GFIS EcoTwin

Explainable bioenergy plant monitoring and digital-twin prototype

College submission and sponsorship dossier

Smart India Hackathon 2026 candidate package

PREPARED FOR

Shri Siddheshwar Women's Polytechnic, Solapur

Computer Engineering and Information Technology student team

College guide: Prof. N. K. Mane, HOD, Computer Engineering

6 students | Working web MVP | 14-day build plan | Industry mentored

Submission proposition

A software prototype for renewable bioenergy management that accepts research or bench telemetry, preserves time and units, explains abnormal anaerobic-digestion conditions, replays research records and presents the result through a responsive plant-twin interface.

WORKING REVIEW ENVIRONMENT

gfis.energy/sih/

MVP · team · workflow · technical readers · editable presentation

CHATAKE INNOWORKS
PRIVATE LIMITED · INDUSTRY SPONSOR AND TECHNICAL MENTOR

Issue date · 9 September 2026

PROJECT PROPOSITION

A visible input-to-advisory engineering path

The project makes monitoring decisions inspectable: every advisory must show its observation, rule or model, evidence coverage and recommended next check.

1 · SENSE

ESP32 gateway or safe electrical emulator sends timestamped temperature, pressure, pH and gas-flow fields.

2 · CHECK

Schema, range, sequence and missing-packet tests reject malformed telemetry before interpretation.

3 · EXPLAIN

Measured replay and synthetic stress scenarios remain visually distinct. Alerts state cause, coverage and action.

4 · RECORD

The event is acknowledged, exported and replayed so a second student can reproduce the result.

What students submit

Deliverable	Evidence expected
Sensor gateway	Packet schema, wiring/emulator note, timestamp and loss tests
Explainable event engine	Trigger, reason, affected observation, action and acknowledgement
Plant-twin interface	Sensor hotspot, visible state change, mobile operation and fallback
Model evidence	Chronological persistence baseline; no shuffled time-series claim
Reproducibility pack	Source inventory, contribution log, checks, recording and offline copy

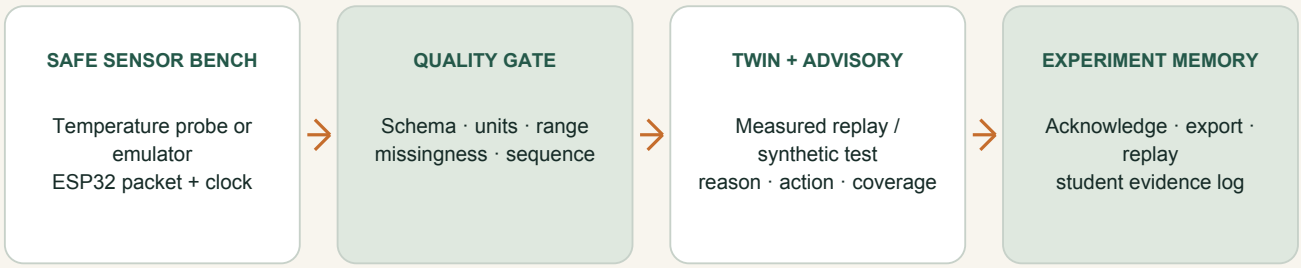
SIH ALIGNMENT CONTROL

Selected statement: SIH26200, AICTE / MIC Student Innovation, Software, Renewable / Sustainable Energy. GFIS supports renewable bioenergy generation and management through plant intelligence. The college SPOC confirms eligibility, nomination and the current submission template.

WORKING SYSTEM

One pipeline, two evidence classes

The web MVP is already reachable. The student prototype adds a safe physical gateway and verification layer without presenting synthetic trajectories as plant observations.



Measured research replay

Public RBL/SBL histories are loaded through the existing same-origin GFIS API. Missing measurements remain missing. The source and licence are exposed with SHA-256 checksums.

SOURCE

Núñez / G-AQUA, UPM · Mendeley Data V1 · DOI 10.17632/jpnjmzp6bj.1 · CC BY 4.0

Synthetic 48-hour exercise

Normal, heating, overfeed and sensor-loss trajectories are teaching stress tests at 15-minute intervals. They drive the same scene and event workflow, but they are never labelled as plant measurements.

BOUNDARY

Schematic twin - not CFD, calibrated ADM1, autonomous control or field validation.

Acceptance checks

- **Packet integrity** — Malformed or missing packets produce explicit fallback state.
- **Scenario traceability** — Selected scenario changes plot, plant state and advisory together.
- **Memory portability** — Exported JSON imports with schema checks and preserves event meaning.
- **Replay honesty** — Total biogas and methane are not relabelled or silently imputed.
- **Model discipline** — Previous-observation persistence is a diagnostic, not claimed validation.
- **Recovery** — Offline copy and a recorded demonstration survive API unavailability.

Live laboratory https://gfis.energy/sih/mvp.html

SIX-MEMBER TEAM

Responsibility follows prior project experience

Each student owns a visible subsystem and a reproducible output. Leadership integrates the work; mentorship reviews scope and evidence.

