NAME: INDHU PRAKASH S

REGISTER NUMBER: 711722243041

ROLL NO: 22AIA41

BRANCH: B. Tech - ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

SUBJECT CODE: OEE351

SUBJECT TITLE: RENEWABLE ENERGY SYSTEM

SEMESTER/YEAR: VI/III

INDIA'S FIRST SOLAR-POWERED RAILWAY STATION – GUWAHATI RAILWAY STATION

Introduction

India, one of the largest railway networks in the world, has been actively working towards sustainability and reducing its carbon footprint. As part of this initiative, the **Guwahati Railway Station** in Assam became India's first fully solar-powered railway station in 2017. This milestone aligns with the Indian Railways' goal of becoming a **net-zero carbon emitter by 2030**.

Background

- **Location:** Guwahati, Assam
- **Inauguration of Solar Project:** 2017
- **Project Implemented By:** Indian Railways in partnership with the Indian Renewable Energy Development Agency (IREDA)
- **Capacity:** 700 kWp (kilowatt peak)
- **Objective:** Reduce dependency on conventional energy sources and lower carbon emissions.

Key Features of the Project

1. **Solar Panel Installation:**
    - 2,500 solar panels installed on the station’s rooftop.
    - Generates **about 2,200 kWh of electricity daily**, fulfilling 100% of the station's energy requirements.
2. **Energy Savings & Cost Reduction:**
    - Saves approximately **₹67 lakhs (6.7 million INR) annually** on electricity bills.
    - Any excess power generated is supplied back to the grid.
3. **Environmental Impact:**
    - Reduces **carbon dioxide emissions by about 2,000 tons per year**.
    - Helps promote clean and green energy in public infrastructure.

4. **Backup Power & Grid Integration:**
    - The solar power system is integrated with battery storage and the state electricity grid.
    - Ensures an uninterrupted power supply for train operations, ticketing systems, and lighting.

Impact & Benefits

1. Environmental Impact

- Reduces reliance on fossil fuels.
- Sets an example for sustainable transportation infrastructure.

2. Economic Benefits

- Significant cost savings in electricity consumption.
- Reduces long-term operational costs for Indian Railways.

3. Passenger Experience

- Promotes awareness of renewable energy among travelers.
- Ensures reliable electricity supply, improving station services.

Challenges & Limitations

1. **Initial Investment Costs:**
    - High upfront cost for installing solar panels and energy storage systems.
2. **Weather Dependency:**
    - Solar power generation fluctuates due to seasonal variations and monsoons.
3. **Maintenance & Durability:**
    - Regular maintenance is required to ensure the efficiency of solar panels.

4. **Scalability Across Other Stations:**
    - While Guwahati was a success, replicating the model nationwide requires significant investment and policy support.

Future of Solar-Powered Railways in India

- **Expansion Plans:** Indian Railways aims to install **solar panels in 7,000 stations** across the country.
- **Net-Zero Emission Goal:** By 2030, Indian Railways plans to become a **100% green energy-powered network**.
- **Innovative Projects:** Introduction of **solar-powered trains** and **large-scale solar farms** to power railway operations.

Conclusion

Guwahati Railway Station stands as a **landmark project** showcasing India's commitment to **renewable energy in transportation**. The success of this initiative has paved the way for more **solar-powered railway stations**, reducing both costs and carbon emissions. With further investments and technological advancements, Indian Railways is set to become a **global leader in green transportation infrastructure**.