1. Details of Incubatee:

1.1\* Details of the Host Institute (HI) Techno International New Town

1.2 \* Name of the Business Incubator (BI) : Techno International New Town

1.3\* Category of the Incubatee- Student

1.4\*Incubatee Name Tirthankar Dasgupta

1.5 \*State  Choose State/UT: WEST BENGAL / पश्चिम बंगाल

1.6\* District  Choose District KOLKATA / कोलकाता

1.7 \*Email ID tirthankar.dasgupta.ece.2022@tint.edu.in

1.8\*Mobile Number +91 8017588882

1.9\*Category  Choose Category:  General

1.10\*Gender : Male

1.11\*Address : 407, S.N. Bye Lane, Rabindra Nagar, North Twenty Four Parganas, West Bengal, pin-700065

2. Details of Idea:

2.1\* Title of proposed idea/innovation

Auralis – IoT-Enabled Adaptive Smart Street Lighting System with Dual Communication and Real-Time Fault Detection

2.2\* Whether the idea involves use of existing intellectual property or not, give brief detail there of  
The idea does not infringe upon or directly utilize any existing intellectual property. It is developed using open-source hardware and protocols, primarily the ESP32 DevKit V1 microcontroller, Wi-Fi, and LoRaWAN communication standards. These are widely available technologies without restrictive licensing, making the solution cost-effective and easily deployable. The novelty lies in the **integrated architecture**, where dual-communication channels (Wi-Fi for urban areas and LoRaWAN for highways/remote locations) are combined with adaptive lighting control and real-time fault detection in a single, modular framework. This integration, scalability, and context-specific adaptability differentiate the system from conventional models and make it unique for smart city infrastructure.

**2.3\*Briefly explain newness/uniqueness of the innovation**  
Auralis introduces **dual-mode communication** (Wi-Fi + LoRaWAN) within a single framework, enabling deployment in both dense urban and remote environments—a capability not addressed in earlier streetlight systems. Unlike conventional models that rely on static operation, Auralis dynamically adjusts LED brightness based on real-time ambient light and motion detection, optimizing energy consumption. A core innovation is the **real-time fault detection mechanism** that proactively identifies failures in LEDs, sensors, and communication modules, transmitting instant alerts to maintenance systems. The system’s **low-cost design using ESP32**, coupled with its **scalability and modularity**, makes it accessible to municipalities and private operators. By integrating adaptive lighting, fault detection, and dual communication into one system, Auralis offers a comprehensive, affordable, and sustainable smart street lighting solution.

**2.4\*Concept & Objective**  
The concept is to develop an IoT-enabled smart street lighting system that intelligently adapts illumination based on real-time conditions, reducing energy wastage and operational costs. Ambient light sensors (LDR) and motion detectors (IR/PIR) dynamically control LED brightness, ensuring both efficiency and safety. The ESP32 DevKit V1 serves as the core controller, managing inputs and communication. Dual communication ensures flexible deployment—**Wi-Fi for smart cities** (real-time monitoring, cloud integration) and **LoRaWAN for highways and rural areas** (long-range, low-power). The system also integrates an **automated fault detection mechanism** to identify and report failures instantly, minimizing downtime. Objectives include: (1) reduce energy consumption by up to 80%, (2) enhance safety with context-aware adaptive lighting, (3) improve maintenance efficiency with real-time fault alerts, and (4) provide a **scalable, cost-effective, and sustainable solution** for modern smart infrastructure.

2.5\*Specify the potential areas of application in industry/market in brief  
 **Smart Cities & Urban Infrastructure** – adaptive street lighting, real-time monitoring, and energy-efficient lighting networks.

 **Highways & Rural Roads** – LoRaWAN-based long-range deployment for low-power, remote lighting management.

 **Municipal Corporations & PWD** – cost reduction in energy bills, fault detection for efficient maintenance.

 **Industrial Campuses & SEZs** – automated lighting management based on activity and operational hours.

 **Real Estate & Gated Communities** – smart, sensor-driven lighting solutions with automated fault detection.  
These applications cover both **public infrastructure** and **private development**, ensuring wide market adaptability.

