360 Energy Dashboard Report

Edward Dang

Tech Stack: React, JavaScript, Python, HTML, and CSS
Database: MongoDB
Tools: Node.js, Tailwind, WeatherAPI, and MapAPI, ETL Data pipeline

Sponsor: 360 Energy

Motivation: The goal of this project is to expand EV charging infrastructure with an affordable and technologically driven solution in Indonesia. This application along with the growing demand for use of renewable energy provides an opportunity to design and develop a solar tracking mount to store energy in a battery swapping station. This system would be connected to a centralized web application dashboard to monitor and control the battery swapping station and solar tracking system. Each location would have solar panels and a battery locker which serves as a charging station but instead of charging an EV bike, the user would swap out their dead battery with a fully charged one.

Overview:
The online dashboard system functions as a centralized platform for monitoring and controlling both the BSS and the solar panel setup. It provides real-time data visualizations, including energy intake, temperature, and wind speed, collected from the solar panel control monitor. This allows users to track environmental conditions and system performance effectively. Additionally, the dashboard offers control over the BSS, with features to lock and manage batteries using an intelligent sorting algorithm that optimizes charging time and battery swapping based on demand. This algorithm uses energy projections from the solar panels to ensure efficient energy management and maximize battery performance. By integrating monitoring, control, and optimization into a single interactive interface, the system enables seamless management of energy resources.

The dashboard was developed over nine months using React, Node.js, JavaScript, and TailwindCSS for the front end, with Python handling data processing. It incorporates Matplotlib for visualizations and BeautifulSoup for web scraping.

A MongoDB database stores essential station data, including:

- **Station Specifications**: Details on each BSS and its solar panel system.
- **Real-time Monitoring**: Live status updates for solar panels and battery swapping operations.
- **Historical Data**: Records of energy production, usage, and solar radiation trends.
- **Alerts & Maintenance**: Automated notifications for maintenance needs and operational issues.

This dashboard not only centralizes station management but also improves efficiency by automating data analysis and maintenance tracking.

Results:
Login Page

Registration Page

Home Page

PDAM Makassar

Project Name: PDAM Makassar
Location: Makassar
Timezone: Asia/Makassar
Current Time: 11:52 PM

360 Energy

MENU

- Dashboard
- Alerts
- Solar Panel Status
- Battery Station
- Maps
- Add New Project
- Admin View

OTHERS

- Settings
- Logout

Solar Panel
5.2 kWh

Current Weather
Makassar
moderate rain
Temperature: 24.03°C
Humidity: 100%

Notifications
Solar Panel Disconnected

Battery Swapping Station

battery-2	battery-4
battery-5	battery-7
battery-8	battery-10
battery-11	

History Swaps
91

Energy Prediction
1733 kW
19/02/2025

Alerts Page

360 Energy

MENU

- Dashboard
- Alerts
- Solar Panel Status
- Battery Station
- Maps
- Add New Project
- Admin View

OTHERS

- Settings
- Logout

Alerts						
Alert Type	**Severity**	**Location**	**Date**	**Description**		**Actions**
Solar Panel	High	Jakrata	1-1-24	Some really long message to show what would happen if it overflows		Delete

+ Add Alert

Add New Alert

Add New Alert

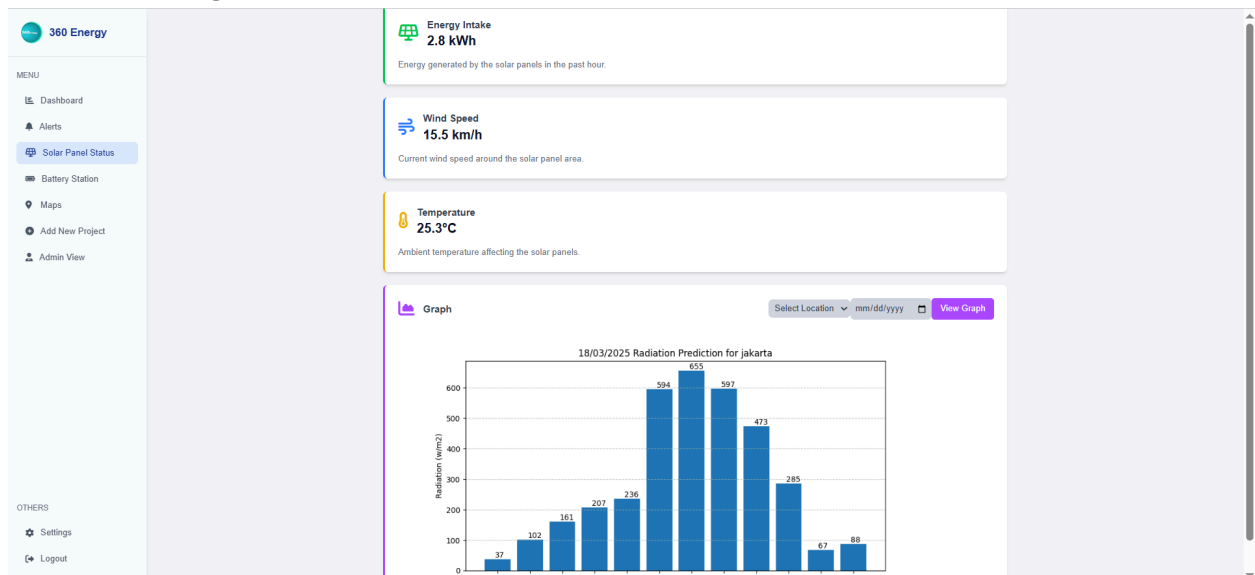Select Alert Type ⌄

Select Severity ⌄

Select Location ⌄

mm/dd/yyyy 📅

Description

Add (+)

