



Solar Photovoltaic Portfolio Centralization and Optimization

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ABSTRACT

The City of Calgary manages a substantial solar portfolio of 6.2MW across 20 locations, which presents challenges in data consolidation and maintenance. This project is dedicated to enhancing solar data management by centralizing information into a singular and efficient platform.

This project is a unified dashboard seamlessly aggregating production data from platforms including Enphase, SolarEdge, and Fronius. Recognizing the absence of such a centralized system, the team has developed a robust and scalable dashboard. This platform is designed to regularly incorporate new data updates and is built to effortlessly accommodate new sites for years to come.

The centralized dashboard streamlines data and also introduces real-time notifications, ensuring proactive corrective actions. Beyond addressing current operational challenges, this project aims to streamline the work of stakeholders by providing an efficient dashboard. This contributes significantly to the modernization of Calgary's solar infrastructure, marking a pivotal step toward increased efficiency and sustainability in solar management.

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MOTIVATION

The City of Calgary's solar photovoltaic portfolio has grown substantially, posing challenges in monitoring, optimizing, and maintaining diverse installations. The solar capacity is around 6.2MW over 20 locations, monitored through 3 separate inverter dashboard platforms, leading to inefficiencies. Our objective is to develop a unified, user-friendly dashboard to consolidate and streamline performance data and system insights for the City of Calgary. Our team has created a centralized platform tailored to Calgary's needs, improving monitoring efficiency and serving as a hub for important information. Our main goals include consolidating photovoltaic production data for easier tracking by City staff and implementing automated alerts for maintenance. The final product of this project is a user-friendly tool enhancing management and proactive maintenance of Calgary's solar power systems.

DESIGN

The design of our dashboard was inspired by the requirements requested by The City of Calgary. The whole design aspect of the dashboard includes various interactive visuals made up of historical and current data. Our team has developed a user-friendly interactive tool designed to streamline data access for City staff. This tool brings all necessary data together in one centralized location, enhanced with visual elements for easier interpretation and analysis. The dashboard efficiently manages data from various manufacturers and their sites, providing a comprehensive view in a single platform.

We've organized our data into four tabs—historical, live, metrics, and alerts—each serving a distinct purpose in providing insights into the raw data. These tabs are designed to facilitate easier analysis for our sponsor, simplifying their workflow. Additionally, users have the option to download data in CSV format for each timeframe, granting access to the raw data whenever needed. Notably, we've achieved an ideal timestamp of 15-minute intervals for data from two out of three manufacturers.

We've incorporated various interactive settings to enhance user experience, including features such as zooming in and out of graphs, selecting specific date ranges, choosing manufacturers, and selecting sites, among others.

To create our dashboard, we utilized React JS, a user-friendly library specifically designed for building interactive and dynamic user interfaces for web applications which is built on JavaScript. This was pivotal in our project's development, ensuring the development of a seamless and efficient user interface.

SOLAR DASHBOARD FUNCTIONALITY OVERVIEW

Our dashboard is designed to provide in-depth insights into solar site performance across multiple manufacturers. Here's what you can expect:

Date Range Selection: Customize your analysis by selecting specific date ranges for data comparison.

Data Visualization: Explore solar site data effortlessly with intuitive plots, facilitating seamless interpretation and thorough analysis.

Downloadable Spreadsheets: Access production metrics in kWh for each site with the option to download data in Excel or CSV formats.

Metrics Tab: Access production metrics for each site, including kWh data for various timeframes.

Alert Notifications: Stay informed with real-time alerts for site downtime or issues, ensuring proactive management.

Daily Data Updates: Our dashboard refreshes daily, providing up-to-date information for every site without delay.

Seamless Integration: Through Python scripts linked to inverter APIs, we seamlessly gather critical data from various sources.

Scalability and Customizability: We've ensured scalability for future data volume increases and offer customizable dashboard features to tailor your visualization needs.

