Project Title: Smart Energy-Sharing and Management Devices for a Low Carbon Society

Background:

1. Many remote communities still lack access to the national electricity grid.
2. Off-grid power systems are essential—particularly independent power systems—but they often suffer from low efficiency and reliability.
3. The current project aims to extend and promote the use of energy-sharing and management devices developed in a previous ERC-supported project to enhance energy efficiency, reliability, and regional collaboration.
   The proposed system will utilize IoT technologies such as power electronics, data communication, wireless communication, and data analysis.

Targets:

- Expanding to other areas and securing Funding in Thailand.
- **Strengthen collaboration** among Japan, Lao PDR, Cambodia, and Myanmar through joint research, workshops, and training.
- **Promote prototype adoption** by installing systems in Thailand (2 sites), Lao PDR, Myanmar, and Cambodia.

Speaker: Natchpong Hatti, Thailand

ERC stands for Energy Regulatory Commission, Thailand

Project Title: Smart Energy-Sharing and Management Devices for a Low Carbon Society

Project Members (23) :

Thailand [NECTEC] (8 Members): Natchpong Hatti , Surasak Nuilers, Ruchao Pupadubsin, Seubsuang Kachapornkul, Santipong Karukanan, Prakob Komeswarakul, Pichet Pudson, Kanokvate Tungpimolrut

Laos [NUOL] (6 Members): Vimontha Khieovong, Vorachack Kongphet, Chansamone LIEMKEO, Seemueang CHANTHAKHAMANY, Thaksin CHOUMMANEEVONG, Santisouk SOUTTHICHAK

Myanmar [UCSY] (6 Members): Thin Lai Lai Thein, Khine Htoo, Win Lelt Lelt Phyu, Ah Nge Htwe, Ye Naing, Moe Moe Myint

Cambodia [CADT] (2 Members): Cheab Sovuthy, Lihour Nov

Japan [NICT] (1 Member): Yasunori Owada

Project Duration : 1 June 2025 – 31 May 2027

Project Budget: 40,000 USD/Year, 80,000 USD in Total

Project Activities: Symposium, Site Visit, and Meeting: 19 – 21 Aug. 2025, Chiang Mai, Thailand

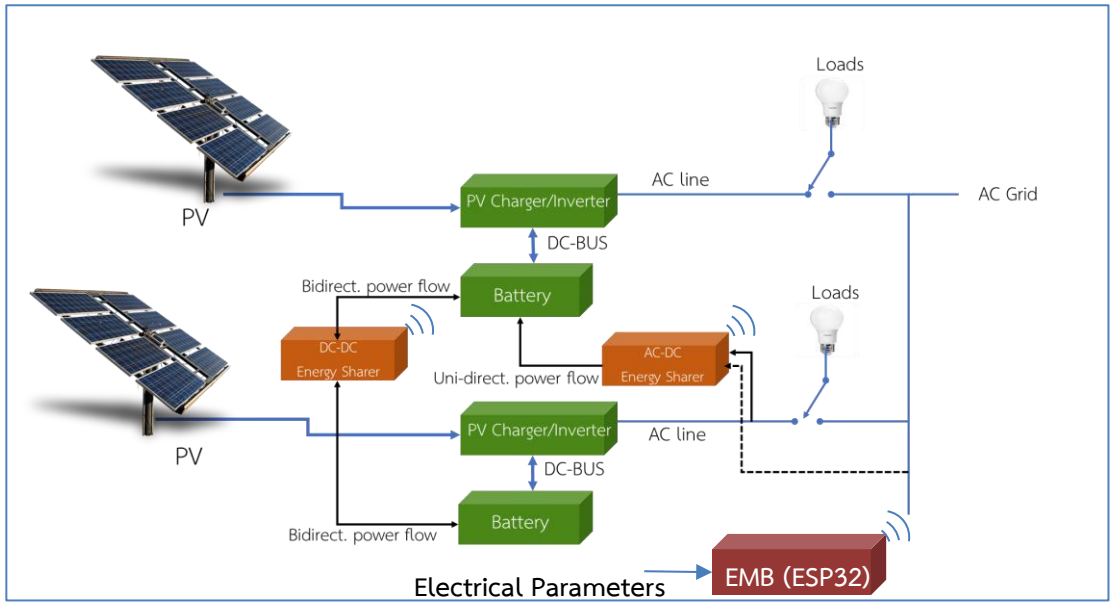
Site Visit at Rajamangala University of Technology Lanna (RMUTL)

