Asia-Pacific Economic Cooperation

Department of Alternative Energy Development and Efficiency
MINISTRY OF ENERGY

Small and Medium PV System Database in the APEC Region

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EGNRET 50
Honolulu, Hawaii, USA
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Objective/Outcomes

1. To compile, collate, analyze, report, disseminate profiling of small to medium scale PV system information in selected Grid Connected and Off-Grid PV systems.
   - **Compiled Data for 45 PV systems**
2. To initiate a strong institutional network for collecting, updating and maintaining the database for the PV systems in the APEC member economies.
   - **Indonesia, Malaysia, Thailand, United States & Viet Nam**
3. To share the information of small to medium scale PV system status in selected GC and OG PV systems in a common platform as an information cloud sharing environment.
   - **www.apecpv.cmru.ac.th**

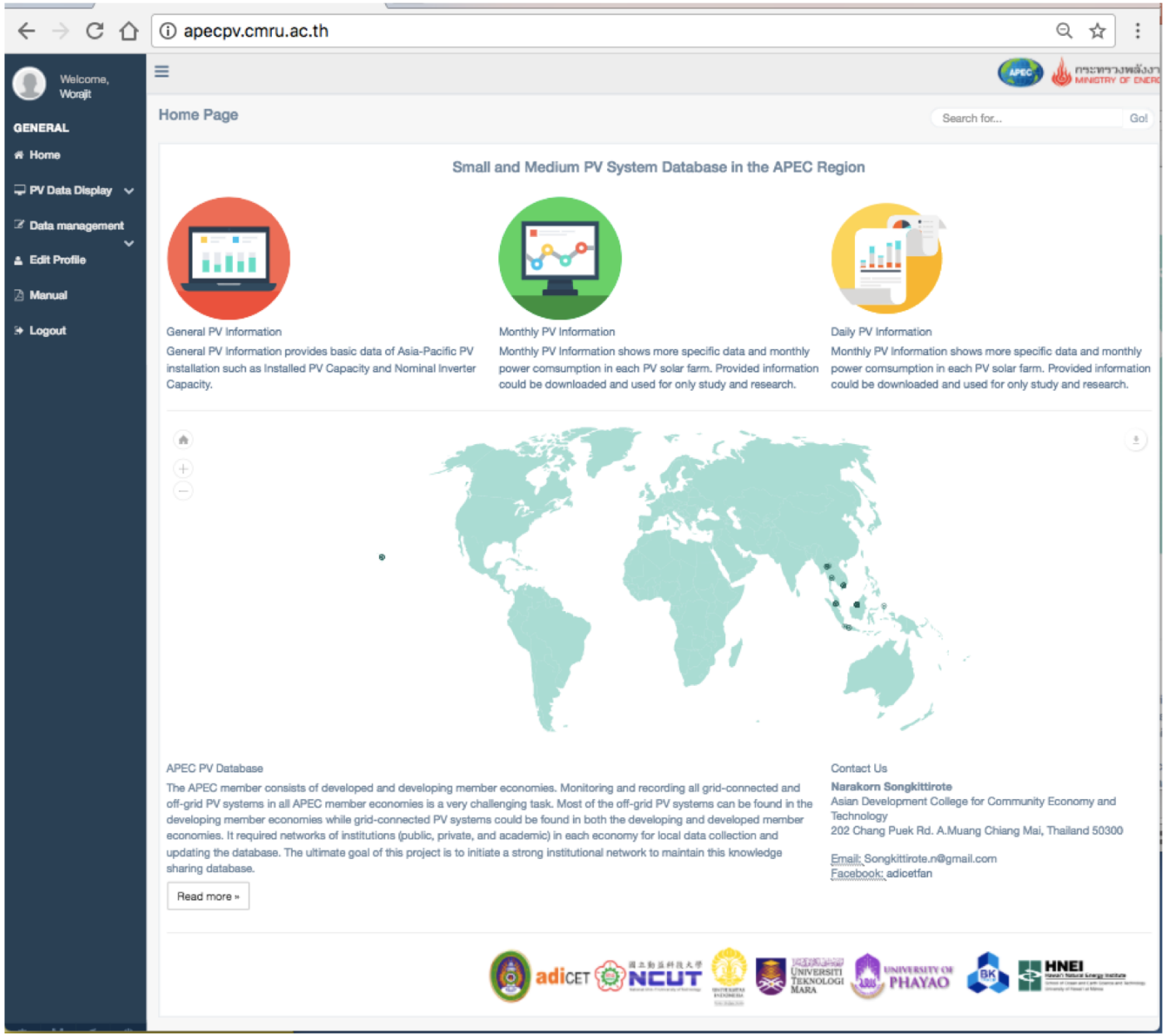
1st APEC Workshop on Small and Medium PV System Database in the APEC Region at Chiang Mai, Thailand

