
# Research & Development Activities

# Net-Zero Energy Systems

Centre for Net-Zero Technologies (CNET)

CENTRE FOR NET-ZERO TECHNOLOGIES
RESEARCH | INNOVATION | IMPACT

## 1 Project Title: Design and Development of Portable Solar Power Station

The power station features several innovations, including a modular design with foldable solar panels and a novel single-axis automatic solar-tracking system.

**Funding / Project Period**

Pedigri Technologies, UAE
(Consultancy Project) VIT SEED Grant

**Status**

Completed (July 2023 to Jun 2025)

**Outcome / Technology**

Intellectual Property India,
Patent No.: 406099-001 (2024)

**Faculty / PI:** Arjun Singh K

## 2 Software Development for Hospital Management System


**Funded by**

Sri Thirumala Physiotherapy and
Pain Relief Clinic, Tamilnadu

**Status**

Completed : 2024

**Outcome / Technology**

MoU granting VIT a 10%
royalty on software sales

**Faculty / PI:** Dr. D. Elangovan

# Net-Zero Energy Systems

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RESEARCH | INNOVATION | IMPACT

## NET-ZERO ENERGY

**RESEARCH THRUST AREAS**

- Solar PV
- Wind Energy
- Smart Grids & Microgrids
- Digital Twins
- Energy Management Systems
- Renewable Energy Integration
- Smart Campus

3

**Project Title:** Smart Energy Management of DC-Microgrid

**Faculty / PI:** Santanu Kumar Dash

### Short Summary

This research focus on Development of artificial intelligence based energy management for Microgrid. Development of an adaptive controller for the power conditioning in the Microgrid. Analyzing the performance of artificial intelligence based controllers for the considered microgrid system including Solar PV, supercapacitor, battery energy storage and thermo chemical energy.

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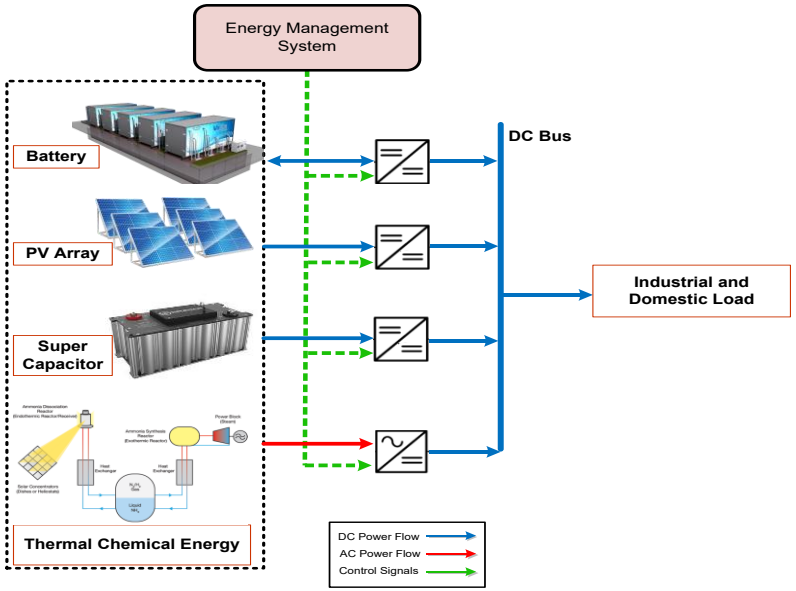
### Product




**Funding**
**VIN International Research Fund**

**Status**
**Completed : 2024**

**Outcome / Technology**
**MOU Signed between VIT and Walailak University**

# Green Hydrogen & Alternative Fuels

Centre for Net-Zero Technologies (CNET)

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RESEARCH | INNOVATION | IMPACT

## GREEN HYDROGEN

**RESEARCH THRUST AREAS**

- Hydrogen Production & Storage
- Hydrogen Labs & Infrastructure
- Clean Fuels
- Fuel Cells

1

**Project Title:** Biomass-driven working electrode for green hydrogen generation

**Faculty / PI:** KALAISELVAN N

Short Summary


Biomass-derived carbon materials can be used as sustainable working electrodes for green hydrogen generation through alkaline water electrolysis. Their porous structure and high surface area provide abundant active sites, improving the hydrogen evolution reaction and electrode performance.

Solar PV-powered floating systems can provide renewable electricity for water electrolysis, enabling sustainable green hydrogen production with reduced land requirements. Integrating floating solar with electrolyzers can utilize water bodies efficiently while reducing carbon emissions and supporting decentralized clean-energy generation.