Objectives

- Foster collaboration and knowledge sharing in **IoT, AI, Power Electronics, and Smart Energy Management**.
- Exchange **practical experiences** for sustainable rural development.
- Align **project direction, scope, and action plans** among ASEAN and Japan partners.
- Strengthen collaboration through **expert involvement** and technical discussions.

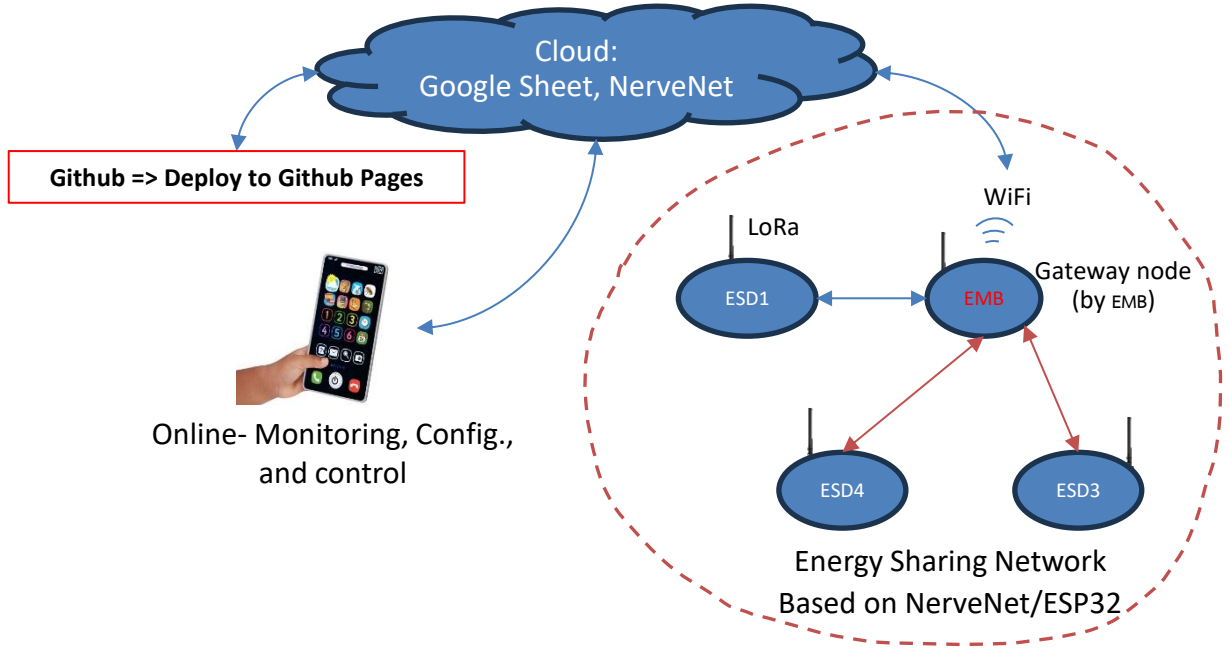
Remark: The Cambodian member joined the symposium and meeting online.