**2.6\*Briefly provide the market potential of the idea/ innovation**  
Auralis addresses the problem of excessive energy consumption in conventional streetlights, which typically cost around ₹38.40 per day per lamp, leading to heavy municipal expenses. Our solution introduces a smart, energy-efficient streetlight module that reduces the daily operating cost to just ₹8.35 per lamp, achieving nearly 78% energy savings. This translates into savings of approximately ₹30.05 per lamp per day, or about ₹10,966 annually per lamp. For a 30-lamp block, the total annual savings amount to around ₹3.28 lakhs. The required one-time investment per lamp is ₹1,700 when integrated with existing infrastructure or ₹2,500 for new infrastructure. Despite this small upfront cost, the system offers a rapid payback period—just 2.5 months for existing infrastructure and 3 months for new setups. With such a quick ROI, municipalities and smart city projects can significantly cut costs while ensuring sustainable, energy-efficient lighting solutions.

**2.7\*Name and details of Mentors  
Maximum 500 characters allowed.  
  
Prof. Sandip Bhattacharya**: Working in the field of nanotechnology, electron devices, and systems. Pursuing PhD (Tech.) from CRNN, University of Calcutta. Teaching experience: 14 years; Industry experience: 1 year.  
**Prof. Joyati Chattopadhyay**: Currently an Assistant Professor in the Electronics and Communication Department at Techno International Newtown. Areas of interest: Embedded System and Communication System. Experience: 15 years; Qualification: M.Tech.

**2.8\*Experience and Qualification of Mentors  
Prof. Sandip Bhattacharya**: 14 years of teaching experience and 1 year in the industry. Pursuing PhD (Tech.) from CRNN, University of Calcutta.  
**Prof. Joyati Chattopadhyay**: 15 years of experience as an Assistant Professor in Electronics and Communication. Holds an MTech degree with expertise in Embedded and Communication Systems.

2.9\*Contact Details of Mentors  
**Prof. Sandip Bhattacharya**:

**Email**: [sandip.bhattacharya@tict.edu.in](mailto:sandip.bhattacharya@tict.edu.in)

**Phone No**. : +91 96813 99441

**Prof. Joyati Chattopadhyay**:

**Email**: [joyati.chattopadhyay@tict.edu.in](mailto:joyati.chattopadhyay@tict.edu.in)

**Phone No**. : +91 7980874250

**2.10\* Current Development Status of innovation  
Maximum 500 characters allowed.**  
A miniature prototype of the smart street lighting system has been developed, integrating ESP32, sensors, and dual communication modules. Initial lab-scale testing confirms adaptive brightness control and basic fault detection, validating the core concept for future scaling.

**2.11\*Expected time of completion of idea development  
Maximum 500 characters allowed.**  
With planned field trials, hardware optimization, and large-scale integration, the complete system is expected to be fully developed and deployment-ready within the next **6 months**.

2.12\*Theme

|  |
| --- |
| Low-carbon footprint solutions/technologies |

2.13\*Idea Sector

|  |
| --- |
| *Power, Renewables, Electricals, Power Electronics, Energy Efficiency and any related sub-sector* |

3.Financial requirements:

3.1\*Please give Total idea/project cost (Rs in lakh)

\*Total idea/project cost (Rs in lakh): Rs.10 Lakhs

\*Total GOI Assistance required (Rs in lakh):Rs.8 Lakhs

\*Total Incubatee share (Rs in lakh):Rs. 2 Lakhs

|  |  |  |
| --- | --- | --- |
| **Particular/Item (As per the scheme guidelines)** | **Amount GOI assistance (Rs. In lakh)** | **Incubatee share (Rs. In lakh)** |
| Technology related Expenditure towards machine usage charges etc., Electricity charges, Procurement of raw material , testing/Calibration charges, other charges essential for development of idea **Max (10.00) lakh.** | Rs. 500,000 | Rs.100,000 |
| Charges for mentor/handholding supporting team **Max (3.00) lakh.** | Rs. 150,000 | Rs. 50,000 |
| Travelling Expenses or any other item not coverd as above may be allowed as per need for development of the idea **Max ( 2.00) lakh.** | Rs. 150,000 | Rs.50,000 |

