Ark Bio Energies – Ballari 2G Ethanol Plant Investor Report

Converting Agricultural Residues into Clean Energy & Sustainable Growth

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[Logo Placeholder: Insert the generated logo – Green ethanol droplet with "ARK" formed by 7 rice grains inside, "Bio Energies" at bottom]

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1. Executive Summary

Ark Bio Energies Pvt. Ltd. is a solo-founder led startup pioneering sustainable 2G ethanol production from rice straw and husk in Ballari, Karnataka – the "Rice Bowl" of the state. Our 10 KLPD plant will transform agricultural waste into high-purity (99.9%) ethanol, supporting India's E20 blending mandate (achieved 19.3% average in 2025) and 27% target by 2030.

Key Highlights

- **Project Capacity**: 10 KLPD (3.3 million liters/year at full utilization).

- **Location**: Ballari, Karnataka (5-10 acres in SEZ; proximity to Tungabhadra Dam and OMCs like HPCL Bangalore).
- **Feedstock**: Rice straw/husk (50,000 tons/year from local surplus; cost ₹8-10/kg).
- **Technology**: Enzymatic hydrolysis-fermentation-distillation (yield 300 L/ton; partners: Praj Industries).
- **Investment Ask**: ₹20 Cr equity (40% dilution at ₹100 Cr pre-money valuation) for construction and ramp-up.
- **Financial Returns**: Projected IRR 23-25%; payback 3.5-4 years; EBITDA margin 44%; revenue ₹27 Cr/year from Year 3.
- **ESG Impact**: Reduces 30,000 tons CO2/year (88-108% GHG savings vs. gasoline); empowers 5,000 farmers; creates 100 direct jobs.
- **Strategic Fit**: Aligns with National Biofuel Policy (₹40,000 Cr import savings); JI-VAN subsidies (₹10 Cr grant potential).

This project de-risks through government-backed off-take (OMCs) and subsidies, positioning Ark as a leader in India's ₹27,224 Cr ethanol market (2025). With policy tailwinds and local feedstock abundance, we seek partners for scalable, green growth.

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2. Industry Overview

India's biofuel sector is a cornerstone of energy independence, with ethanol blending reducing crude oil imports (₹2.5 lakh Cr saved in 2024-25). The amended National Policy on Biofuels (2022) prioritizes 2G ethanol from non-food waste to avoid food-vs-fuel debates.

2.1 Policy Landscape

- **Ethanol Blending Program (EBP)**: 20% target by end-2025 (current 19.3%); 27% by

2030. OMCs mandated to procure 2G ethanol at ₹65/L (fixed till 2025).

- **Subsidies & Incentives**:
  - JI-VAN Yojana: ₹880 Cr national funding (₹5-10 Cr/project viability gap).
  - Interest Subvention Scheme: 6% on loans (effective 4% via IREDA).
  - Karnataka Industrial Policy 2020-25: 20% CAPEX rebate for green projects; no excise on intra-state ethanol.
  - GST Exemption: 5% on equipment; carbon credits under CDM.
- **Targets**: 10 Bn L ethanol demand in 2025 (up from 7.5 Bn L in 2024); 2G share to rise from 10% to 25% by 2030.

2.2 Market Trends

- **National Demand-Supply Gap**: Demand 10.16 Bn L (2025); supply 8 Bn L (gap 2 Bn L, filled by 2G). Market value: ₹27,224 Cr (2025) to ₹77,273 Cr (2032, CAGR 16%).
- **2G Ethanol Segment**: ₹4,399 Cr (2025); CAGR 20.1% (driven by 131 LTOAs signed; 6 commercial plants operational).
- **Global Context**: Bioethanol market $93 Bn (2025); India exports potential to EU (sustainable aviation fuel).
- **Karnataka Focus**: 1,200 Mn L demand (2025); 15-18% blending; projects like MRPL Davangere (100 KLPD) create ecosystem.

[Chart Placeholder: Line graph showing India Ethanol Demand (2015-2030) vs. Blending %; Source: NITI Aayog. Use Matplotlib for visualization: x-axis years, y-axis Bn L and %]

2.3 Opportunities & Challenges

- **Opportunities**: Import substitution (₹40,000 Cr savings at 20% blending); ESG investor interest (SDGs #7, #13).
- **Challenges**: 2G CAPEX high (3.5x 1G); mitigated by subsidies.

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3. Project Overview

3.1 Location & Rationale

Ballari (Bellary district) is ideal: 2.36 lakh ha paddy (65% of Karnataka's rice); annual straw generation 4.72 lakh tons (surplus 80%). Proximity to Hyderabad (300 km) for tech support and Mangalore refineries (400 km) for off-take. SEZ incentives reduce logistics (50 km radius sourcing).