Project Activities: Proposed Smart Energy Sharing Network Concept



Power Diagram of the Energy Sharing and Management System

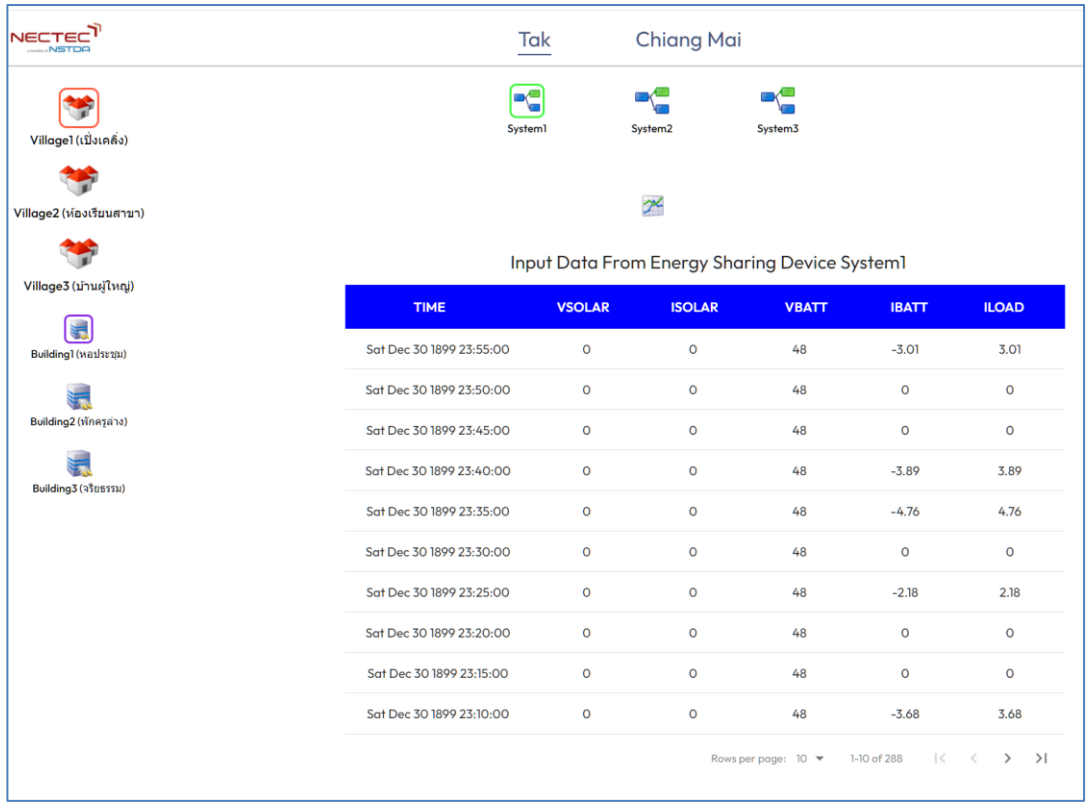
- Independent off-grid power systems: such as PV or pico hydro systems
- Energy Sharing Devices (ESDs): AC-DC and DC-DC types

