Portable Electric Stove

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Exploring innovation in kitchen appliances

INTRODUCTION

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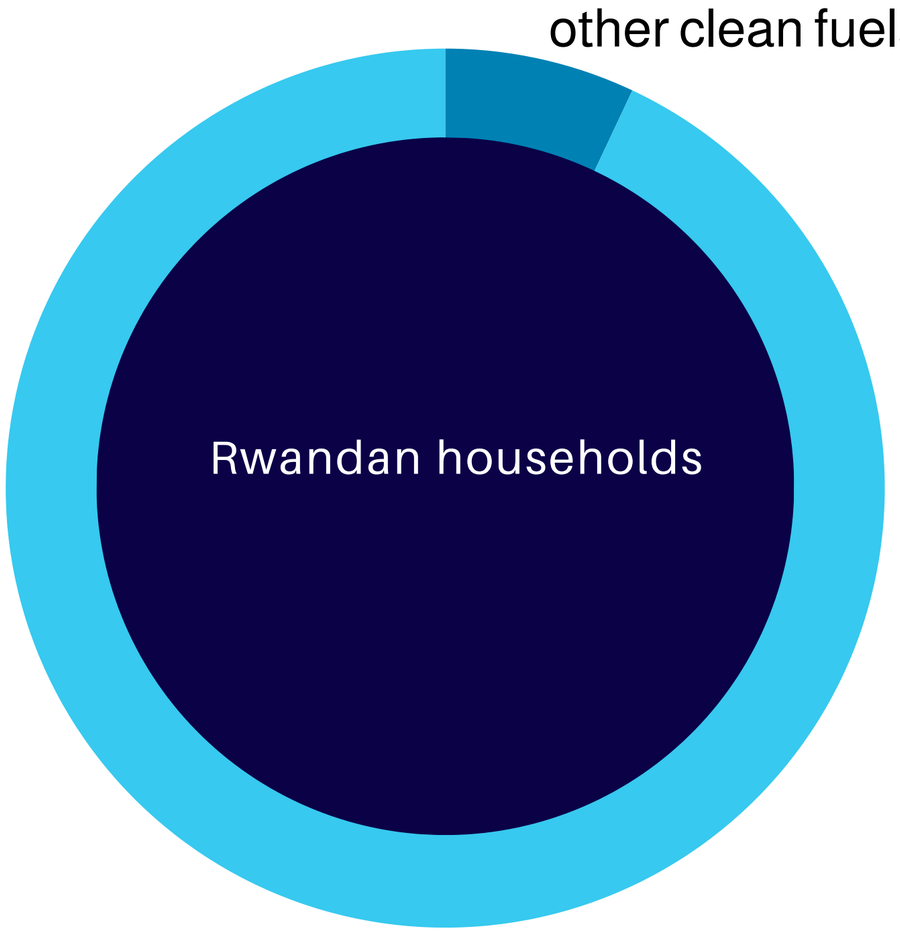
- This project proposes a compact electric stove integrated with an oven.
- It provides a modern, energy-efficient, and smart cooking solution.
- Designed for people in small homes, hostels, rural areas, or travelers.
- Combines portability, smart features, and environmental responsibility.

Background



- **These fuels cause indoor air pollution, deforestation, and health risks.**
- **Electric stoves are cleaner but often bulky and power-hungry.**
- **There’s a gap for a portable, efficient, smart cooking appliance.**

PROBLEM STATEMENT

01 Conventional stoves lack portability and smart features

02 High power consumption and safety issues

03 Unsuitable for small spaces and travel needs

Main Objective

Design a lightweight, energy-efficient, smart portable electric stove with an integrated oven for homes and mobile use.

SPECIFIC OBJECTIVES

01 Use sustainable materials

02 Ensure compact and durable design

03 Improve energy efficiency

04 Integrate a smart control system (ESP32 + app).

05 Test and validate functionality and safety

RESEARCH QUESTIONS

01. What materials minimize weight and maximize efficiency?

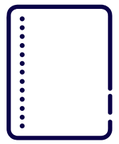
02. How can we optimize space without losing durability?

03. What smart control system fits compact stove needs?

04. How do we validate user safety and usability?

05. What environmental and cost benefits does this offer?

Literature Review



Studies show nichrome coils and stainless steel enhance efficiency.

Previous designs lack smart control or portability focus.