Product

**Funding / Project Period:** NIL

VIT SEED Grant

**Status:** On going

**Outcome / Technology:** TRL4 patent published

# Smart Sustainable Mobility

Centre for Net-Zero Technologies (CNET)

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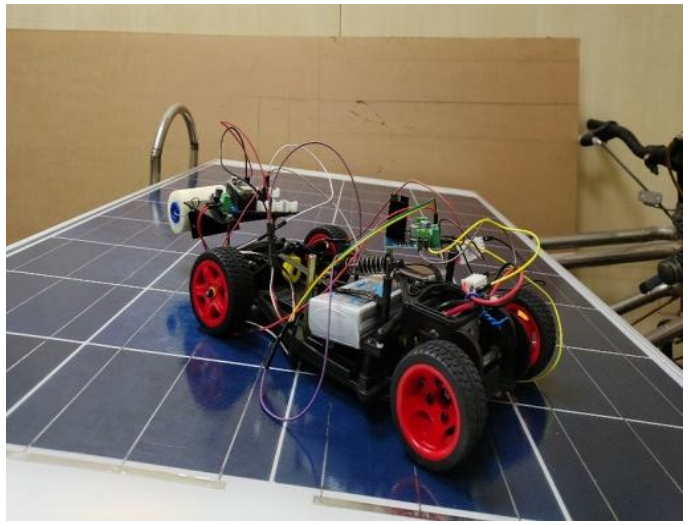
RESEARCH | INNOVATION | IMPACT

## 1 Project Title: Smart PV Cleaning Robot : May 2024



The Smart PV Cleaning Robot enhances the efficiency of photovoltaic solar panels by utilizing automated navigation and real-time environmental sensing

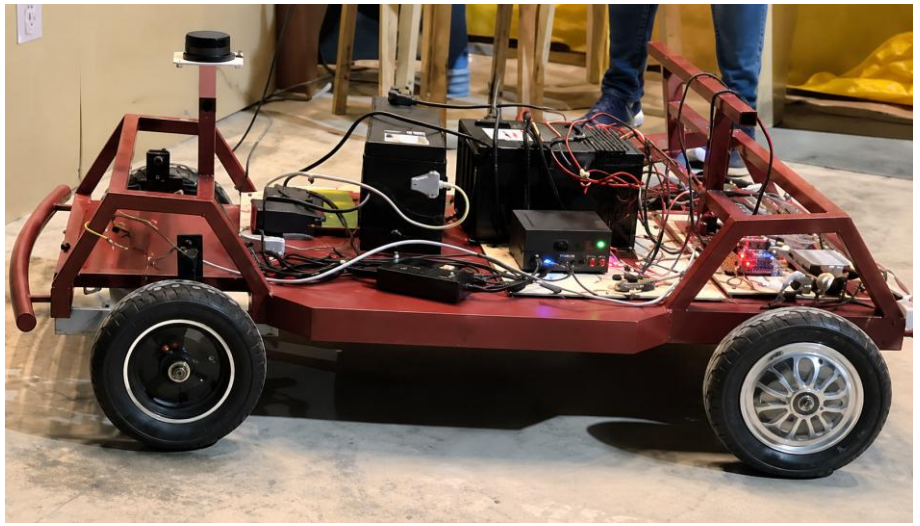
**Funding / Project Period**
VIT consumables

**Outcome / Technology:**
Patent Granted

**Status:** on going

**Faculty / PI:** KALAISELVAN N

## 2 Project Title: Autonomous EV for medical applications



An autonomous electric vehicle (EV) designed for intelligent, self-guided mobility. It integrates electric drive, sensors, controllers, and embedded electronics for autonomous navigation and control.

**Funding / Project Period**
VIT start up Venture 2025

**Outcome / Technology:**
TRL 5 under progress

**Status:** on going

**Faculty / PI:** KALAISELVAN N

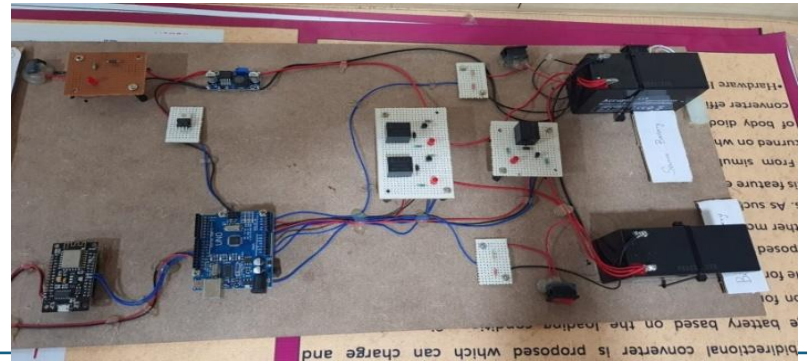
# Smart Sustainable Mobility

Centre for Net-Zero Technologies (CNET)

