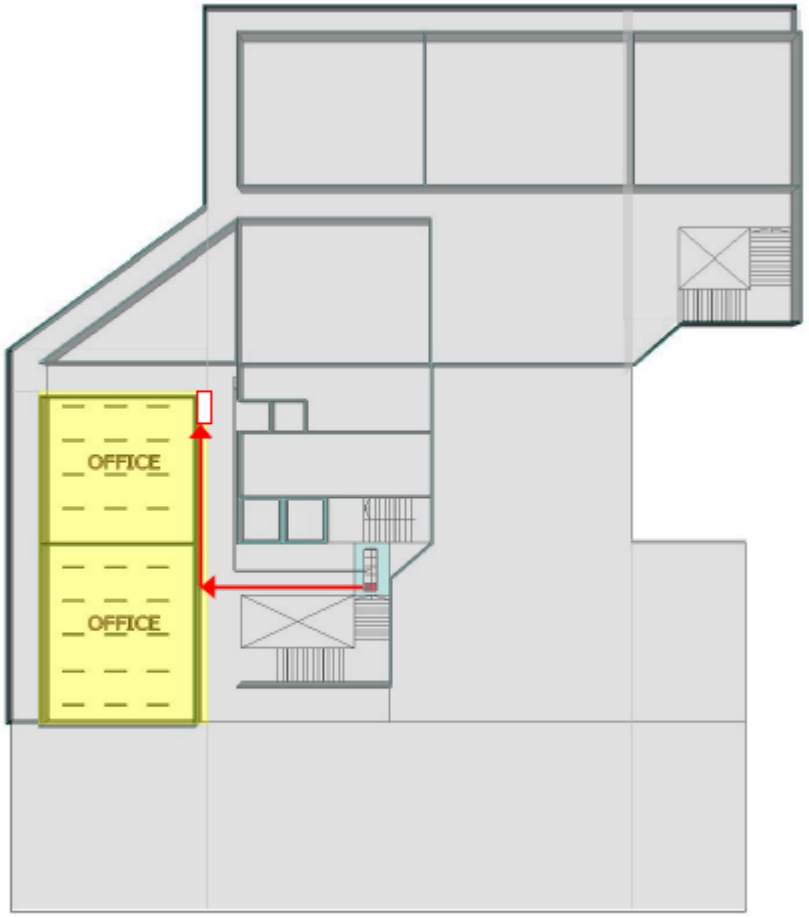


- PV system operation mode in night time



- PV system operation mode in day time with black out condition



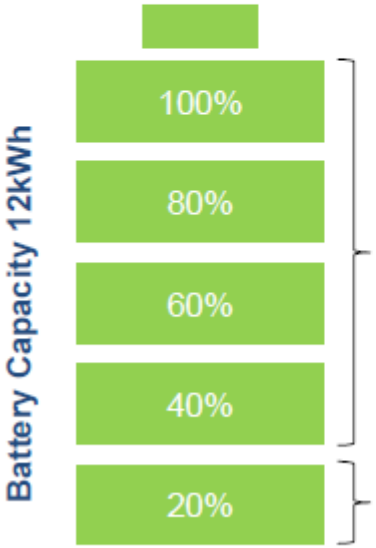


Emergency Lighting Coverage Area

Non - Emergency Lighting Coverage Area

Emergency Load	Qty	Rating (W)	Total (W)
Lighting Points	60	40	2,400
AC Outlet	6	10	600
Others	NA	NA	NA