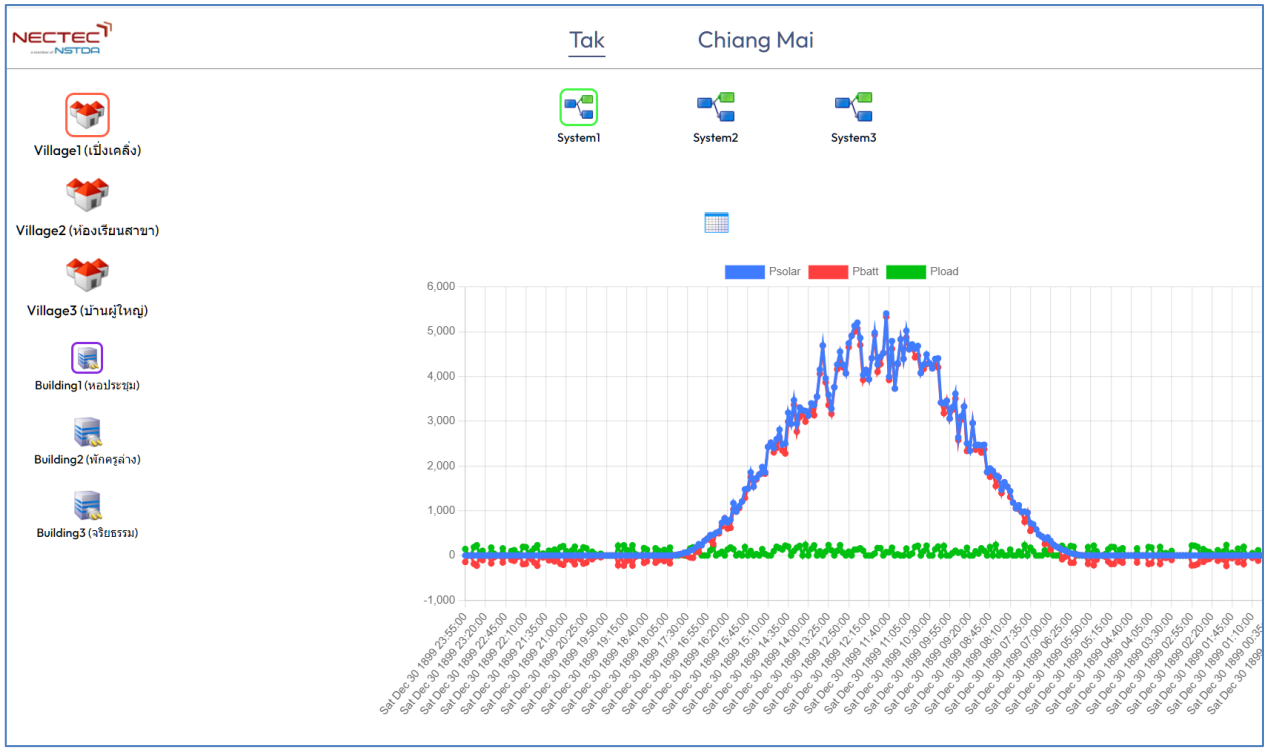


Communication Network of the Energy Sharing and Management System

- **ESDs with IoT Modules:**
  Each ESD is equipped with IoT modules to enable data communication and remote monitoring.
- **EMB:**
  The EMB monitors overall energy management, including power generation, storage, and load sides. It serves as the main controller for data collection and system optimization.
- **Communication Network:**
  Communication technologies such as LoRa or Wi-Fi will be selected based on local feasibility and availability to ensure reliable data transmission between systems.