CENTRE FOR NET-ZERO TECHNOLOGIES
RESEARCH | INNOVATION | IMPACT

3

**Project Title:** Active thermal management-based smart charge controller for EV application



**Funding / Project Period**
VIT SEED FUND

**Status:** Completed

**•Outcome / Technology:**
- **Patent Granted,** 400576-001
- **Patent Filed,** 417596-001

**Faculty / PI:** Santanu Kumar Dash

4

**Project Title:** Development of GPS-Denied Autonomous Drone for Internal Environments

This research focuses on the development of an autonomous drone capable of operating in GPS-denied indoor environments.

**Funding**
Pedigri Technologies, UAE
( Consultancy Project)

**Status:** ongoing 2024

**Outcome / Technology:**
TRL 5 in progress

**Faculty / PI:** Arjun Singh K

# Smart Sustainable Mobility

Centre for Net-Zero Technologies (CNET)

CENTRE FOR NET-ZERO TECHNOLOGIES
RESEARCH | INNOVATION | IMPACT

5

**Project Title:** Solar-Powered Electric Vehicle(EV) for Sustainable Indoor Hospital Transportation

This project focuses on developing a solar-powered electric vehicle (EV) designed for sustainable indoor transportation within hospital environments

**Funding**
E-Cell, Faculty Startup Venture-2024

**Outcome / Technology:**
Patent Granted
414045-001

**Status:** Completed,2025

**Faculty / PI:** N. Kalaiselvan

6

**Project Title:** Fuel Cell-Powered Electric Bicycles


VIT, Vellore, in collaboration with PSG Tech, Coimbatore, is working on an innovative project to power two- and three-wheelers using green hydrogen through the indigenous development of a 250W Proton Exchange Membrane Fuel Cell (PEMFC) stack.

**Funding**
VIT SEED FUND

**Outcome / Technology:**
- Part of the work published in Scientific Reports
- Product will be launched in Dec 2025

**Status:** Completed, 2024

**Faculty / PI:** D. Elangovan

# Smart Sustainable Mobility

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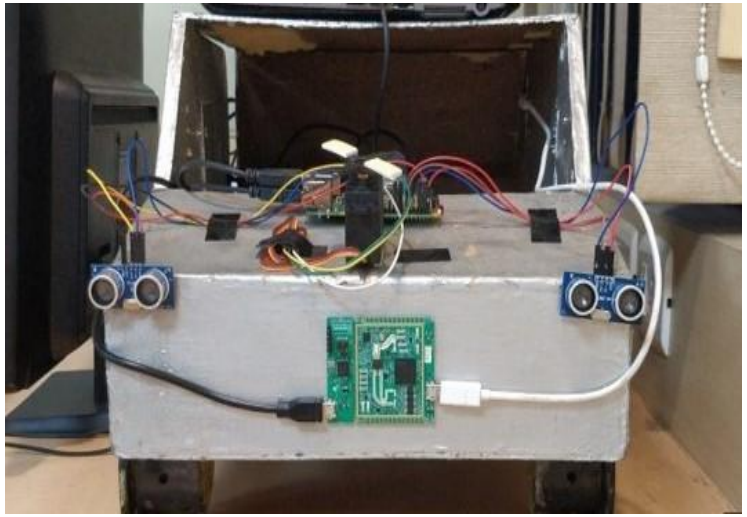
RESEARCH | INNOVATION | IMPACT

**7** **Project Title:** Integrated sensing and control system for enhanced autonomous vehicle



This research focuses on using a combination of sensors, including radar and ultrasonic systems, to accurately measure distances and speeds of objects for autonomous driving.

**Funding**
VIT Consumables

**Outcome / Technology**
Publication

**Status:** Completed, 2023

**Faculty / PI:** Santanu Kumar Dash

**8** **Project Title:** Universal Hybrid Wireless Fast Charger For Two/Three wheeled Electric Vehicles

Wireless Power Transmission (WPT) has gained global research interest, but challenges like coil misalignment and varying battery voltage levels have limited efficient power transfer..