Total Demand: 3,000W



- Usable Capacity: 9.6kWh
- Support Emergency Load (3000W), up to 3.2 hours

Reserved to maintain 20% DOD

Complete set up of 20 kW PV system in UY

Ribbon cutting ceremony of 20 kW PV system in UY new research building

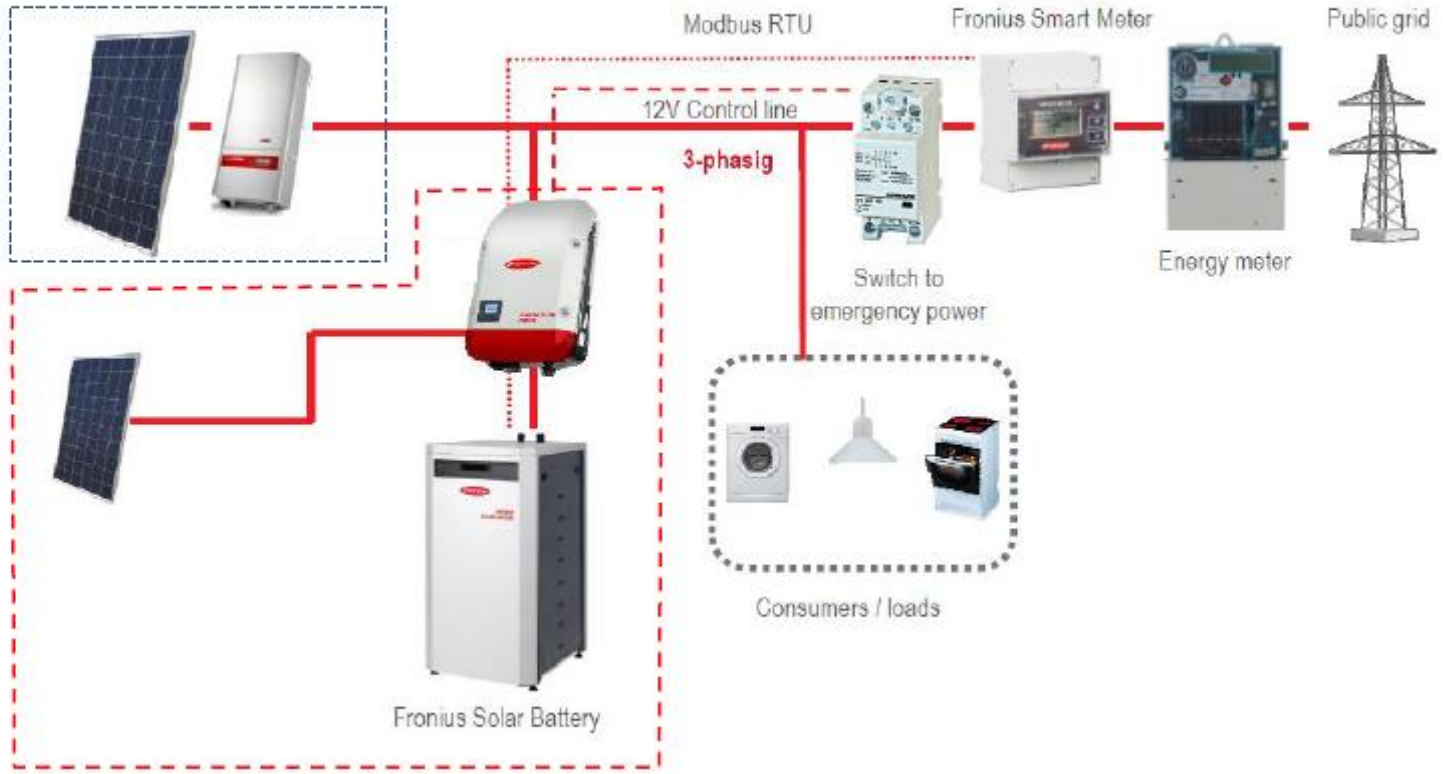
- Future Plan of UY PV system

Highlights:

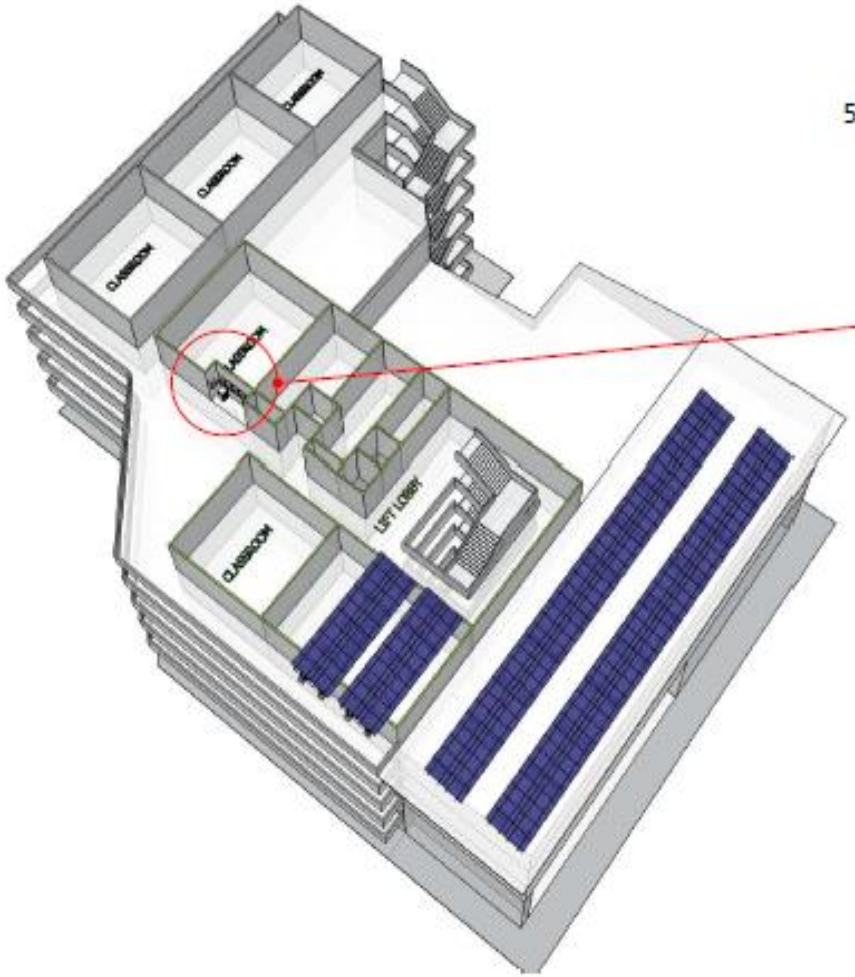
(1) Expansion of existing PV system, installed at 2 locations
- Level 5 Deck Roof – 72 pcs of 270Wp Solar Modules (19.44kW)
- Level 6 Deck Roof – 40pcs of 270Wp Solar Modules (10.80kW)

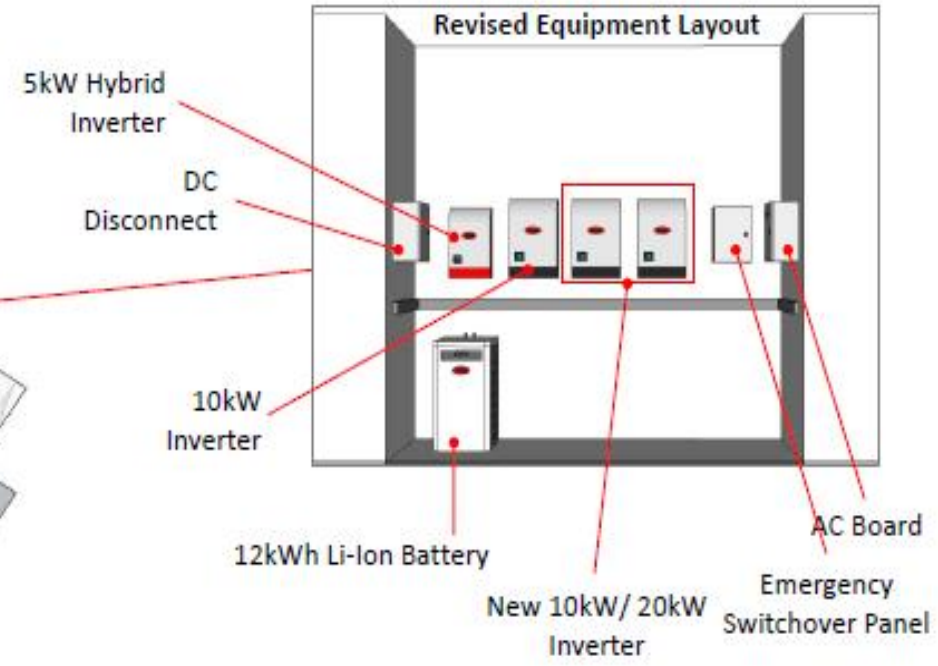
(2) Solar-Powered High Definition IP Camera Surveillance System
- HD Camera Surveillance for PV assets (PV Array, Inverters and Battery)
- Night surveillance with IR Capability
- Video analytics like motion detection, intrusion detection, etc

