Feasibility Report

Feasibility Report: Enugu Clean Cookstove Carbon Project
Location: Enugu State, Nigeria

Project Owner: Powerstove Energy
Crediting Period: 5 years (2024–2028)

1. Executive Summary

The Enugu Clean Cookstove Carbon Project aims to deploy **15,000 Powerstove T100 units** (58.9% thermal efficiency) to replace traditional three-stone fires, reducing deforestation, greenhouse gas emissions, and health risks. Funded by **NASENI** (IoT devices) and **Powerstove Energy** (stoves), the project leverages carbon finance under the **Tyndall Carbon Standard** (aligned with **AMS-II.G**). Key feasibility insights include:

- **Annual Emission Reductions**: 43,950 tCO_2e (net after 10% buffer pool).
- **Financial Viability**: $1.91M net profit over 5 years, with a **2-year payback period**.
- **Co-Benefits**: $197,775/year from health, gender, and economic uplift.

2. Technical Feasibility

Technology Suitability

- **Stove Efficiency:** Powerstove T100 achieves **58.9% thermal efficiency,** validated by third-party labs, reducing pellet consumption to 2 kg/day (vs. 12.4 kg wood/day baseline).
- **IoT Monitoring:** $38/unit IoT devices track real-time usage and fuel savings, ensuring MRV compliance. Data transmitted via GSM networks (coverage: 95% in Enugu).

Fuel Supply Chain

- **Pellet Production**: 15,000 stoves require **10,950 tonnes/year** of pellets.
    - **Feedstock**: Sawdust (60%) and post-harvest waste (40%) sourced from 10 local suppliers.
    - **Capacity**: Existing pellet mills can scale to meet demand (current output: 12,000 tonnes/year).

Manufacturing & Deployment

- **Stove Assembly**: Local workshop in Enugu assembles stoves ($30/unit).
- **Training**: 50 technicians trained for maintenance; spare parts stocked regionally.

3. Economic Feasibility

Cost Analysis

Category	Cost
Upfront Costs	$1,020,500 (stoves + IoT + registration)
Annual OpEx	$798,451 (O&M, insurance, fees)
Beneficiary Payments	$600,000/year

Revenue Streams

- **Carbon Credits:** 39,555 tCO_2e/year × $30 = **$1,186,650/year.**
- **Co-Benefits: $197,775/year** (certified premium).
- **Total Revenue (5-year): $6.92M.**

Profitability

- **Net Profit (5-year)**: **$1.91M** after costs.
- **ROI**:
  - **Powerstove**: 315% ($1.53M profit on $450k investment).
  - **NASENI**: 55.9% ($344k profit on $570k investment).

Sensitivity Analysis

Variable	Impact on Profit
Carbon price drops to $25	Profit ↓ 17% ($1.58M)
fNRB adjusted to 30%	Credits ↓ 14% ($1.64M)
Adoption rate 90%	Profit ↓ 10% ($1.72M)

4. Environmental Feasibility

Emission Reductions

$$\frac{12.4\,\text{kg/day} \times 365}{1,000} \times 1.85 \times 0.35 = 2.93\,\text{tCO}_2\text{e/year/stove.}$$

- **Annual Reductions:** 43,950 tCO_2e (net after buffer).

Deforestation Mitigation

- **Wood Saved:** 6,200 tonnes/year (prevents ~50 hectares of forest loss annually).

Sustainability of Pellet Production

- **Waste Utilization:** 100% of pellets from agricultural/industrial waste (zero competition with food crops).

5. Social Feasibility

Community Impact

- **Health:** Reduces HAP-related diseases, saving 225 DALYs/year (WHO methodology).
- **Livelihoods**:
  - **Households**: $40/year direct payment (5 years).
  - **Jobs**: 6,000+ jobs in pellet production (40% female employment).

Stakeholder Acceptance

- **Surveys**: 85% of households prefer Powerstove (faster cooking, less smoke).
- **Cultural Fit**: Pellet stoves align with traditional cooking practices.

6. Risk Analysis & Mitigation

Risk	Likelihood	Impact	Mitigation
Carbon Price Volatility	Medium	High	60% credits pre-sold via forward contracts ($25 floor).
Pellet Supply Disruption	Low	Medium	Contracts with 10 suppliers; buffer stock for 3 months.
fNRB Reassessment	Low	High	Annual satellite audits + World Bank data validation.
IoT Failure	Medium	Medium	Redundant devices; local repair hubs.

7. Regulatory & Compliance

- **Local Permits**: Approved by Enugu State Environmental Agency.
- **Carbon Standard**: Tyndall aligns with **UNFCCC AMS-II.G**; validation by SGS.
- **NDC Alignment**: Supports Nigeria's goal to reduce emissions by 20% by 2030.

8. Conclusion

The Enugu Clean Cookstove Project is **technically viable, economically profitable, and socially impactful**. With robust risk mitigation, compliance with carbon standards, and strong community engagement, it offers a scalable model for clean cooking in Sub-Saharan Africa.

Appendices:

- Emission Calculation Worksheets
- Supplier Agreements
- Community Survey Results
- Financial Model (5-Year Cash Flow)

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