**Funding**
VIT SEED FUND

**Outcome / Technology**
Publication

**Status:** Completed, 2023

**Faculty / PI:** D. Elangovan

# Smart Sustainable Mobility

Centre for Net-Zero Technologies (CNET)

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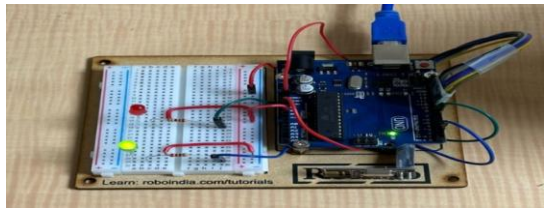
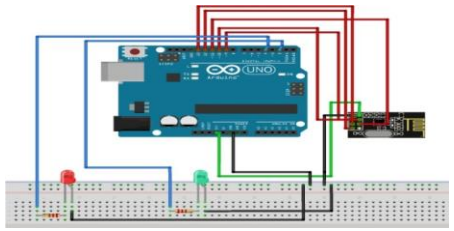
RESEARCH | INNOVATION | IMPACT

**9** **Project Title:** Automated curved road vehicle detection





The escalating threat of avenue injuries in India necessitates modern answers to enhance street protection. While a great portion of injuries (67%) occur on straight roads, incidents on curved, pothole-ridden, and steep-grade roads together contribute to only 13.8% of the overall injuries.

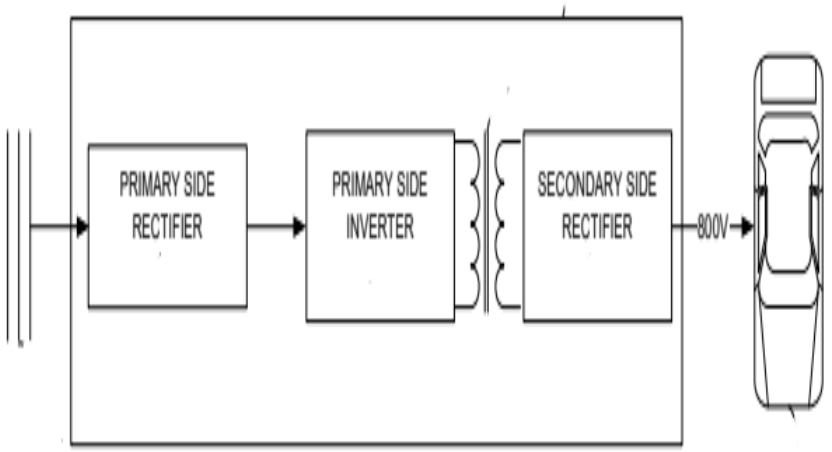
**Funding**
VIT Consumables

**Outcome / Technology**
Publication

**Status:** Completed, 2023

**Faculty / PI:** N. Kalaiselvan

**10** **Project Title:** Current Fed Fuel Cell Powered High Voltage Charging Circuit For Electric Vehicles




This fuel-cell-powered high-voltage (800V) charging system for electric vehicles achieves substantial voltage gain through an optimized voltage multiplier and minimal capacitor selection.

**Funding**
VIT SEED FUND

**Outcome / Technology**
Patent Granted Patent No: 442627

**Status:** Completed, 2023

**Faculty / PI:** D. Elangovan

# Smart Sustainable Mobility

Centre for Net-Zero Technologies (CNET)

CENTRE FOR NET-ZERO TECHNOLOGIES
RESEARCH | INNOVATION | IMPACT

## SMART SUSTAINABLE MOBILITY

**RESEARCH THRUST AREAS**

- Electric Vehicles (EV)
- Vehicle-to-Grid (V2G)
- Smart Charging Infrastructure
- Smart Transportation
- DC Microgrids
- Intelligent Traffic Management

**11** **Project Title:** Renewable Energy Powered Wireless Fast Charger For Electric Bicycle

**Faculty / PI:** D. Elangovan

Short Summary

# VIT receives patent for its wireless e-bicycle charger

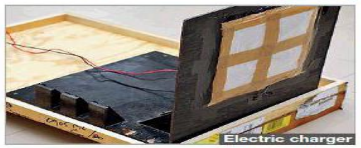
Researchers at Vellore Institute of Technology (VIT), Vellore, were recently granted a patent by the Government of India for creating renewable energy powered wireless fast charger for electric bicycles. The team led by Dr Elangovan, Associate Professor and Deputy Director, TIFAC-CORE, and Dr Peter K Joseph, PhD from the School of Electrical Engineering, claim to have set the benchmark with their renewable energy powered wireless e-bicycle charger. The solar-powered wireless chargers have been developed with funding from the Department of Science and Technology (DST) and the VIT SEED grant scheme.

