

IoT-enabled Grid Monitoring and Management System for EV Chargers in Residential Applications

Project Group 08

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Outline

- 1 Introduction
- 2 Objectives
- 3 Literature Review
- 4 Methodology
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- 6 Work Plan
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- The number of electric vehicle (EV) users in India is rapidly increasing.
- This surge in EV users can significantly impact the power distribution grid, leading to increased load, grid congestion, voltage drops, and reduced power quality.
- For our project, we plan to focus on developing an Enhanced System for addressing this potential issue.

Objectives

- Develop a system for real time data collection and analysis.
- Upgrade existing digital meters with an additional module.
- Create a backend server for data management.

Literature Review

Sl. No	Title	Details of publication	Year	Remarks
1	I. Varadarajan, T. Babu, P. M and P. Nivedhitha, "IoT-Based Energy Meter Analysis Using Real-Time Data Monitoring,"	2022 1st International Conference on Computational Science and Technology (ICCST), CHENNAI, India, 2022, pp. 138-141,	2022	Proposes a system for real-Time data monitoring for energy meters
2	Srivatchan NS, Rangarajan P. A novel low-cost smart energy meter based on IoT for developing countries' microgrids.	Concurrency Computat Pract Exper. 2018;e5042	2018	The operating principle of the transformerless seven-level inverter is analyzed and detailed
3	N. A. Hidayatullah, A. C. Kurniawan, and A. Kalam, "Power transmission and distribution monitoring using Internet of Things (IoT) for smart grid,"	IOP Conf. Ser., Mater. Sci. Eng., vol. 384, no. 1, 2018, Art. no. 012039,	2018	Introduces fundamental Internet of Things architecture for power transmission and distribution monitoring system.

Methodology

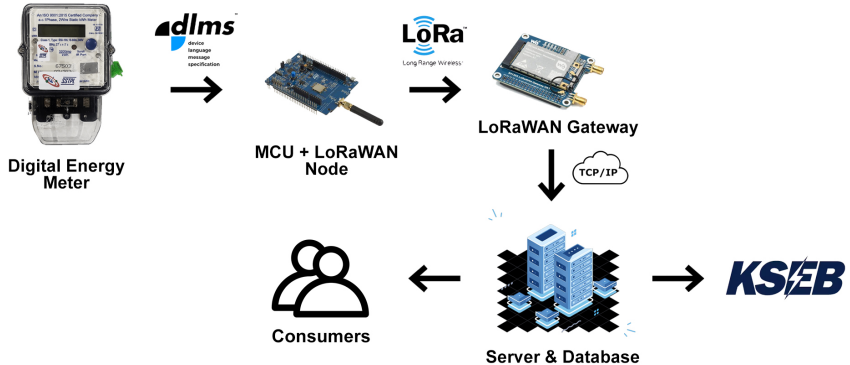


Figure: Proposed Model

Components

Sl. No	Component	Cost
1	STM32F103C Microcontroller	₹649.00
2	SX1278 LoRa Module x2	₹800.00
3	Infrared Sensor	₹200.00
4	3.7V Li-ion Battery	₹500.00
5	Raspberry Pi Zero	₹1,649.00
	Total Cost	₹3798.00

Table: Component List

Work Plan

Sl. No	Task	Period	Status
1	Literature review	Aug-Sept	Ongoing
2	Hardware Procurement	Sept	To be done
3	Design and implement a prototype to collect energy meter data	Oct	To be done
4	Design and implement a LoRaWAN gateway	Oct-Nov	To be done
5	Create a backend server for data collection and analysis	Jan-Feb	To be done

Table: Project Work Plan

- An IoT Based module for real time data acquisition from existing energy meters.
- A data analysis and management system for monitoring EV charging usage.

References

- [1] G. A. Abiassaf and A. A. Arkadan, "Impact of EV Charging, Charging Speed, and Strategy on the Distribution Grid: A Case Study," in IEEE Journal of Emerging and Selected Topics in Industrial Electronics, vol. 5, no. 2, pp. 531-542, April 2024, doi: 10.1109/JESTIE.2024.3352505.
- [2] I. Varadarajan, T. Babu, P. M and P. Nivedhitha, "IoT-Based Energy Meter Analysis Using Real-Time Data Monitoring," 2022 1st International Conference on Computational Science and Technology (ICCST), CHENNAI, India, 2022, pp. 138-141, doi: 10.1109/ICCST55948.2022.10040444.
- [3] Srivatchan NS, Rangarajan P. A novel low-cost smart energy meter based on IoT for developing countries' micro grids. Concurrency Computat Pract Exper. 2018;e5042. <https://doi.org/10.1002/cpe.5042>

THANK YOU