An Example of GitHub Pages We Are Designing



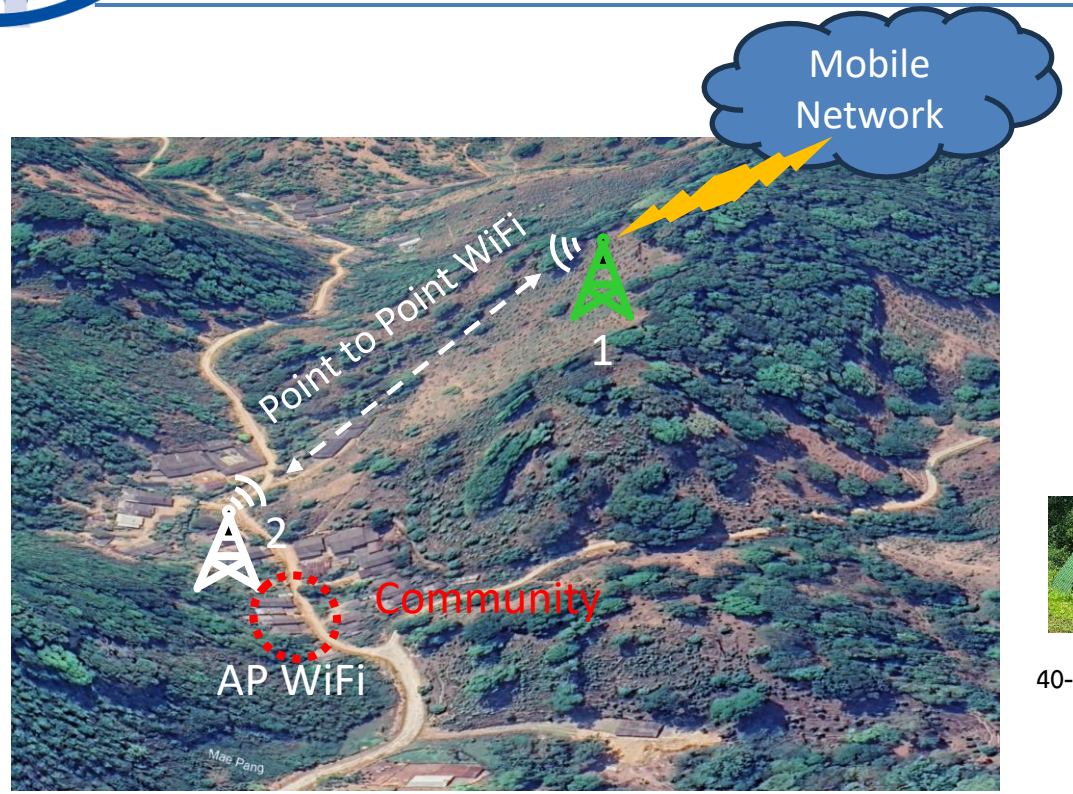


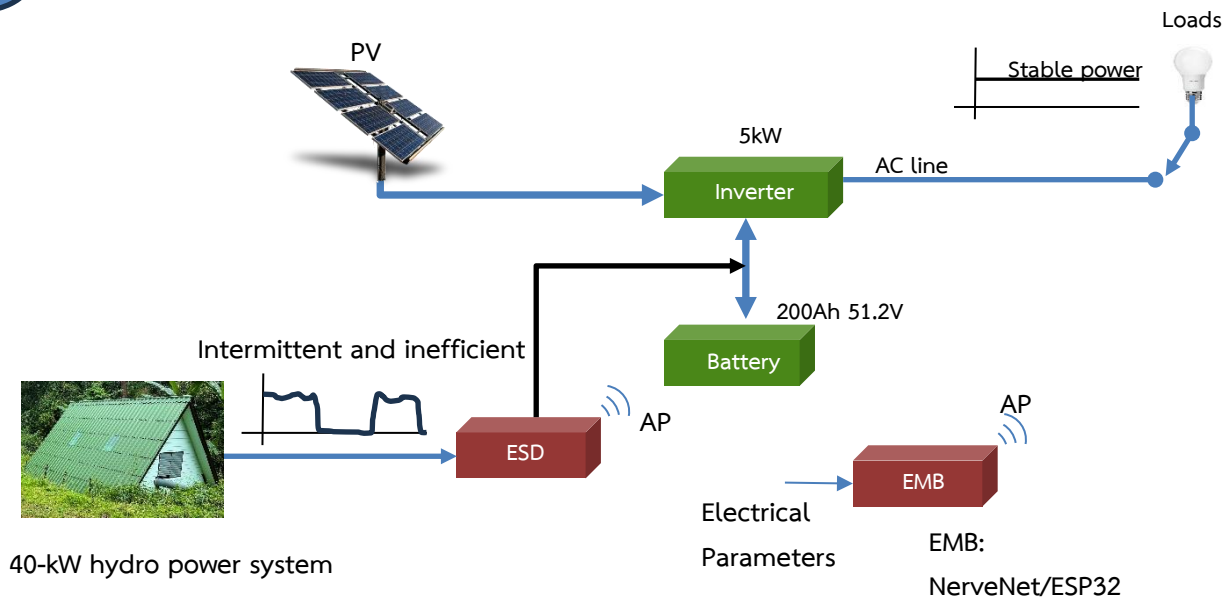
Project Activities: Field Visit to Ban Khun Pang Village on 30 Sep. 1 Oct 2025, Chiang Mail

Following up: Voice call to update information to re check about mobile signal coverage areas, feasibility to support the proposed system.