Cancel

Solar Panel Page

360 Energy

MENU

- Dashboard
- Alerts
- Solar Panel Status
- Battery Station
- Maps
- Add New Project
- Admin View

OTHERS

- Settings
- Logout

Energy Intake
2.8 kWh
Energy generated by the solar panels in the past hour.

Wind Speed
15.5 km/h
Current wind speed around the solar panel area.

Temperature
25.3°C
Ambient temperature affecting the solar panels.

Graph

Select Location ⌄   mm/dd/yyyy 📅   View Graph

18/03/2025 Radiation Prediction for jakarta

37, 102, 161, 207, 236, 594, 655, 597, 473, 285, 67, 88

Radiation (w/m2)

Battery Station Page

360 Energy

MENU
- Dashboard
- Alerts
- Solar Panel Status
- Battery Station
- Maps
- Add New Project
- Admin View

OTHERS
- Settings
- Logout

Select a Project:
PDAM Makassar

Project Name: PDAM Makassar
Location: Makassar
Timezone: Asia/Makassar
Current Time: 11:56 PM

Current Power Source   Electrical Grid

📅 **Charging Schedule**

battery-1:	Start: 2025-02-28T13:00:00.000Z, End: 2025-02-28T15:00:00.000Z
battery-2:	Start: 2025-02-28T15:00:00.000Z, End: 2025-02-28T17:00:00.000Z
battery-3:	Start: 2025-02-28T17:00:00.000Z, End: 2025-02-28T17:00:00.000Z
battery-4:	Start: 2025-02-28T06:00:00.000Z, End: 2025-02-28T07:00:00.000Z
battery-5:	Start: 2025-02-28T07:00:00.000Z, End: 2025-02-28T09:00:00.000Z
battery-6:	Start: 2025-02-28T09:00:00.000Z, End: 2025-02-28T11:00:00.000Z

🕐 **Charging Times**

↻ Allocate Optimal Times

⊗ Reset Charging Schedule

Select Battery:
Choose a battery...

Start Time:
--:-- --

End Time:
--:-- --

🕐 Schedule Charging

⟨·⟩ **Battery Swapping Station**

⊗ Swaps: 13 Health: 61%	✓ Swaps: 7 Health: 93%	⊗ Swaps: 11 Health: 66%
✓ Swaps: 6 Health: 61%	✓ Swaps: 16 Health: 37%	⊗ Swaps: 2 Health: 67%
✓ Swaps: 10 Health: 82%	✓ Swaps: 1 Health: 82%	⊗ Swaps: 3 Health: 78%
✓ Swaps: 9 Health: 35%	✓ Swaps: 5 Health: 66%	⊗ Swaps: 3 Health: 97%

Add New Project Page

360 Energy

MENU
- Dashboard
- Alerts
- Solar Panel Status
- Battery Station
- Maps
- Add New Project
- Admin View

OTHERS
- Settings
- Logout

Add New Project

Project Name
Enter Project Name

Project Location
Enter Project Location

Latitude
Enter Latitude

Longitude
Enter Latitude

Project Partner
Enter Project Partner

Partner Type
Individual

Project System
Meissa Microgrid

Project Type
Direct Purchase

Solar Panel Size (m²)
Enter size in meters squared

Solar Panel Efficiency (0.2 = 20%)
Enter efficiency in decimal

Battery Size (kWh)
Enter battery size in kWh

+ Add New Project

Energy Predction Calculator

Enter Solar Panel Count (ex. 10 = 10 panels)

Enter Solar Panel Size in m² (ex. 10 = 10 m²)

Enter efficiency in decimal (ex. 0.2 = 20%)

Enter Sunlight Hours (ex. 5 = 5 hours)

Enter Solar Irradiance in W/m² (ex. 1000 = 1000 W/m²)

Enter the number of battery locker slots (ex. 10 = 10 slots)

