Replace LPG with Ethanol and IPCR Technology

Utilizing existing LPG stove hardware to deliver superior cooking duration, cost-effectiveness, and thermal intensity via localized E100 fuel infrastructure.

IPCR stands for Induction-Based Phase-Change Retrofit.

Prepared by: Denny Jacob | denny.jacob@onlinetoolsx.com

Executive Summary

System Transformation

Convert liquid E100 (27 MJ/kg) into high-velocity dry vapor before burner entry.

Hardware Compatibility

Utilizes existing LPG stove hardware without internal modifications or physical attachments.

Efficiency Benchmark

85% system thermal efficiency, outperforming standard LPG average of 55%.

Economic Impact

28% reduction in total operating costs compared to commercial LPG rates.

Operational goal: 20kg ethanol supply matches effective cooking hours of 20kg LPG cylinder.

The IPCR "Retro-Box"

A Phase-Change Pre-Mixer positioned between E100 fuel tank and existing LPG stove, translating liquid fuel into gaseous state and pressure required by standard LPG jets.

Key Innovation

Converts liquid E100 into high-velocity, dry vapor before burner entry—bridging the 'Energy Density Gap' between liquid ethanol and LPG.

Electromagnetic Phase-Change Chamber

01

Induction Heating

High-frequency induction coil wrapped around 316 Stainless Steel vaporization tube provides near-instantaneous heat (78°C) without exposed resistive elements.