Student	Department / role	Engineering ownership	Submission evidence
Vijayalaxmi Kalidas Sundalam	CO · Team Leader	Integration, acceptance and opening pitch	Checklist · release review · opening
Sunaina Shashikant Gaikwad	IT · Data/ML	Units, time order, provenance and baseline	Dictionary · evaluation · data explanation
Shweta Laxmikant Vibhute	CO · Telemetry	Gateway, probe interfaces and packet timing	Emulator · wiring · calibration log
Samina Mahemood Shaikh	CO · Event memory	Alert lifecycle, loss handling and export	Alert tests · event schema · incident file
Sneha Mallinath Wale	IT · 3D / ROS2	Plant scene, assets, sensor hotspots and ROS2 mapping	3D asset map · scene · topic mapping
Sakshi Ajay Malwadkar	CO · 3D / ROS2	Twin integration, ROS2 replay and scenario verification	Replay bridge · twin tests · recovery

SUPERVISION AND REVIEW

Industry mentor: Akash Shivadas Chatake, Chatake Innoworks Private Limited
College guide: Prof. N. K. Mane, HOD, Computer Engineering Department
Institution: Shri Siddheshwar Women's Polytechnic, Solapur

Presentation order: Vijayalaxmi + Sakshi (idea / ROS2); Sunaina + Sneha Wale (data / 3D); Samina + Shweta (alerts / telemetry).

FOURTEEN-DAY SPRINT

Build one connected path before expanding

Every stage ends with evidence that another team member can reproduce. The exact calendar begins only when the college confirms kickoff.

D1-2 — Scope + contracts

Freeze input fields, units, reuse inventory and acceptance checklist.

D3-4 — Connected path

Packet changes a visible hotspot and creates an exportable advisory.

D5-7 — Bench + replay

Safe probe/emulator, clock and loss scenarios; calibration log.

D8-10 — Validation

Scenario, memory, mobile, fallback and chronological-baseline checks.

D11-12 — Story + evidence

Six slides, three-minute run and technical walkthrough.

D13-14 — Rehearsal

Mentor review, official fields, checksum and offline recovery.

Before the SPOC submits

- [ ] Confirm live problem title / ID and category
- [ ] Confirm diploma eligibility and six-member rule
- [ ] Insert official team name, ID and institute fields
- [ ] Use the current official SIH PPT template
- [ ] Declare existing GFIS and new student contribution
- [ ] Obtain authorised sponsor signature
- [ ] Test web and offline demo on presentation laptop

SAFETY AND CLAIM BOUNDARY

No biogas generation, ignition, compression or unsafe field actuation in the student demonstration. No cross-plant, causal, autonomous-control or calibrated industrial-performance claim. Any later field pilot requires risk assessment, calibrated instruments and institutional/company approval.

RIGHTS AND SUBMISSION PERMISSION

Selected GFIS assets may be used by the named team for SIH and internal academic evaluation with attribution. Existing GFIS IP is not transferred. Ownership of new student work follows SIH/institutional rules and any later written agreement.

9 September 2026

To
The Principal
Shri Siddheshwar Women's Polytechnic, Solapur
Through: Institutional Smart India Hackathon Coordinator
Copy to: Prof. N. K. Mane, HOD, Computer Engineering Department

Subject: GFIS EcoTwin sponsorship - SIH26200 / Software / Renewable Energy

Respected Sir/Madam,

Problem Statement ID: SIH26200.
Problem Statement Title: Student Innovation-Innovative ideas that help manage and generate renewable /sustainable sources more efficiently.
Organisation: AICTE / MIC Student Innovation. Category: Software. Theme: Renewable / Sustainable Energy. Chatake Innoworks Private Limited supports GFIS EcoTwin for this statement through explainable AI, biogas monitoring and digital-twin software.

The proposed student team comprises Vijayalaxmi Kalidas Sundalam (Team Leader, Computer Engineering), Sunaina Shashikant Gaikwad (Information Technology), Shweta Laxmikant Vibhute (Computer Engineering), Samina Mahemood Shaikh (Computer Engineering), Sneha Mallinath Wale (Information Technology) and Sakshi Ajay Malwadkar (Computer Engineering).

Akash Shivadas Chatake will serve as Industry Mentor. The company will provide in-kind technical mentorship, architecture and evidence reviews, source orientation, and controlled access to selected GFIS demonstration resources. Prof. N. K. Mane, HOD, Computer Engineering Department, will serve as College Guide subject to the institution's nomination process.

For SIH preparation and internal academic evaluation, the company grants the named team and institution limited, non-exclusive, non-transferable permission to use the selected GFIS demonstration assets supplied for this project, with attribution. This letter does not transfer pre-existing GFIS software, research, models, datasets, branding, patent-related material or other intellectual property. It also does not predetermine ownership of new student work; that will follow applicable SIH and institutional rules and, where necessary, a separate written agreement accepted by the relevant parties.

This support does not create a cash, procurement, travel or contractual service commitment. Equipment purchases require separate written approval. The team must maintain a dated contribution record. This letter does not authorise physical plant control, unsafe gas handling, commercial deployment, public release of protected material or unsupervised field work.

Institutional nomination, problem-statement selection, eligibility and acceptance remain governed by the college and the applicable SIH rules. We request the institution to consider the team for its internal selection and submission process, subject to those checks.

Sincerely,

Akash Shivadas Chatake
Industry Mentor
For Chatake Innoworks Private Limited

PROJECT REFERENCE

https://gfis.energy/sih/

https://chatakeinnoworks.com/