The UESH Retrofit Solution

A Series Hybrid Powertrain for 1200cc Vehicles

Executive Summary

Project Goal

Eliminate charging infrastructure dependency while maximizing fuel economy in urban environments.

Core Technology

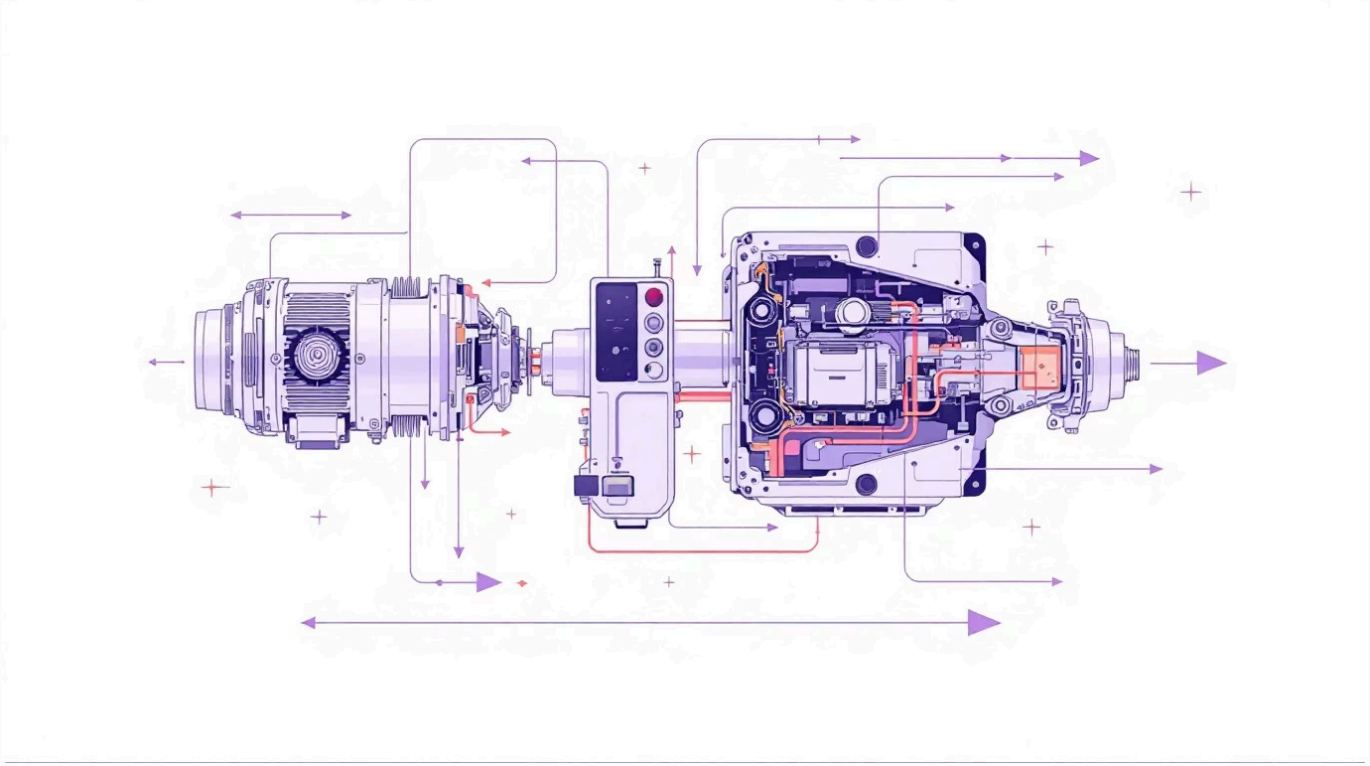
1200cc engine as dedicated generator paired with 72V LiFePO4 battery buffer.

Efficiency Milestone

40-60% improvement in real-world city mileage over standard ICE configurations.

UESH stands for Urban-Efficient Series Hybrid.

Powertrain Architecture



Prime Mover

1200cc petrol engine optimized for fixed-point efficiency at 2400-2800 RPM.

Electrical Output

5.0 kW nominal via permanent magnet alternator for continuous propulsion and battery charging.

Battery Buffer

72V 100Ah LiFePO4 for peak loads and energy recovery.

Key Specifications

1

Propulsion System

15kW nominal / 30kW peak BLDC motor with high-torque delivery from 0 RPM, mated to existing 5-speed gearbox.

2

Cooling System

Active air/liquid thermal loop maintains optimal 90-100°C efficiency window for power electronics and engine.