Develop structure of the database platform & create institutional network

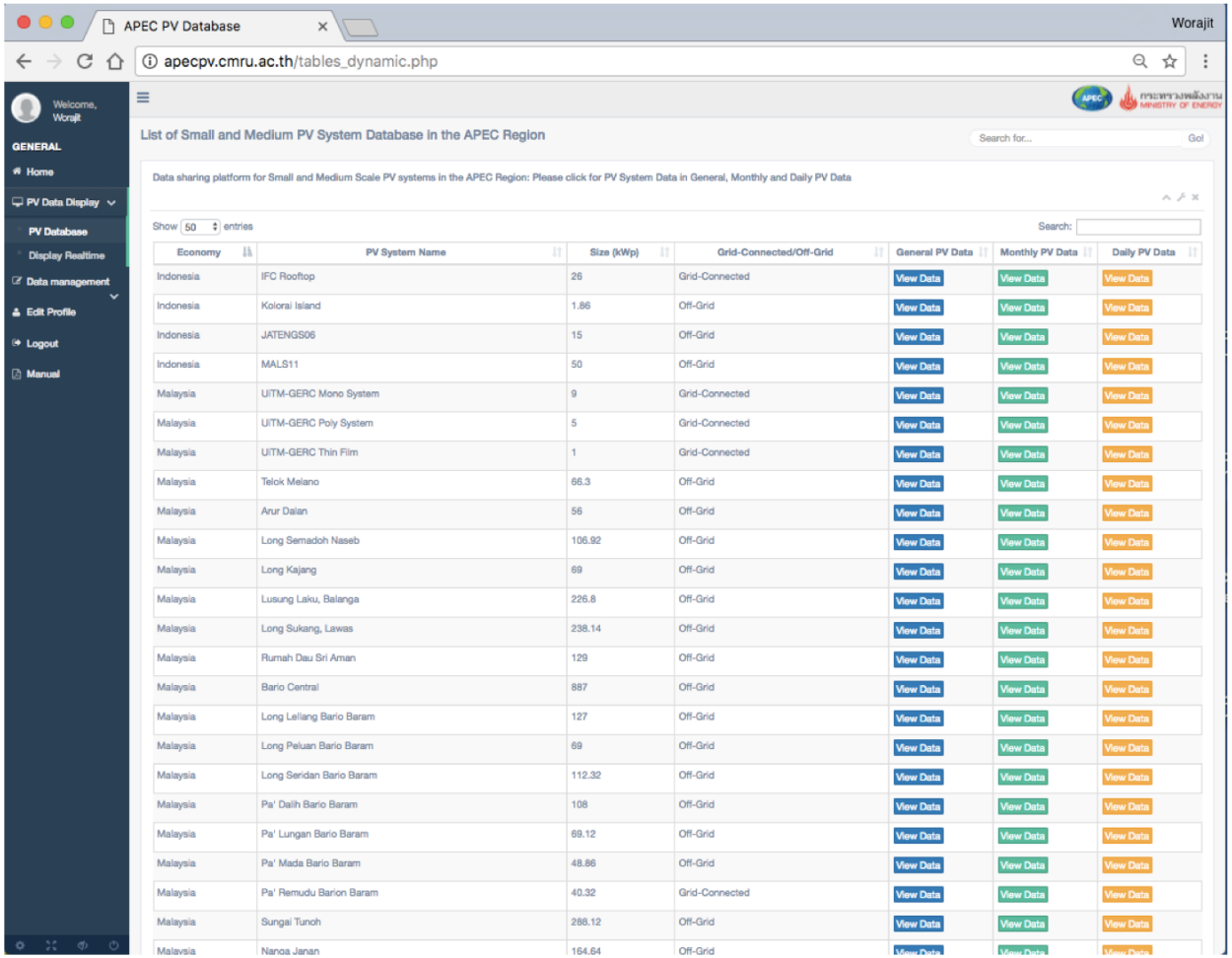
2nd APEC Workshop on Small and Medium PV System Database in the APEC Region at Tokyo, Japan

Experience of database usage and way forward with stakeholders, reporting and data analysis