4.Please give name of other students/Entrepreneurs associated with this project/idea, if any (in the periodical order):

|  |  |  |
| --- | --- | --- |
| **Name** | **Aadhar No. / Udyam Registration** |  |
| Sriniketh Adika  Arpan Bairagi  Bibaswan Bajpayee  Sukomal Debnath  Prisha Chakraborty | 801556073654  533698746940  436882294169  908669283068  405204405840 |  |
| Note:- Please fill above information and click Add button.You can repeat adding for multiple students/Entrepreneurs associated with this project/idea. | | |
|  | | |

Note:- Kindly do not write the Name/Organization Name/ Company Name of the incubatee in order to maintain transparency in the evaluation process. (If found, the idea will not be considered.)

**\* Ref. No. :** INC25EWB107129

**\* 5. Summary of the idea. This is the section reviewers read to understand the technical solution. Please state the solution clearly. Reviewers may ask: What is the actual technical advancement or improvement provided by this solution?  
Maximum 750 characters allowed.**  
The **Auralis**-**IoT-Enabled Adaptive Smart Street Lighting System** revolutionizes urban and highway infrastructure with intelligent energy savings and real-time fault detection. Using ambient light and motion sensors, it dynamically adjusts LED brightness, cutting power use by up to **80%**. A dual communication architecture—**Wi-Fi + LoRaWAN**—ensures scalability across both dense cities and remote highways. Integrated fault detection alerts maintenance instantly, reducing downtime and costs. Built on a cost-effective ESP32 platform, this modular solution aligns with India’s **Smart Cities Mission**, offering municipalities, developers, and communities a future-ready, sustainable lighting system that enhances safety, efficiency, and reliability.

\* 6 (a) Is it a new concept?

|  |  |
| --- | --- |
| Yes |  |

\* (b) Prior art on the concept, if any  
Maximum 300 characters allowed.

**\* 7. Main Problem Being Addressed in the Project (Every solution targets a certain problem. Please use this section to highlight the specific problem the solution addresses. This section can be as short or as long as needed to describe the precise problem the solution addresses)**  
Conventional streetlights consume excessive energy, operate inefficiently, and require frequent manual maintenance. They lack adaptability to ambient conditions and traffic flow, causing energy waste and high costs. Additionally, absence of real-time fault detection leads to delays in repairs and increased downtime.

8. Background for getting the idea?

\* a. Who is it for?  
Municipal bodies, smart city developers, highway authorities, industrial campuses, and gated communities seeking cost-effective, energy-efficient, and automated street lighting with reduced maintenance overheads.

\* b. What will it do?  
It will dynamically adjust LED brightness based on light and motion conditions, cut power consumption by up to 80%, and detect faults in real time. The system ensures safety, sustainability, and reduced downtime for public and private infrastructure.

\* c. Any unique features? Explain?  
Dual communication (Wi-Fi + LoRaWAN) for flexible deployment, real-time fault detection, and low-cost modular design using ESP32. Unlike conventional systems, it is scalable, adaptive, and suitable for both dense urban areas and remote highways and it controls brightness and uses a light capsule like thing to always keep the light focused on the subject.

\* 9. How simple or complex will the idea’s execution or implementation be? What are the risk factors involved in executing the idea?  
Implementation is moderately simple, leveraging readily available ESP32 hardware and standard sensors. Risks include ensuring reliable LoRaWAN coverage in remote areas, scalability of cloud infrastructure, and sensor calibration for diverse environments. These can be mitigated with phased prototyping and testing.