Future Expansion without Battery Storage

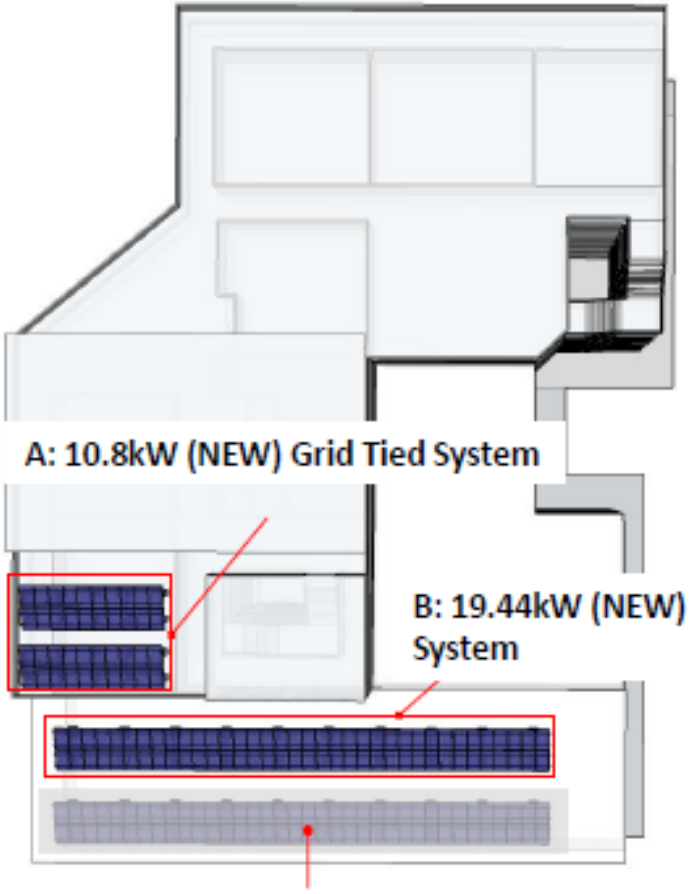


Existing Battery Storage System





Next phase of 30.24 kW for pilot plan 100 kW



Additional 30.24kWp of Solar Modules to be Installed

(A) Level 6 Roof Area*

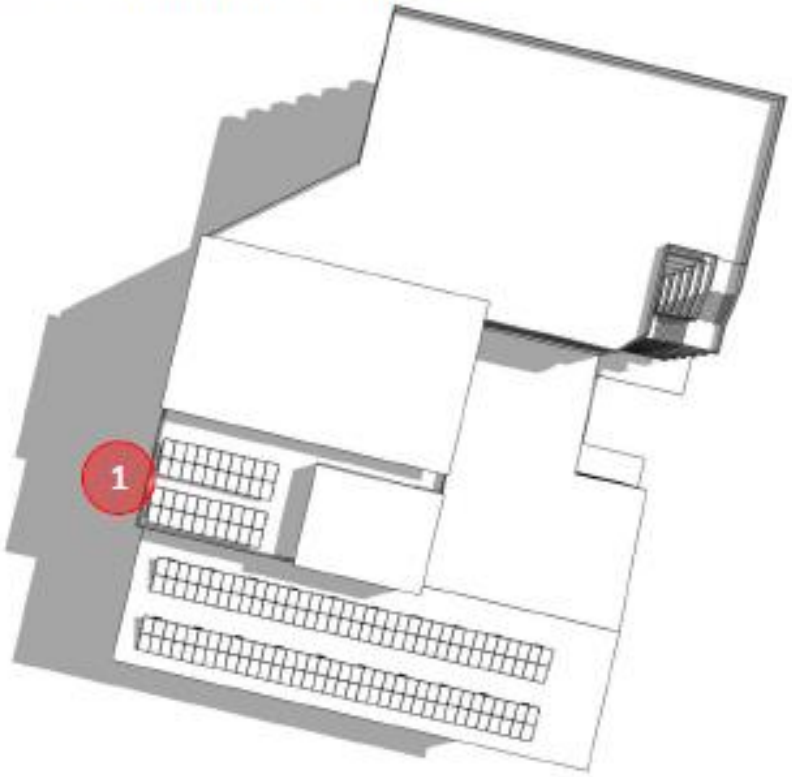
- 40 pcs of 270Wp (10.80kW) solar modules is proposed to be installed
- Array structural height will be designed to avoid shading from parapet (1.20m height)