3

Energy Recovery

Regenerative braking captures energy during deceleration, unlike conventional ICE systems that waste energy as heat.

Modification Cost Breakdown

Total estimated cost: **₹170,000** (prioritized for safety, durability, and low-cost implementation)

₹40K-...

Traction Motor

15-20kW electric motor

₹70K-...

Battery Pack

72V LiFePO4 buffer

₹20K-...

Generator

Permanent magnet alternator

₹25K-...

Motor Controller

High-voltage controller

₹15K-...

Power Distribution

DC-to-DC converter & PDU

₹10K-...

Hardware

Adapters & miscellaneous

UESH vs. Alternatives

Addressing the "Efficiency Gap" with EV-like efficiency and existing fuel infrastructure convenience.

Metric	Standard 1200cc Petrol	Sequential CNG Kit	UESH Retrofit
Real-World Mileage	14-16 km/l	20-22 km/kg	**24-28 km/l**
Engine State	Variable (Low)	Variable (Moderate)	**Constant (Peak)**
Braking	Energy Wasted	Energy Wasted	**Energy Recovered**
Infrastructure	Petrol Stations	CNG Stations (Long Queues)	**Petrol Stations (No Waiting)**

Performance Logic

Manual Torque Management

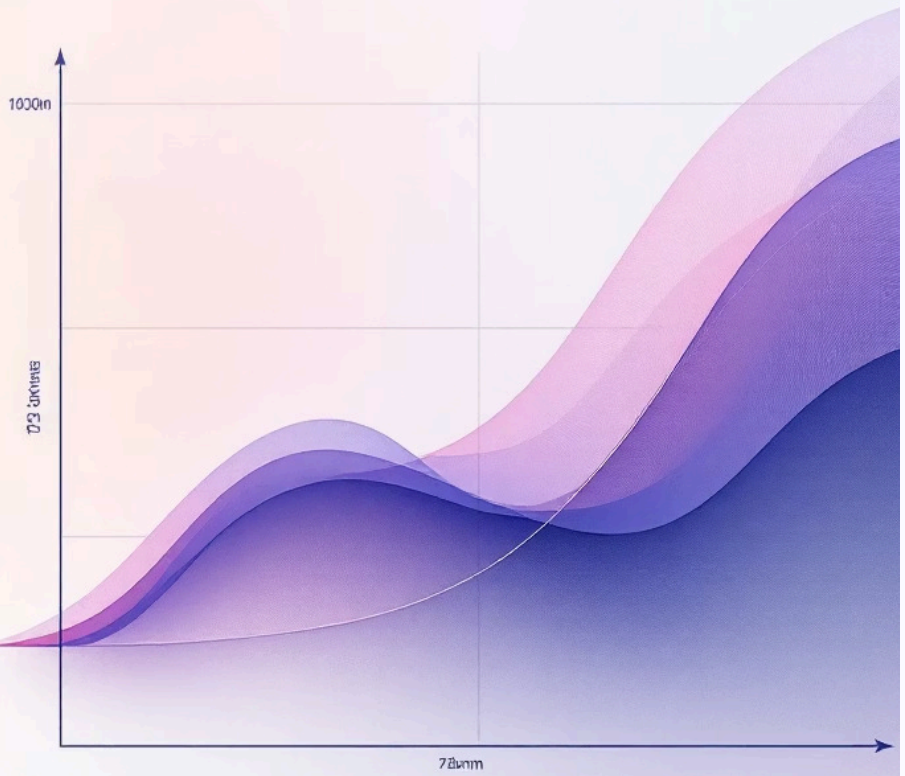
Retained manual gearbox allows downshifting for mechanical advantage, reducing electrical current during climbs or heavy loads.

Driver-in-the-Loop

Manual power-gen switch enables proactive generator engagement based on upcoming terrain to maintain battery buffer.

Weight Neutrality

Removal of clutch, flywheel, and full fuel tank offsets motor and battery weight, maintaining OEM safety standards.



Engineering Pillars

Fixed-Point Efficiency

Engine optimized for constant 2400-2800 RPM operation at peak efficiency island, unlike variable-speed ICE systems.

Aggressive Energy Recovery

Regenerative braking captures kinetic energy during deceleration, converting it to stored electrical energy.

High-Torque BLDC Motor

Delivers maximum torque from 0 RPM for instant acceleration without engine revving.

Existing Transmission

5-speed manual gearbox provides torque multiplication and driver control for optimal efficiency.