\* 10. How soon could the idea be put into operation? (TRL of prototype)  
Prototype is at **TRL 5–6** (validated in simulated environment). With investment, it can reach TRL 7 (field prototype) and be ready for pilot deployment within 3-4 months.

\* 11. How much investment would you need for prototyping of the Idea?  
Approx. **₹4.5–5 lakhs** required for sensors, ESP32 modules, LoRa gateways, LEDs, testing, and initial pilot deployment..

\* 12. (a) How do you intend to protect your idea (i.e. your intellectual property or IP)? Status of IPR (If any)  
Currently not patented. The idea will be protected through **patent filing** for the integrated dual-communication + adaptive lighting + real-time fault detection architecture. Copyright and trade name **“Auralis”** will also be secured.

\* (b) Related Background. This section is used to highlight information that can be used by the reviewers or patent attorney to help put the solution in proper context. You can think of this section as something similar to the introduction section of an academic publication. This section is specifically reserved for other people’s work (please include competitive work) as well as your past work that you believe will aid the reviewers in understanding the technical landscape. Data related to or supporting your solution should not be in this section, it should be in Section III: “How is this Solution Made and Used.”

Past studies used Zigbee, GSM, or single-protocol IoT frameworks for smart lighting but lacked scalability, dual communication, and integrated fault detection. Our work advances this by unifying adaptive lighting, long-range communication, and fault monitoring into one system, building upon but surpassing existing research.

**\* 13.How is this project made and used: Please describe in as much detail as possible how the innovation is implemented. This includes details on how you actually make, assemble, synthesize, or build the solution and details on how the solution is used once it is made. Reviewers will ask: How does the technical innovation actually work – or – what is the detailed process to achieve the technical innovation? Please help convince the reviewers with supporting statements using as much of the following that is available: your thoughts, logic, supporting literature, and/or experiments.**

The system uses ESP32 DevKit V1 as the controller, interfaced with LDR, IR/PIR sensors, and LEDs. Wi-Fi and LoRa modules enable communication. PWM logic controls brightness dynamically, while fault detection circuits flag anomalies. Once installed, lights auto-adjust to environment, transmit data to cloud, and notify faults in real time, reducing energy use and maintenance costs.

**\* 14. Is this Idea recommended?**

|  |
| --- |
| Yes |

**\* 15.Weather the varification the age of Incubatee carried out.**

|  |
| --- |
| Yes |

Eligibility: Age 18-60 years (including both) (born between Jun 27, 1965 And Jun 27, 2007)

\* **Upload Block diagram/ flow chart/ Circuit Diagram/Pictures**

[Upload only pdf,File size should not exceed 1 MB]

\* **Please Upload Student ID with duration of course (should be valid atleast till March 2026) and bonafide certificate by HI certifying that the student is currently enrolled in the course (Please upload single file including both Student ID & bonafide certificate by HI)**

[Upload only pdf,File size should not exceed 1 MB]

Declaration

**I declare that:**

1. **I have read the entire scheme guidelines and shall abide by all the requirements stipulated therein for seeking financial assistance.**
2. **I hereby declare that information given above is true to the best of my Knowledge and that I have not withheld/distorted any material fact.**
3. **Any information/ documents that may be required to be verified shall be provided immediately before the concerned authority.**
4. **I hereby declare that I have not availed any financial assistance for this purpose from any other scheme from any Central/ State govt. agency.**
5. **In case the Idea is approved, Host Institute would undertake to make facilities available to carry out the development arrange for the submission of periodic progress reports and other information that may be required by the Ministry.**
6. **I certify that the accounts of the funds received and spent will be kept and made available on demand, as per scheme guidelines**
7. **I certify that the funds will be used only for Idea development as per activities defined in Scheme Guidelines & no funds out of this grant will be utilized for any other activity/production purposes.**

**Signature**

After submission of application, the details can not be changed/edited.