* This area is initially designed with canopy

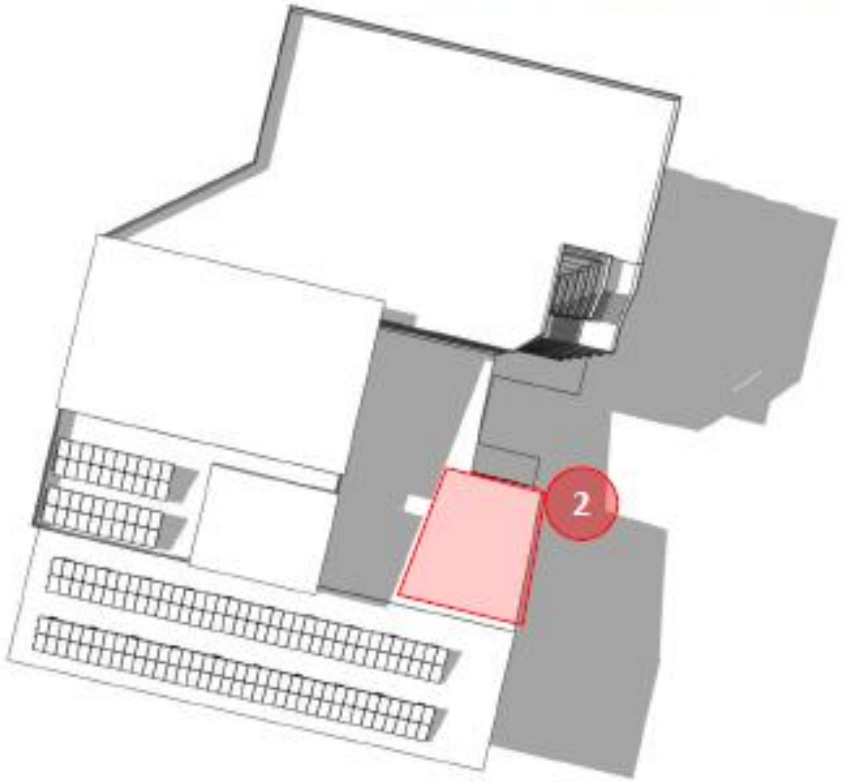
(B) Level 5 Roof Area

- 72ps of 270Wp (19.44kW) solar modules is proposed to be installed

28/6, 9AM Shading Condition



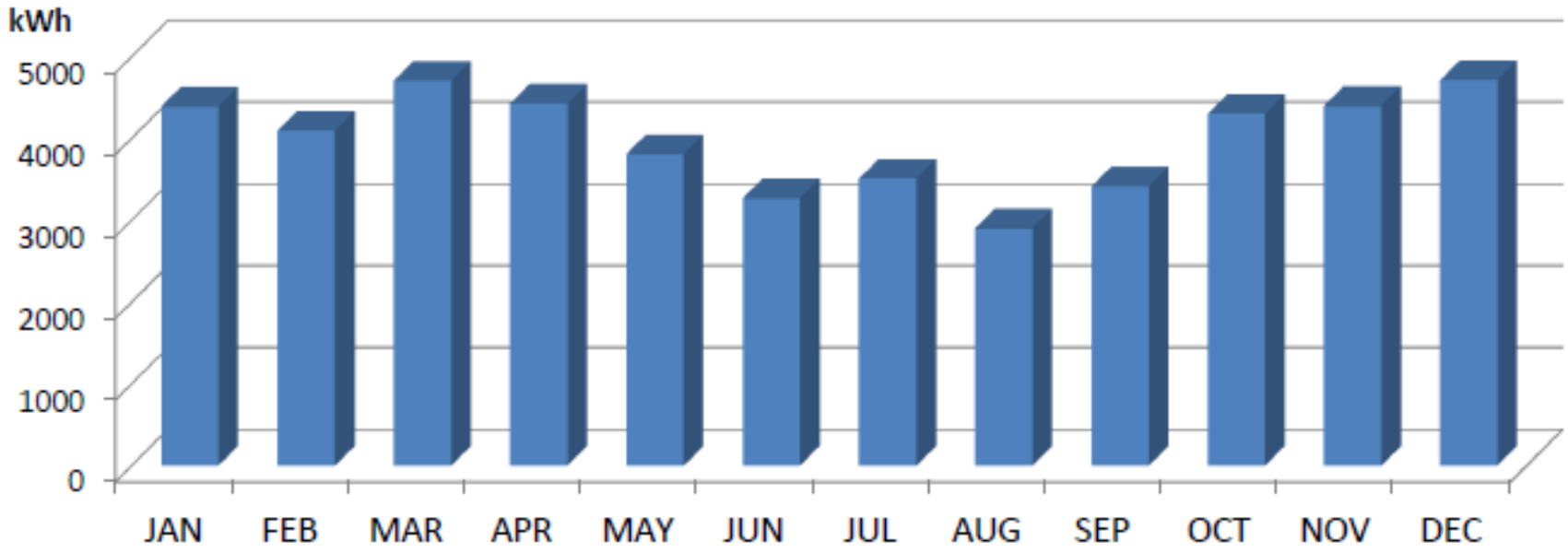
28/6, 3PM Shading Condition



1 Structural height for PV Array (Level 6 Roof) is elevated to be of the same height as parapet

2 Shading on the ramp is prominent during from 2pm onwards

Estimated Monthly PV Generation, kWh



JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total, kWh
4387	4091	4705	4422	3807	3265	3504	2897	3415	4299	4391	4712	47,895

** Estimates based on PVSYST (V6.2.3) Simulation, only for reference*

- **Conclusion and Future Plan**

- The 20 kW PV system with 10 kWh Li-ion battery storage system has been designed to supply stable electricity in the new research building in University of Yangon. The system installation has been started in October and installation is already finished now. The durability of the Li-ion battery is one of issue in a hot and high humidity condition, although it has been tested in Europe and Japan.

- We found that maximum 50 kW PV system can be set on the current installation place. Therefore, additional 30.24 kW PV system is planning. Finally University of Yangon plans to install a large scale, 2 MW, PV system in near future. The system design and installation place are under considerations. Results should be clear and concise. Quantitative results should be expressed using SI units. Tables and figures should be referred to in the text.

Thank you for your attention