PV Database Portal – www.apecpv.cmru.ac.th



List of PV System Page - 45 sites from 5 Economies

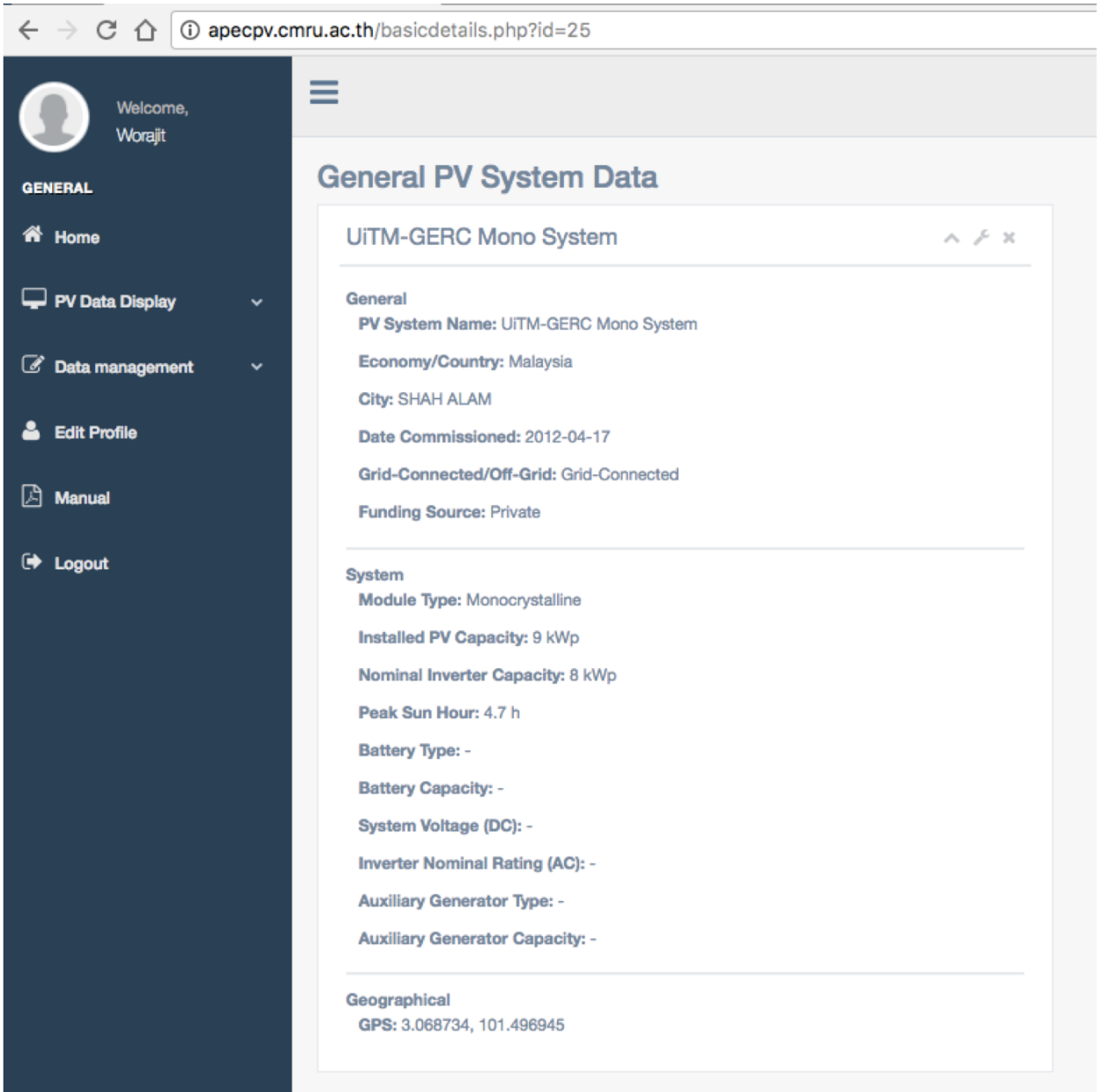


Economy	Number
Indonesia	5