Enter battery size in kWh (ex. 10 = 10 kWh)
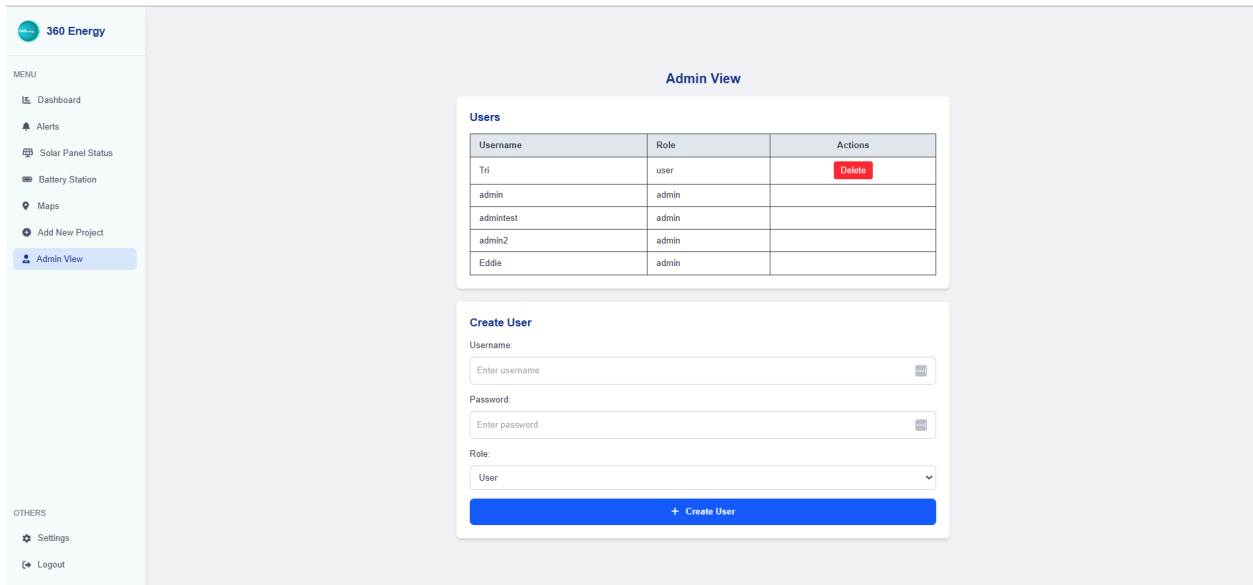
🖩 Calculate

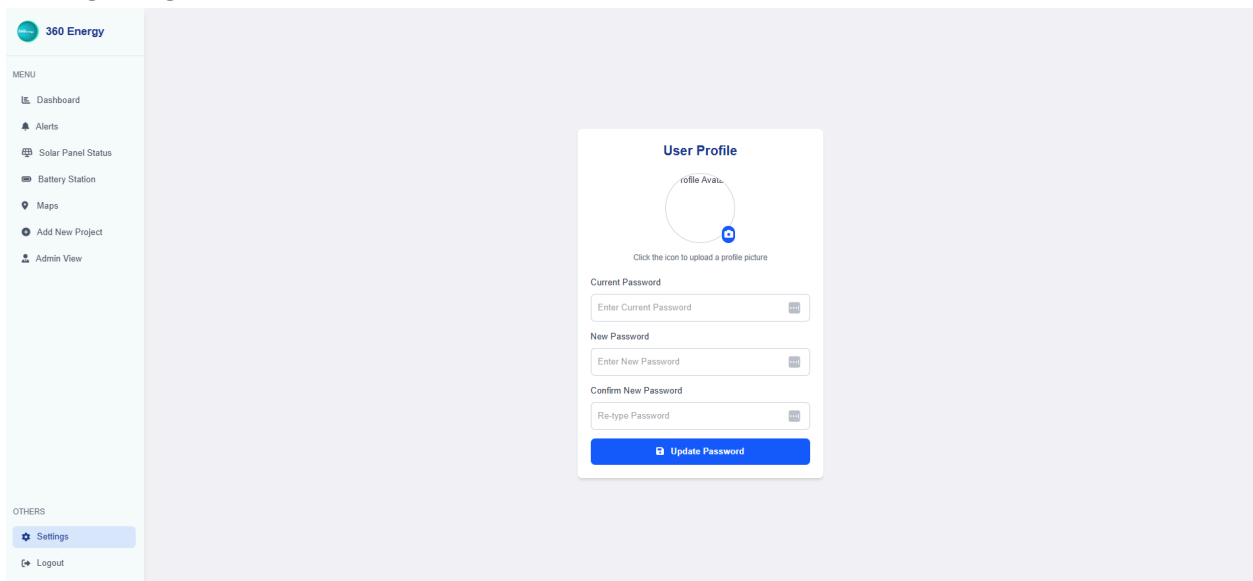### Energy Prediction

Esitmated Solar Energy Production
0 kWh

Esitmated Total Energy Size
0 kWh

Admin Page

Settings Page

Regular User vs Admin difference

360 Energy

MENU

📊 Dashboard

🔔 Alerts

⊞ Solar Panel Status

▭ Battery Station

📍 Maps

⊕ Add New Project

OTHERS

⚙ Settings

↪ Logout

360 Energy

MENU

📊 Dashboard

🔔 Alerts

⊞ Solar Panel Status

▭ Battery Station

📍 Maps

⊕ Add New Project

👤 Admin View

OTHERS

⚙ Settings

↪ Logout