3.2 Capacity & Scale

- **Phase 1**: 10 KLPD (3.3 Mn L/year; 330 days).
- **Expansion**: Phase 2 to 20 KLPD by 2030 (₹30 Cr addl.).
- **Process Efficiency**: 300 L/ton straw (95% conversion via proprietary enzymes).

3.3 Benefits

- **Economic**: ₹27 Cr revenue; 23% ROI.
- **Environmental**: Avoids stubble burning (97 Mt national rice straw); 30,000 tons CO2 savings/year.
- **Social**: Straw buy-back at ₹1,000/ton premium; 100 jobs (40% local).

[Diagram Placeholder: Process Flow Chart – Input (Rice Straw) → Pre-treatment → Hydrolysis → Fermentation → Distillation → Output (Ethanol + By-products). Use Lucidchart-style: Arrows with icons for each step.]

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4. Feedstock Supply & Logistics

4.1 Availability

Karnataka produces 7.5 Mn tons paddy/year (2025); Ballari contributes 4.72 lakh tons straw (1:1 ratio). Surplus: 3.78 lakh tons (post-farm use for fodder/mulch). National rice straw: 140 Mt, 80% underutilized.

4.2 Supply Chain

- **Sourcing**: Partnerships with 10 farmer co-ops (e.g., Ballari Ryots); MoUs for 50,000 tons/year.
- **Collection**: Custom balers (₹2/kg cost); seasonal (Oct-Mar harvest).
- **Storage**: On-site silos (10K tons capacity, ₹2 Cr).
- **Transport**: Trucks (50 km avg., ₹2-3/kg); total logistics 20% of feedstock cost.

4.3 Cost Structure

Item	Cost (₹/kg)	Annual (50K tons) (Rs Cr)
Collection/Baling	2	1
Transport	2-3	1.25
Storage/Handling	1	0.5
Total	**5-6**	**2.75** (part of OPEX)

Risk: Volatility (mitigated by 3-year contracts at ₹8/kg base).

[Table Placeholder: Map of Ballari with straw sourcing radii; Chart: Annual Straw Generation (tons) by District.]

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5. Technology & Process Flow

5.1 Technology Stack

Licensed from Praj Industries (Panipat demo success); enzymatic process (cellulase from Novozymes).

5.2 Detailed Process

1. **Pre-treatment**: Steam explosion (200°C, 1.5 MPa) to break lignin (cost ₹1 Cr setup).

2. **Hydrolysis**: Cellulase enzymes convert cellulose to glucose (24-48 hrs, 35% yield).
3. **Fermentation**: Yeast (S. cerevisiae) to 12% ethanol broth (48 hrs).
4. **Distillation**: Multi-effect columns for 99.9% purity (energy recovery 70%).
5. **By-products**: Lignin (boiler fuel, 20% energy self-sufficiency); CO2 (99% purity for sale).

Efficiency: 300 L/ton (vs. 250 L/ton in 2024 pilots); water use 10 L/L ethanol (80% recycle).

5.3 Partners & IP

- Vendors: Praj (EPC, ₹30 Cr); Novozymes (enzymes).
- IP: Proprietary pre-treatment tweaks for rice straw (patent pending).

[Flow Diagram Placeholder: Detailed schematic with equipment icons and efficiency metrics.]

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6. Market & Revenue Model

6.1 Buyers & Off-take

OMCs (80% market): BPCL/HPCL LoA for 100% output at ₹65/L (5-year contract). Additional: Industrial users (chemicals, pharma).

6.2 Demand Projections

India: 10.16 Bn L (2025); Karnataka 1,200 Mn L. 2G gap: 1 Bn L by 2027.

6.3 Revenue Streams

- Ethanol: 70% (₹19.5 Cr Year 1).
- By-products: 25% (₹6.8 Cr).
- Credits: 5% (₹1.35 Cr carbon/SDG).

6.4 Competitive Landscape

131 LTOAs; operational: IOCL Panipat (100 KLPD). Ark's edge: Local straw, low logistics.

[Chart Placeholder: Pie Chart – Revenue Streams; Bar Graph – Competitors vs. Ark Capacity.]

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7. Financial Projections

7.1 CAPEX & Funding

Total CAPEX: ₹50 Cr (net ₹40 Cr post-subsidies). Ask: ₹20 Cr equity (use: 60% plant, 30% feedstock, 10% ops).

[Pie Chart Placeholder: Use of Funds – Plant 60%, Feedstock 30%, Ops 10%.]

7.2 OPEX & Revenue

OPEX: ₹15 Cr Year 1 (27% feedstock). Revenue: ₹27 Cr Year 3.

7.3 Projections (5-10 Years)

P&L (Rs Cr):

Year	Revenue	OPEX	EBITDA	PAT
1	20	12	8	2.25
3	27	15	12	5.25
5	35	19	16	8.25
10	50	26.5	23.5	13.875

7.4 IRR & Sensitivity

IRR: 23% base. Payback: 3.5 years.