Malaysia	23
Thailand	8
United States	4
Viet Nam	5
	45

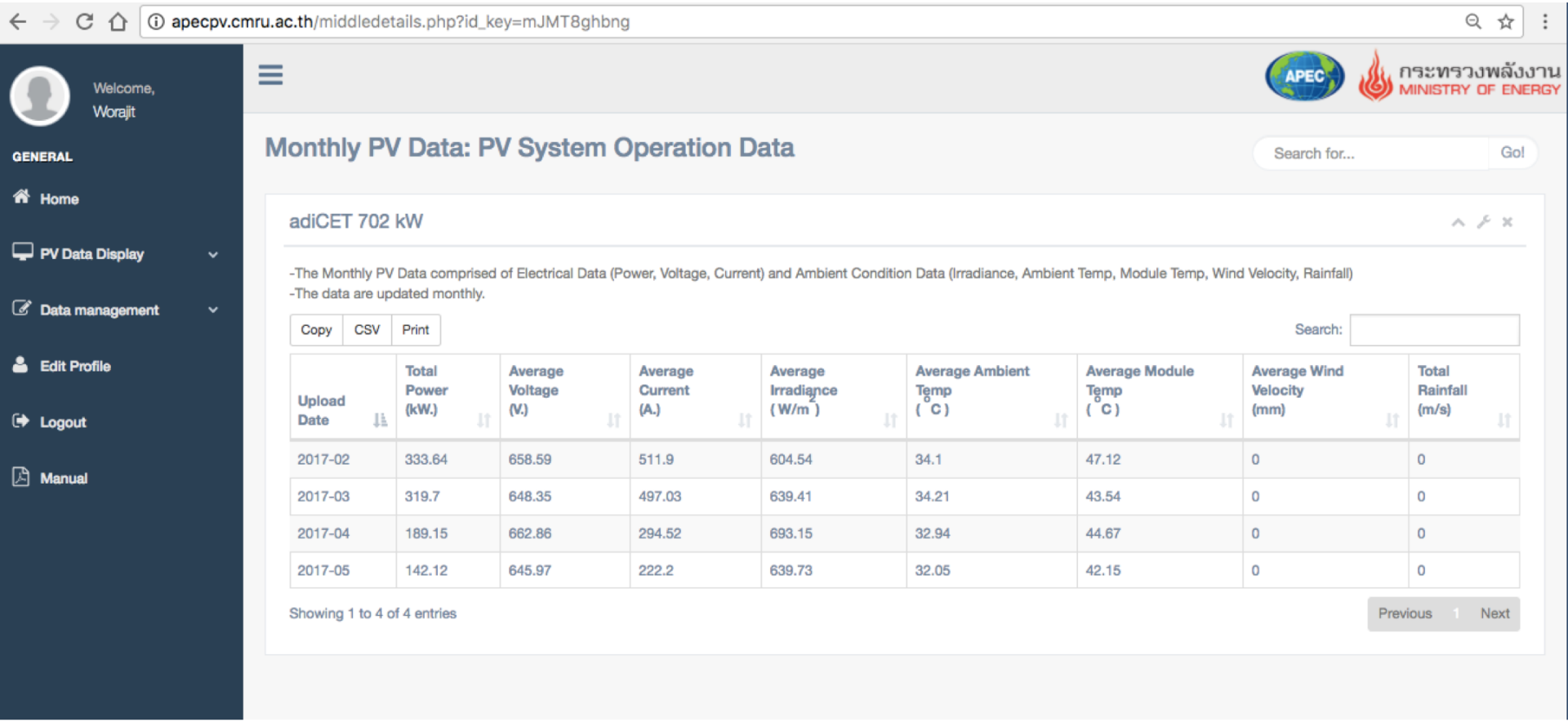
Type	
Grid-Connected	23
Off-Grid	22
	45

Size kWp	
1-100	31
100-200	7