02

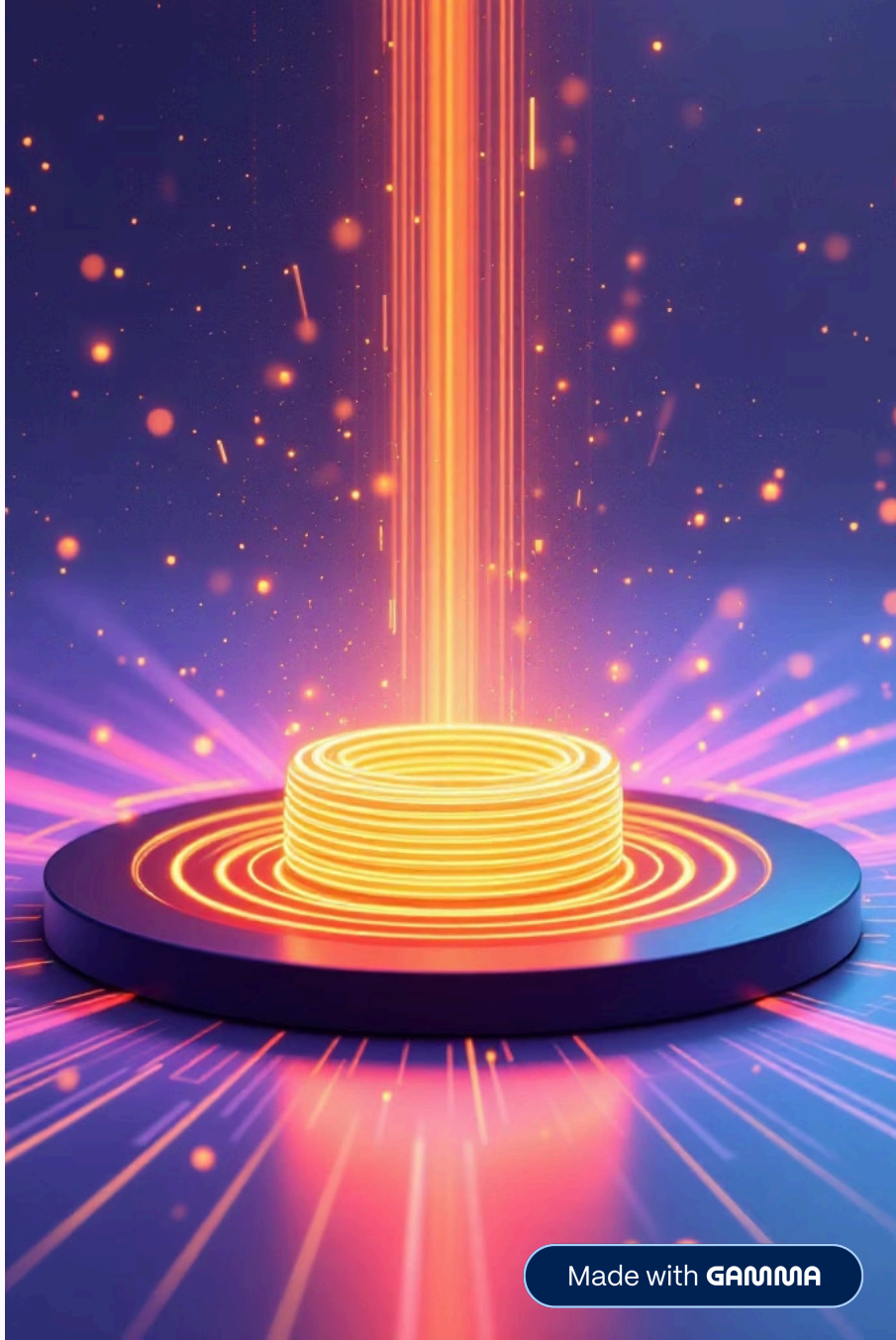
High-Surface Matrix

Internal chamber packed with Microporous Alumina-Silica Ceramic Fiber, increasing evaporation surface area by 400%.

03

BEV Technology

Pre-heats liquid E100 to boiling point in sealed internal pipe before nozzle exit, transitioning from "Liquid Burner" to "Gas Burner."



Pressure and Flow Regulation

Vapor Reservoir

Chamber acts as regulated pressure vessel, delivering dry ethanol gas at 30–50 mbar to mimic standard LPG regulator flow rate.

Jet Compatibility

Fuel delivered in gaseous state maintains existing LPG burner's Venturi effect, drawing oxygen for high-velocity Blue Kinetic Flame exceeding 1,600°C.

Automated Safety Systems

Multi-layered electronic and mechanical defense requiring zero extra fittings to existing LPG stove:

1

Internal Pressure-Logic Protection

Digital Pressure Transducer monitors vapor line. If burner turns off or leak detected via pressure fluctuations, controller instantly cuts power to induction coil and closes Solenoid Fuel Valve.

2

Thermal Runaway Protection

Mechanical Thermal Cut-Off (TCO) Fuse integrated into chamber breaks circuit if temperatures exceed 110°C, preventing over-pressurization.

3

Pressure Relief

Spring-loaded valve tuned to vent excess vapor safely if internal pressure exceeds operating threshold.

4

Flashback Arrestor

Stainless steel mesh at vapor outlet prevents internal ignition in fuel line.

Performance Comparison (20kg Metric)

Metric	Commercial LPG	Ethanol + IPCR
Energy Content	920 MJ	540 MJ
System Efficiency	55%	85%
Effective Heat Output	506 MJ	459 MJ
Cooking Duration	~65 Hours	~62 Hours
Operating Cost (Est.)	Rs. 1,950	Rs. 1,400

Strategic Advantages

Eliminates High-Pressure Hazards

Ethanol stored at atmospheric pressure; leaks do not create pressurized gas cloud risks.

Enables "Pay-as-you-go"

Modular fueling model (buying 1-litre at a time) lowers barrier for low-income households.

Supports Indian Infrastructure

Leverages India's 2026 ethanol surplus (maize, sugarcane, damaged grains) for 100% domestic, carbon-neutral solution.

Conclusion: Economic and Strategic Viability

The IPCR module represents a shift from "backup fuel" to a primary, high-performance cooking technology.

Key Benefits

- Superior cooking duration and thermal intensity
- 28% cost reduction vs. commercial LPG
- 85% system thermal efficiency
- Enhanced safety profile
- Domestic fuel infrastructure

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Positioning the Retro-Box between the E100 tank and the stove enables a transformative shift in cooking technology—delivering superior performance, enhanced safety, and significant cost savings while supporting domestic infrastructure.

Contact: Denny Jacob | denny.jacob@onlinetoolsx.com