Objectives: 1. To check the information, including specifications and the current physical conditions of the existing energy sources and electrical loads in the targeted testing areas. **2. To discuss with the community leaders and end users** in the targeted areas to reconfirm their requirements, as well as the problems and limitations of the existing systems. **3. To observe the actual environment** at each targeted site in order to identify any obstacles for the design and installation of the developed Energy Sharing Devices and/or Wireless Communication System, ensuring the most suitable solution for each location.

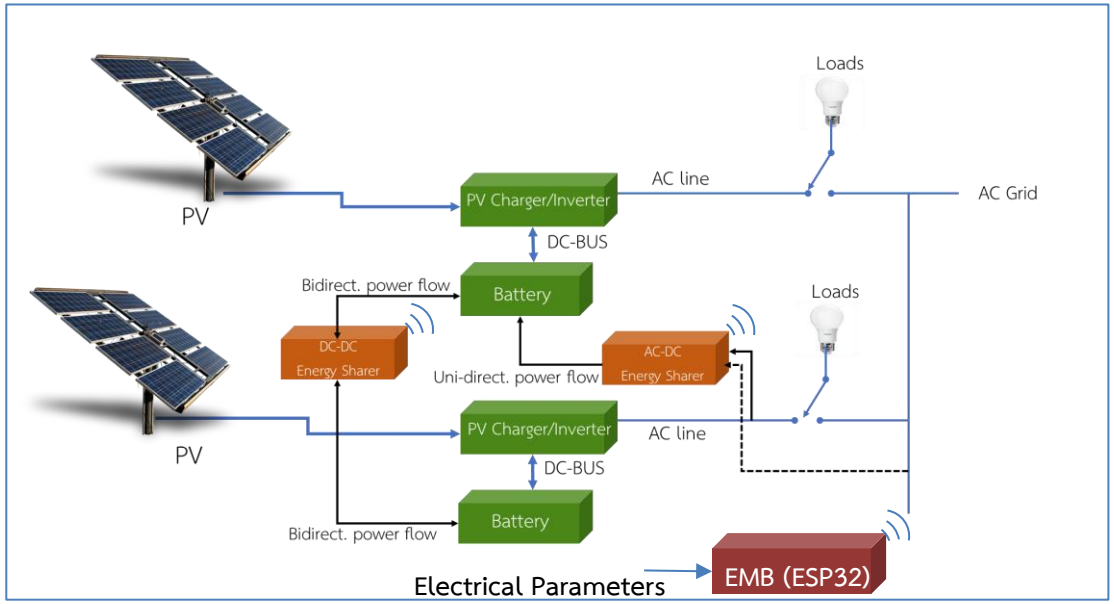
Future works: In Ban Khun Pang Village, Mae Pang Subdistrict





1. Mobile network coverage is available on the top of the mountain (location 1), where a SIM Card, router, and Wi-Fi bridge will be installed to transmit and receive internet signals.
2. Wi-Fi Bridges and WiFi routers are deployed at locations 2 to provide connectivity for EMBs and ESDs, and basic communication.
3. By the end of this year, we plan to install EMBs to collect electricity data, followed by the installation of the off-grid power system (inverter and battery) and ESDs.
4. As for the PV system, the community will take responsibility for it later, as they will need to propose a budget to their organization.

Project Activities at the Umphang Demo Site and Its Future Plans



Pictures from the previous project

By contacting corresponding persons in this community via voice call.

Update Status:

This is a demo site from a previous project, which contains offline versions of ESDs and EMBs. However, some PV systems were destroyed by lightning.

Project Activities at the Umphang Demo Site and Its Future Plans

Recently, local technicians have been restoring the system that was destroyed by lightning.




Solution and Future Plan:

- Install an inverter and a battery to restore the systems to normal operation.
- Conduct a site visit to install the new version of the EMB and upgrade the ESDs so they can connect to the internet (scheduled for around December 2025 – January 2026).