200-1,000	7
	45

Data from Tier 1– General information of PV systems



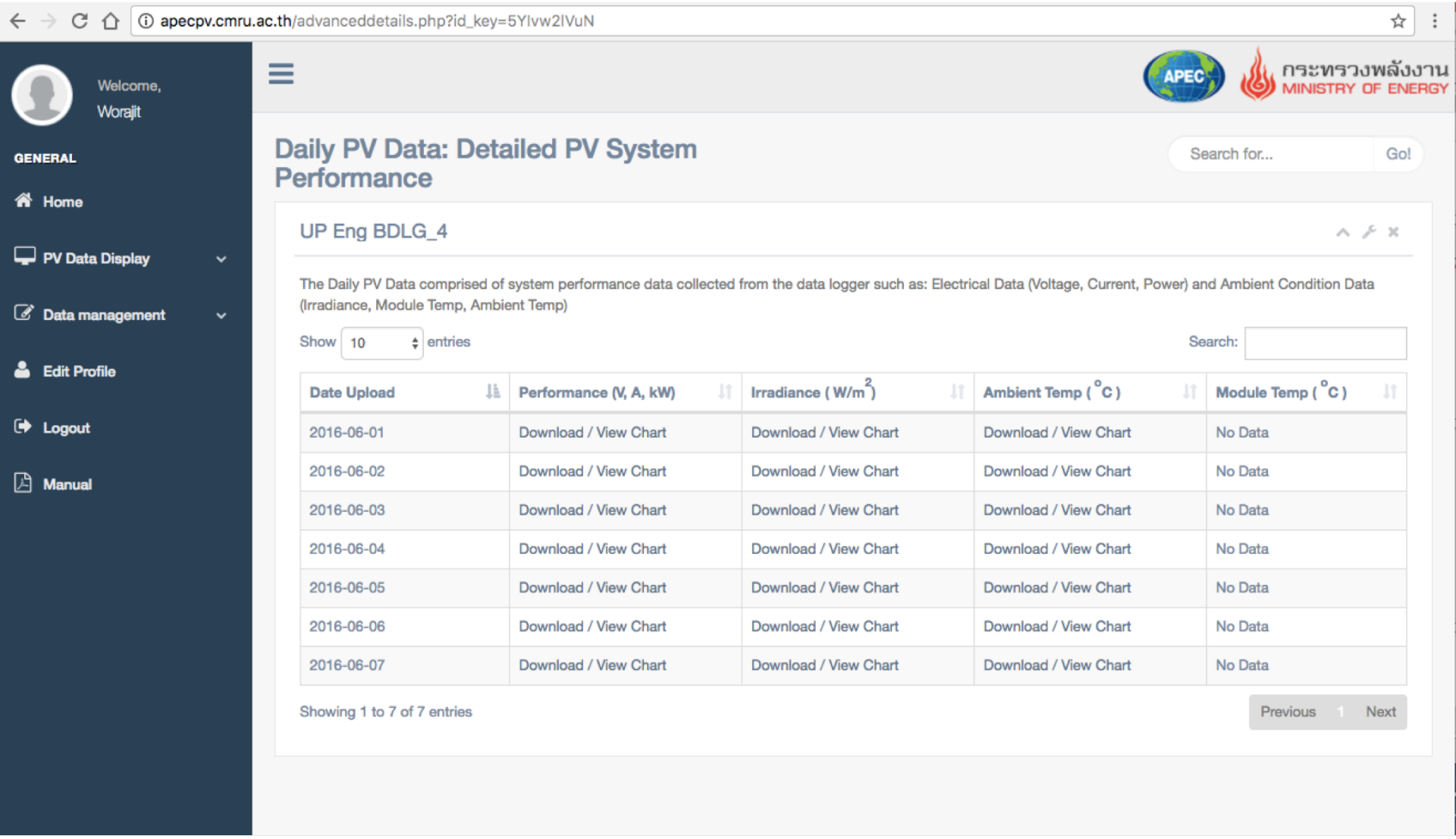
Data from Tier 2– Detailed system operation data (monthly)