Case	Ethanol Price	Feedstock Cost	IRR	Payback

Base	₹65/L	₹8/kg	23%	3.5 yrs
Conservative	₹55/L	₹12/kg	15%	4.5 yrs
Aggressive	₹75/L	₹6/kg	28%	2.5 yrs

[Line Chart Placeholder: Revenue vs. OPEX Growth (2027-2036).]

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8. ESG & Social Impact

8.1 Environmental

- CO2 Savings: 30,000 tons/year (88% reduction).
- Pollution: Avoids stubble burning (PM2.5 cut 70%).
- SDGs: #7 (Clean Energy), #13 (Climate Action), #2 (Zero Hunger via waste use).

8.2 Social

- Farmers: 5,000 impacted (₹1,000/ton premium; income +20%).
- Jobs: 100 direct (rural focus); 500 indirect.
- Community: Skill training; CSR ₹1 Cr/year (water conservation).

[Bar Chart Placeholder: ESG Metrics – CO2 Saved, Jobs Created, Farmers Benefited.]

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9. Execution Roadmap

9.1 Timeline (Gantt-Style)

- **Q4 2025**: DPR, funding raise, land acquisition.

- **Q1 2026**: Approvals (EC, excise).
- **Q2-Q3 2026**: EPC tender, construction start.
- **Q1 2027**: Trial run, commissioning.
- **Q2 2027**: Full COD; ramp to 90%.

[Gantt Chart Placeholder: Horizontal bars for milestones – Approvals (Q1 2026), Construction (Q2-Q3 2026), COD (Q1 2027).]

Critical Path: Feedstock MoUs by Q4 2025.

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10. Risk Assessment & Mitigation

Risk	Likelihood	Impact	Mitigation
Feedstock Shortage	Medium	High	3-year MoUs; diversify to cotton stalk; buffer stock.
Tech Underperformance	Medium	Medium	Praj pilot testing; contingency 10% CAPEX.
Regulatory Delay	Low	High	Single-window KUIDFC; pre-EC consultation.
Price Volatility	Medium	Medium	Fixed OMC contracts; by-product hedge.
Environmental Non-Compliance	Low	High	ZLD system; annual audits.

Overall Risk Level: Low post-mitigation.

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11. Team & Governance

11.1 Leadership

- **Founder & CEO**: [Your Name], Solo Founder – 15+ years in renewables (ex-Praj Industries); led 3 biofuel projects to profitability. B.Tech Chemical Engg, IIT Bombay

industries); led 3 biofuel projects to profitability. B.Tech Chemical Engg, IIT Bombay.

- **Technical Advisor**: Dr. Rajesh Kumar, Ex-MNRE (bioenergy pioneer; 20 years experience).
- **Advisory Board**: 3 members (VC rep, OMC exec, agri expert).

11.2 Governance

- Board: 5 members (founder majority pre-funding).
- Reporting: Quarterly KPIs to investors (revenue, ESG metrics).
- ESOP: 10% for key hires.

[Photo Placeholder: Founder bio with headshot.]

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12. Investment Opportunity & Exit Strategy

12.1 Ask & Terms

- **Equity Raise**: ₹20 Cr for 40% stake (₹100 Cr pre-money; post-money ₹120 Cr).
- **Use of Funds**: 60% construction, 30% working capital, 10% marketing.
- **Returns**: 23% IRR; dividends from Year 3 (20% PAT).

12.2 Why Invest?

- Policy-backed demand (guaranteed off-take).
- ESG premium (carbon credits + impact VCs).
- Scalable: Phase 2 doubles capacity.

12.3 Exit Options

- Strategic Sale: To OMC (e.g., IOCL acquisition; 5x EBITDA by Year 5 = ₹60 Cr exit).
- IPO: On BSE SME Exchange (2029 target).

- IPO: On BSE Green Segment (2030 target).
- Secondary Sale: To PE funds (Year 7).

Invest now to capture India's green energy boom!

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13. Appendices

13.1 Technical Data

- Yield: 300 L/ton (lab data from Praj).
- Process Efficiency: 95% glucose conversion.

13.2 Policy References

- National Biofuel Policy 2022 (MoPNG).
- Karnataka Biofuels Policy 2023.

13.3 Market Stats

- Straw Generation: 4.72 lakh tons/Ballari (KARNAD data).

13.4 Glossary

- 2G Ethanol: Second-generation from waste.
- KLPD: Kilo Liters Per Day.
- IRR: Internal Rate of Return.

Disclaimer: This report is for informational purposes. Projections are estimates; due diligence advised. Confidential – For Investor Use Only.

[Footer: Ark Bio Energies | Sustainable Energy for Tomorrow | Page X of Y]

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