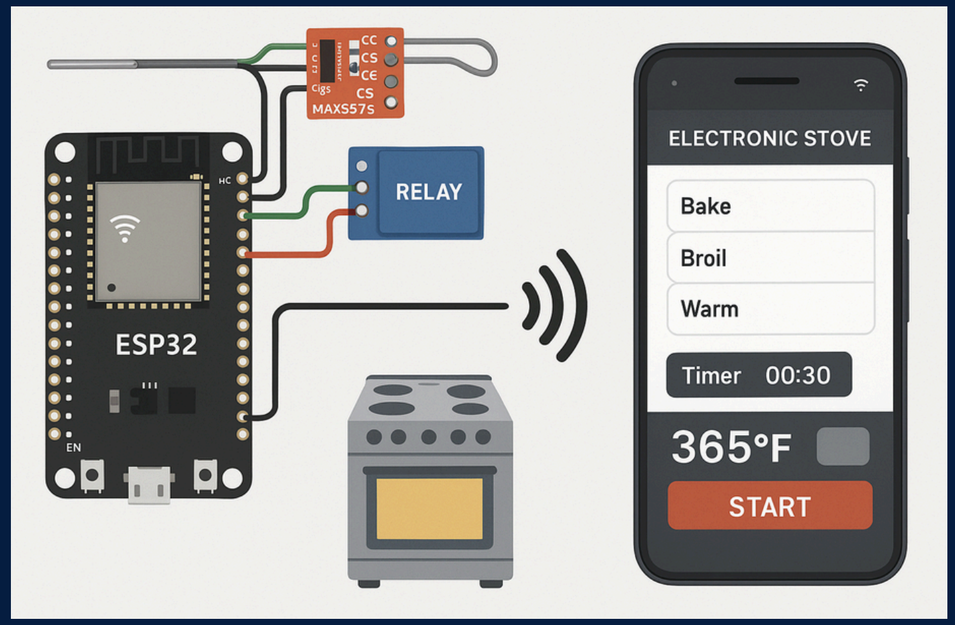
This project fills the gap: small, smart, low-energy oven-stove combo.

Aligned with SDG 7 & SDG 12 (clean energy + sustainable production).

Methodology Overview

The project used a Design-Based Research (DBR) approach to address the need for a smart, portable cooking solution.

The prototype was modeled in SolidWorks, simulated in COMSOL, and controlled using an ESP32 microcontroller.



System Design Overview

The system features a compact structure that integrates a stovetop heating coil and resistive oven elements, enclosed with proper insulation to ensure efficient heat retention and safe operation.

Fabrication Summary

- Cutting and shaping the metal
- Assembling the heating components safely
- Integrating the oven with stove
- Testing structural integrity and durability
- Applying heat-resistant coatings uniformly
- Installing electrical wiring and connections
- Quality assurance and safety checks
- Final assembly and packaging for delivery

User Target Groups

01 Identifying key user demographics and needs

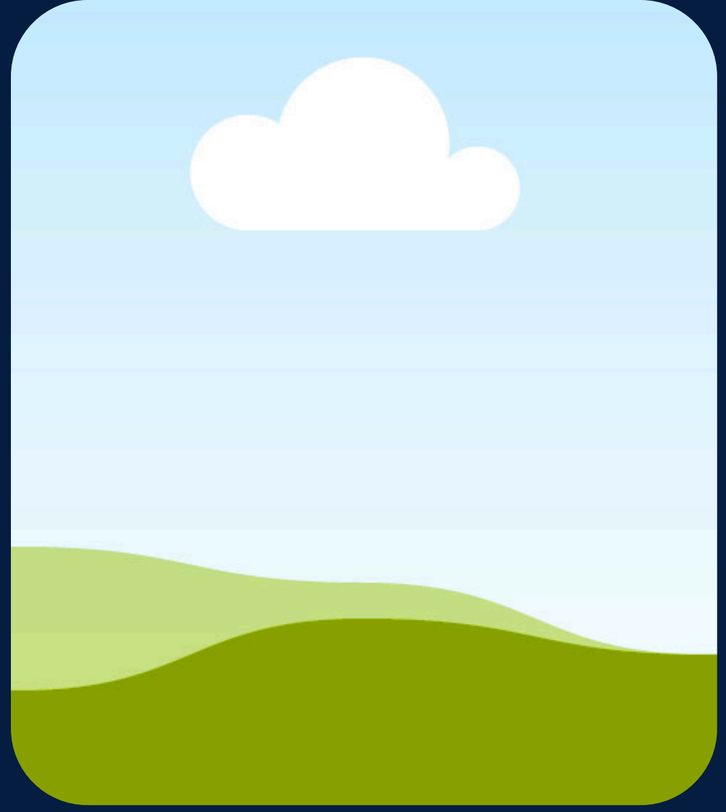
Understanding users' preferences is essential.

02 Potential market segments for the product

Targeting urban dwellers with limited space.

03 Environmental considerations for user selection

Eco-conscious consumers are increasingly important today.



Testing Results Overview

Testing confirmed that the system heats efficiently to 317°C, distributes heat evenly, reduces energy use, and is user-friendly and safer than traditional gas stoves.

Conclusion

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The system met its goals by being portable, compact, and smart. App control improves energy use, making it ideal for urban and off-grid cooking.

Recommendations

01 Upgrade app for recipe suggestions and usage logs.

02 Add solar charging to enhance off-grid functionality.

03 Improve insulation materials for faster heating.

Environmental Sustainability Impact

- Reduced biomass use helps combat deforestation.
- Less indoor smoke led to better health outcomes.
- Promotes responsible energy use (SDG 12).
- Accessible for low-income or remote households.

References

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3. Nyaga, H. N., Ndayishimiye, I., Ntivunwa, D., & Alonso, J. B. (2021, June). Policy and market review for modern energy cooking in Rwanda. Energy 4 Impact.
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Questions and Discussion

Research Insights

- Innovative design for modern kitchens
- Energy-efficient cooking solutions available
- User-friendly features for convenience

Future Considerations

- Potential for market expansion opportunities
- Ongoing research for improved technology
- Enhancements based on user feedback

Thank you !

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