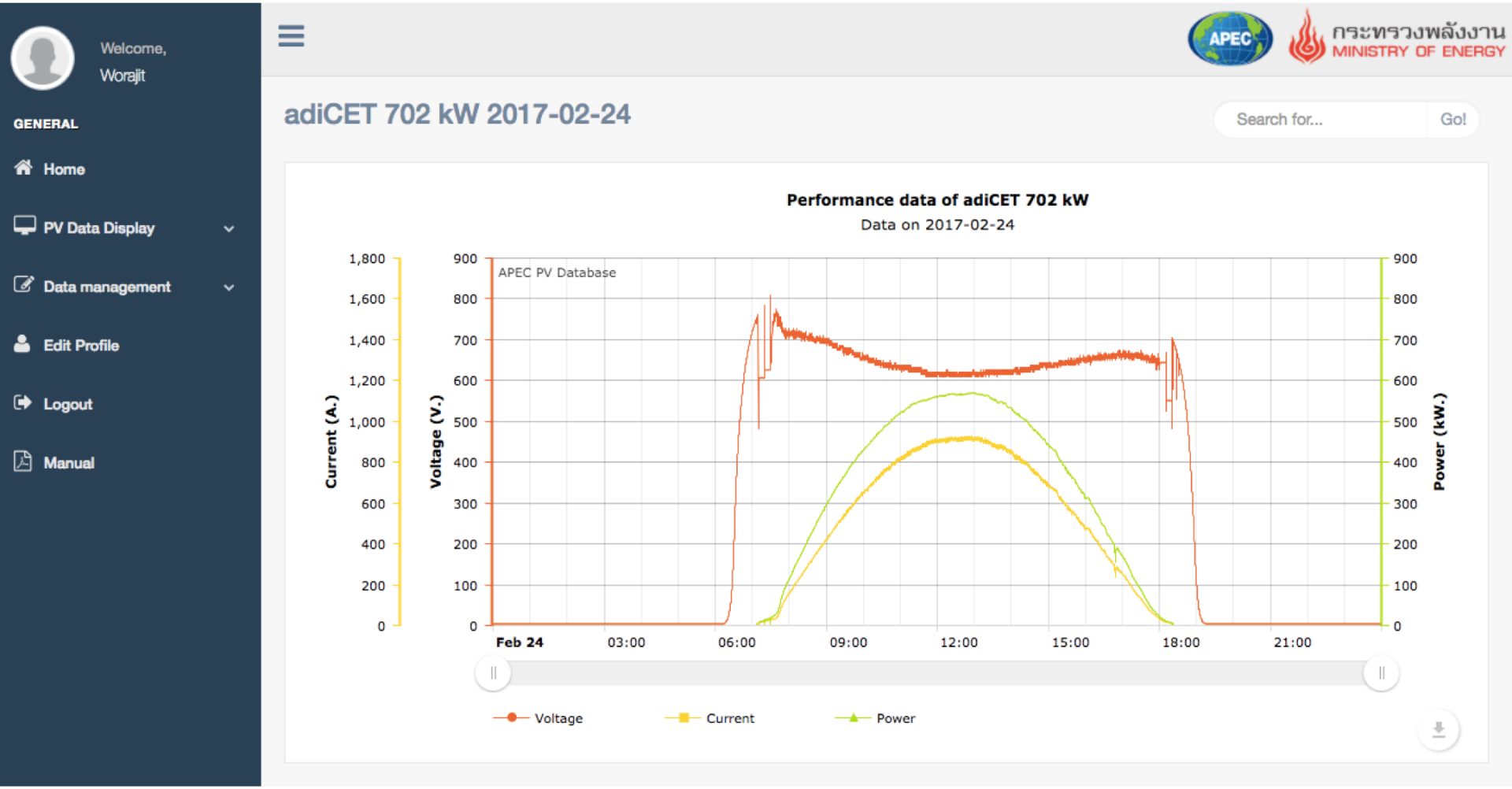
Upload Date	Total Power (kW.)	Average Voltage (V.)	Average Current (A.)	Average Irradiance (W/m^2)	Average Ambient Temp ($^\circ C$)	Average Module Temp ($^\circ C$)	Average Wind Velocity (mm)	Total Rainfall (m/s)
2017-02	333.64	658.59	511.9	604.54	34.1	47.12	0	0
2017-03	319.7	648.35	497.03	639.41	34.21	43.54	0	0
2017-04	189.15	662.86	294.52	693.15	32.94	44.67	0	0
2017-05	142.12	645.97	222.2	639.73	32.05	42.15	0	0

