

Project Design Phase-II

Solution Requirement (Functional & Non-functional)

Date	03 November 2025
Team ID	NM2025TMID01374
Project Name	To Supply Leftover Food to Poor
Maximum Marks	4 Marks

Objective:

To design and implement a system that collects leftover food, processes it into biogas, and generates power efficiently while providing real-time monitoring and analytics.

Functional Requirements:

ID	Functional Requirement	Description / Expected Behavior
FR1	Smart Waste Collection	The system shall provide smart bins equipped with sensors to detect the quantity and type of food waste.
FR2	Data Transmission	Bins shall automatically send fill-level and location data to the central server for monitoring and scheduling collection.
FR3	Waste Segregation Process	The system shall separate biodegradable food waste from non-organic materials before processing.
FR4	Anaerobic Digestion Module	The digester shall convert organic food waste into biogas through controlled anaerobic bacterial processes.
FR5	Biogas Storage & Distribution	The produced biogas shall be stored safely and directed to the power generation module.
FR6	Power Generation	The system shall generate electricity from the biogas using a generator and supply it to the grid or local network.
FR7	Real-Time Monitoring Dashboard	The IoT dashboard shall display data such as waste input, methane yield, temperature, pressure, and energy output.

FR8	Data Analytics & Reporting	The system shall analyze daily, weekly, and monthly performance and provide environmental impact reports (e.g., CO ₂ saved).
FR9	User Mobile App	Users shall be able to view waste contribution, energy generated, and sustainability points.
FR10	Alerts & Notifications	The system shall send alerts for bin overfill, maintenance, or abnormal performance.
FR11	Administrative Control	Admins shall manage bin locations, schedules, and user access through a secure portal.
FR12	Integration with Energy Grid	The generated electricity shall integrate with the local grid or community microgrid.

Non-Functional Requirements:

Category	Requirement
Performance	The system shall process at least 500 kg of food waste per day and generate proportional energy output.
Reliability	The system shall maintain 95% uptime for continuous monitoring and power generation.
Scalability	The architecture shall allow adding new collection bins and digesters without major system redesign.
Security	All data (user, sensor, and energy) shall be encrypted in transit and at rest using standard protocols (e.g., AES-256).
Usability	The dashboard and app shall have intuitive interfaces accessible to both technical and non-technical users.
Maintainability	The system software and hardware components shall support modular updates without downtime.
Availability	Cloud servers and IoT gateways shall ensure 24x7 availability with automatic failover.
Data Accuracy	Sensor data readings (weight, fill level, methane output) shall have at least ±3% accuracy .
Compliance	The system shall comply with environmental and safety standards (ISO 14001, renewable energy guidelines).