Key Advantages

No Charging Infrastructure

Uses existing petrol stations without waiting in queues or range anxiety concerns.

40-60% Mileage Gain

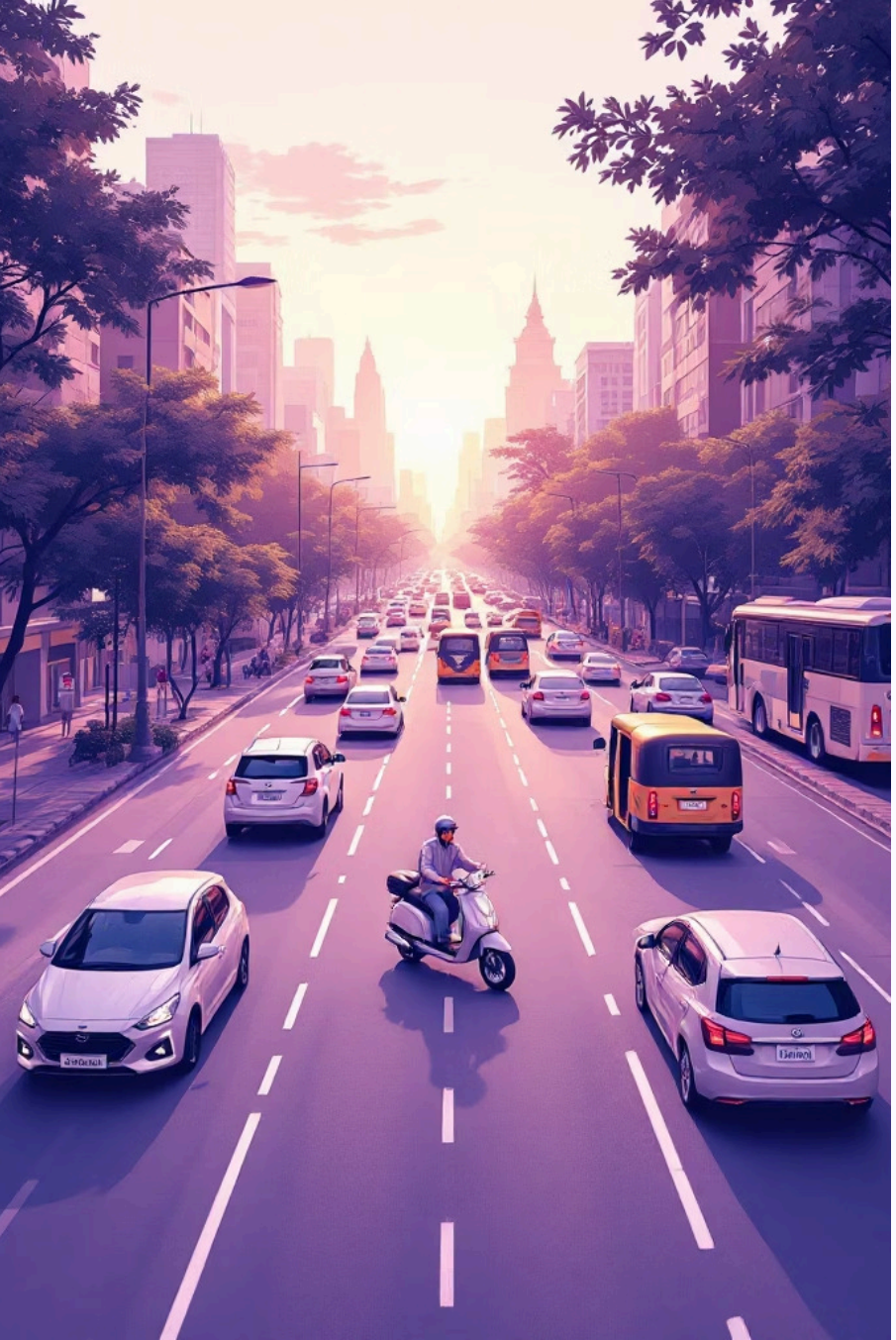
24-28 km/l real-world city mileage versus 14-16 km/l for standard petrol vehicles.

LiFePO4 Battery Chemistry

High-longevity, thermally stable cells with excellent cycle life for durability.

Manual Transmission Retained

Driver maintains control and mechanical advantage through gear selection.



Conclusion

> The UESH project provides a commercially viable, high-efficiency alternative for the Indian commuter. By applying series hybrid logic to a lightweight, optimized platform, it delivers extreme fuel economy without the infrastructure hurdles of pure electric vehicles.

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