Data from Tier 3–

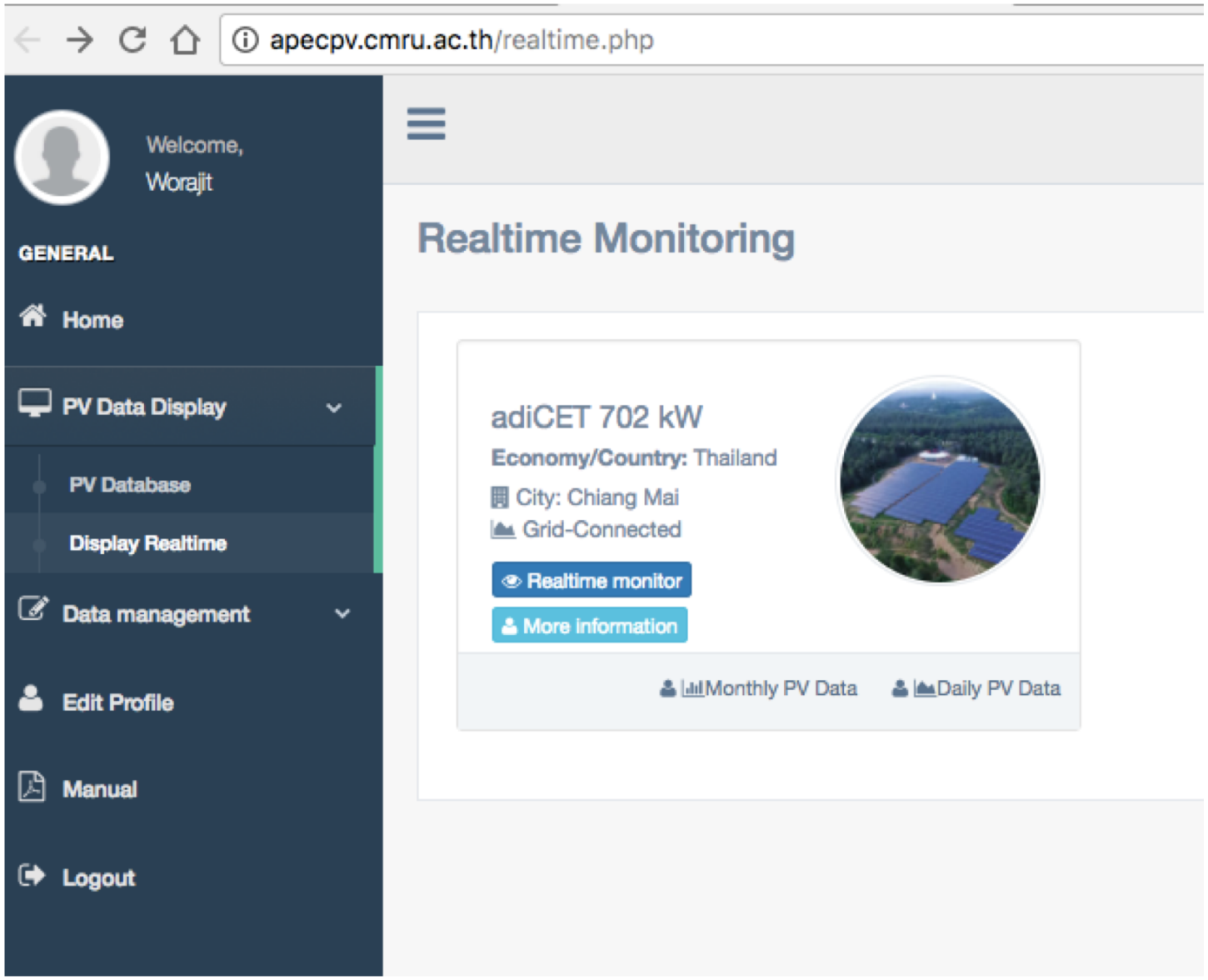
Detailed performance data: Download CSV file and Chart Display