With the transport sector being responsible for a big portion of global greenhouse gas emission, there is an increased need to shift towards electric vehicles (EV). Unfortunately, existing EV charging infrastructure is mostly non-sustainable, being powered through conventional or fossil fuel-based sources. To build a successful EV ecosystem in the future, it is imperative to move towards green power produced from renewable energy sources. "We have set up a solar-powered prototype inside the VIT, Vellore, campus, which can successfully charge an electric cycle battery at a separation distance of 1-1.5 feet with an efficiency higher than 95%. The e-cycle battery can be fully charged in 30 minutes, after which it can travel a distance of 50km, at a top speed of 20kmph," explains Dr Elangovan.

The team has carried forward the invention by building a universal wireless charger that can operate both on-grid power and solar power. This system delivers power transmission at 80%+ efficiency at a separation of 3.3 feet and charge batteries ranging from 12V to 48V of both Lead-acid and Li-ion, says the team. Although the original prototype was aimed at e-bicycles and e-bikes, it can also be adapted for heavy vehicle charging.

The development team at VIT, Vellore, says that they are working to implement this design in public parking spaces, so parked vehicles can get charged without any plug-in mechanism. The team seeks to integrate wireless charging technology with a solar generator based refuelling techniques to pave the way for sustainable transportation. Considering India is flooded with four-wheeler traffic, introducing two-wheelers with renewable energy powered wireless charging technology can bring about a major change in energy conservation, they say.

Dr Elangovan on an e-bicycle



Electric charger

Product

***Highlights***

- **Efficiency : 94.32%**
- **Coupling separation of 20cm. (Upto 40 cm)**
- **Misalignment : 15°**

**Funding**
**VIT SEED GRANT**

**Status: Completed, 2021**

**Outcome / Technology**
**Patent No: 364892**

# Resource Recovery Management

Centre for Net-Zero Technologies (CNET)

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RESEARCH | INNOVATION | IMPACT

## RESOURCE RECOVERY

**RESEARCH THRUST AREAS**

- Wastewater Treatment & Resou
- PV & Battery Recycling
- E-waste Valorization
- Biomass Utilization
- Waste-to-Energy Systems
- Circular Manufacturing System

**1**

**Project Title: Life aged PV waste to active materials extraction**

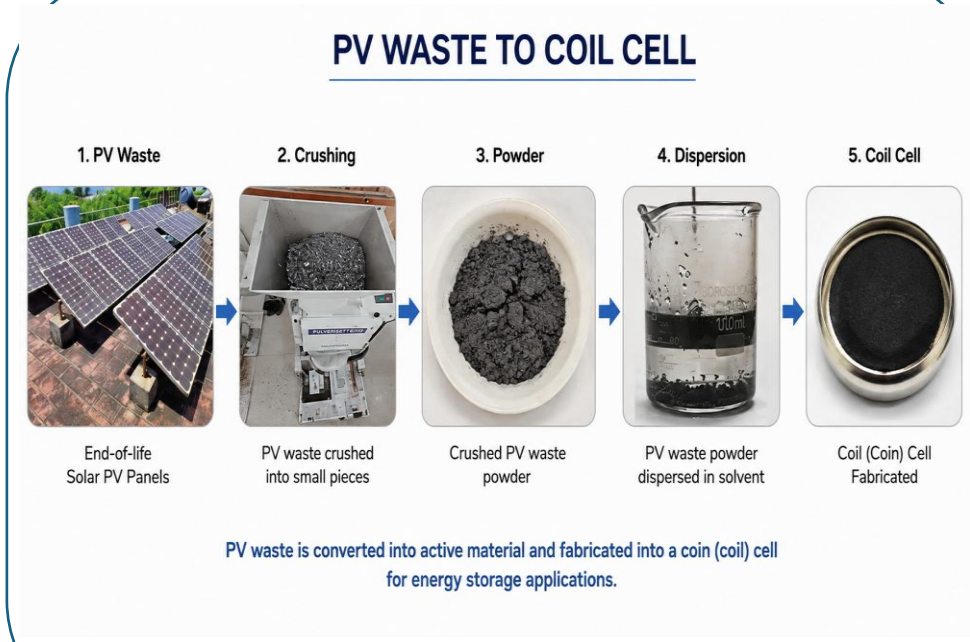
**Faculty / PI:** KALAISELVAN N

Short Summary

Life-aged PV waste can be processed to recover valuable active materials such as silicon, metals, and carbon-based components.

This approach promotes PV waste recycling, resource recovery, and sustainable material production for energy applications.

Product




**Funding / Project Period**
**ANRF-ARG applied**

**Status: On going**

**Outcome / Technology: TRL 4- waste to super capacitor**