Project Activities: Budget Plan

1st Year (June 2025 – May 2026)		2nd Year (June 2026 – May 2027)	
June 2025 – November 2025	December 2025 – May 2026	June 2026 – November 2026	December 2026 – May 2027
Kick-off meeting, Field visits, write and submit papers	Develop mobile apps and IoT modules, attend conferences	Training, workshops, Write and submit papers	Field visits, attend conference

1st Year (June 2025 – May 2026)

Item	Description	Amount (USD)
Kick off meeting (Symposium and site visit) in Thailand	Travel expenses and accommodation fees	5,773
Meeting Progress Report	Travel expenses, accommodation fees, and training material	770
Field visits	In Thailand	2,417
Equipment for field installation	Total amount for all member countries	16,637
Internation conference	Attending an international conference for 4 members	11,054
ESD assembly	Electronic Parts and Prototype Assembly	3,349
	Total	**40,000**

2nd Year (June 2026 – May 2027)

Item	Description	Amount (USD)
Meeting/Workshop/Training	Travel expenses, accommodation fees, and training material	14,000
Field visits		8,000
Equipment for field installation	This includes system operations and maintenance	8,000
Internation conference and publication	Such as ECCE ASIA 2026, Japan	12,000
ESD assembly	Electronic Parts and Prototype Assembly	3,000
	Total	**40,000**

Project Progress and Expected Results:

The results have not been achieved yet, as this is only the beginning of the project. By mid-2026, we expect to obtain results from the demo sites, including:

1. Electrical profiles, such as power and energy data from both the production and load sides, the amount of energy saved, and the energy storage behavior of each system — for application in the energy-sharing algorithm.

2. Participation in international conferences.

Scientific Contribution: International Conference

We will attend the conference within the allowed timeframe and budget (from 1 December 2025 to 31 March 2026).

Conclusion: For The First 6 Months of Our Project

- **Scientific and Technological Activities**

We have organized a symposium, held meetings, and conducted site/field visits in Thailand.

- **Application (or System) Development**

We have designed energy-sharing networks and are currently installing and assessing feasibility at demonstration sites.

- **Experiments Including Field Testing**

These activities are scheduled to be conducted at a later stage.

- **Activities by Other Country Members**

Members participated in symposiums, meetings, and site/field visits in Thailand. Prototype installations in other countries will commence after obtaining initial results from the demonstration sites in Thailand. The partners are currently re-evaluating suitable locations for these demo sites.

Future works

Thailand

- Planning to submit and attend an international conference
- Construct ESDs prototypes
- Develop IoT module for ESDs, ESB, and online energy management
- Collaborate with RMUTL and community for long-term maintenance.
- Build an experiment system in NECTEC for testing
- Install equipment at two demo sites in Thailand
    1. Umphang, Tak: install inverter, battery, and EMBs. Modify ESDs
    2. Mae Pang Chiang Mai: Configure communication network, install ESDs and ESB, and deploy NerveNet system

Lao PDR

The main issue was the need for detailed technical discussions with power system engineers to determine a suitable design for an additional off-grid PV system enabling online energy sharing. The plan is to hold a focused meeting between the Thailand and Lao teams to finalize system design and installation approaches.

Myanmar

Challenges included ongoing energy shortages at USCY and the lack of detailed data on load profiles, production, and storage conditions. Equipment procurement was also constrained by regulations and currency instability. The next step is to organize a small meeting with Thai engineers to plan the installation of an Energy Management Box (EMB) for system data collection.

Future works

Cambodia

Finding a suitable demo site near Phnom Penh proved difficult due to limited cooperation from off-grid system owners. The action plan is to discuss with the Thailand team possible alternatives—such as demonstrating only IoT systems or selecting a closer site for easier maintenance. Any new system should verify EMB/ESD use and remain under CADT or a designated agency's responsibility after project completion.

NICT, Japan

Collaborate with ASEAN members for consulting and deploying the NerveNet to the suitable sites.

Thank you for your kind attention!