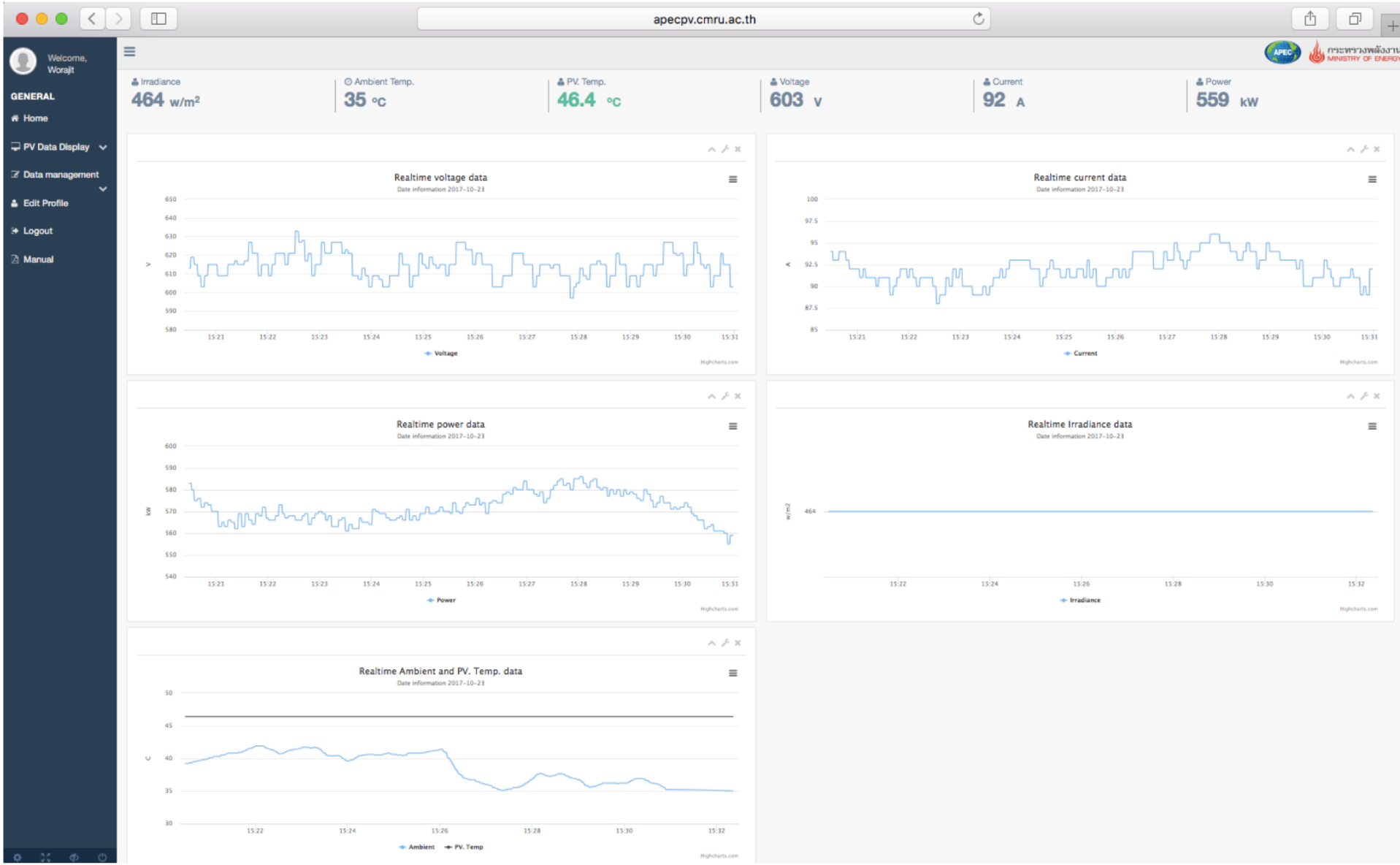
Data from Tier 3 – Chart Display



Real-time Data – Linked to PV monitoring system



Real-time Data – 702 kW, Chiang Mai, Thailand



http://apecpv.cmru.ac.th/monitor702.php

Data Compile and Collate

- Tier 1: General data – all sites provided data
  - Technology of PV, PV Size, Inverter Capacity, Location, Date of Commissioned
  - Some provide source of funding, some peak sun hour, most do not have battery and generator
- Tier 2: Monthly Data
  - Difficult for data input due to manual input – should make automatic average/sum from the Tier 3 data
- Tier 3: Detailed Performance Data
  - Data was provided from grid-connected sites with real time monitoring
  - Off grid do not have data for this tier
- Data were provided from academic/research institutions & affiliations
  - University of Teknologi Mara, Malaysia
  - University of Indonesia, Indonesia
  - Chiang Mai Rajabhat University, Thailand
  - University of Phayao, Thailand
  - NECTEC, NSTDA, Thailand
  - NHEI, University of Hawaii, United States
  - Ho Chi Minh City University of Technology, Viet Nam
- Difficult to share data from private or government entity

Database Experience Sharing

- Data Updating → Progress & Barriers
  - Need good data; should have some quality control protocol to determine good quality data
  - Standardize units, range of data
  - Time format: date, time zone
  - Easier data input, data sorting, monthly input split to daily
  - Size of file limitation
- Data →Useful for Stakeholders
  - Focused on Performance data (more detail)
    - Performance ratio, Energy Storage, Power Factor, kWh
  - Location Site Mapping/ Geographical View
  - PV structure
  - CO_2 Emission Computations
  - Energy consumption data
  - Algorithm for Forecasting
- Way forward
  - Use IEC 61724 and build upon IEA PVPS Task Force
  - Datasharing agreement
  - Data sharing should start with Universities with their own monitoring system

What's Next – Way forward?

- Using Existing Network – for data collection
  - Categorize 3 types of data:
    - General
    - National Monitoring System (Monthly/Yearly)
    - Detailed Monitoring System (1-15 min)
  - Grouping/Analyze data based on similar sites
  - Connect with other Related Association
    - Indonesia Green Building Association
    - Malaysia National Monitoring System

- Build upon the network with EGNRET Network, IEA database, APERC, CSR, Industry Associations, Government Monitoring

- Continuation of the project
  - Phase 1: Data Collection 5 Economies
  - Phase 2: Capacity Building – Discuss with APEC Sec with HNEI Support
  - Phase 3: Continue Data Collection for other Economies; Grouping; Analysis for 3 group of stakeholders → Data Utilization

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Acknowledgments

- Ministry of Energy, Thailand
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- University of Phayao
- Ho Chi Minh City University of Technology
- University of Indonesia
- National Chin-Yi University of Technology
- NECTEC, NSTDA
- NHEI, University of Hawaii
- Office of Naval Research, USA
- National Research Council of Thailand

Thank you – Kob Khun Ka

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