Zero Way
Bio Energy

To build scalable bioenergy infrastructure that converts India’s agricultural surplus into reliable, low-carbon energy for industry and power.

Biomass Pellet Manufacturing

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Section 1

The Problem

- India’s Air Pollution Crisis: Quantified Economic & Human Impact
- India’s Stubble Crisis Is a Massive Untapped Energy Resource
- India’s Biomass Pellet Revolution: Massive Market Opportunity Awaits

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Stubble burning is a key source of India's air pollution crisis

"India's Silent Economic Killer: Air Pollution Outpaces Tariffs as Top GDP Threat"
- Gita Gopinath (Davos 2026)

WORLD ECONOMIC FORUM

AQI

Quantified Economic & Human Impact

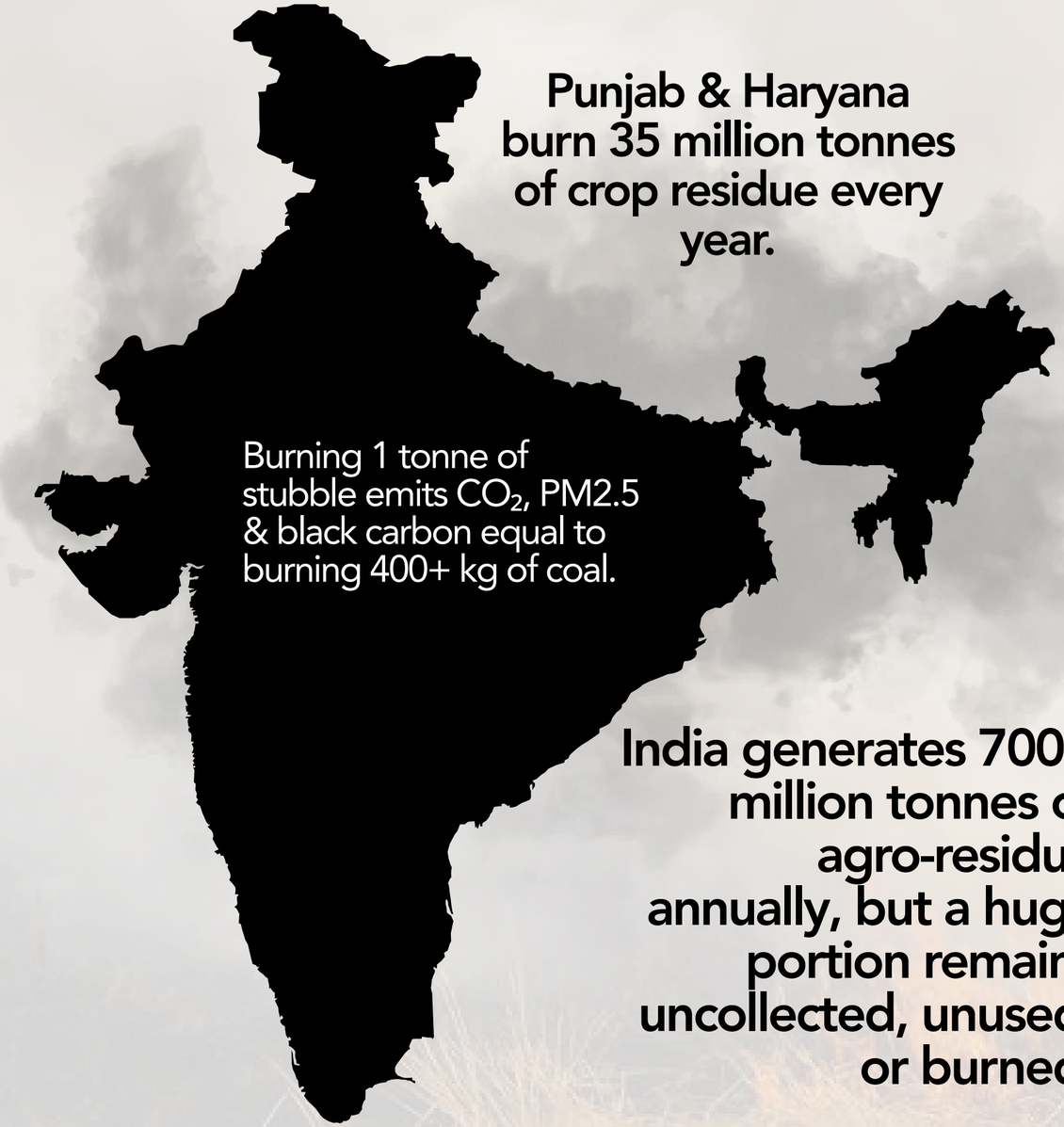
Metric	Verified Range
GDP loss due to air pollution	6% (World Bank) → ~9% (Lancet)
Working days lost annually	1.3 billion days
Deaths attributable to air pollution	~2 million/year (~5,500/day)

Crop residue burning is a dominant seasonal amplifier in Delhi-NCR pollution

Media & government-linked estimates **38–48% of winter PM2.5 spikes are linked to stubble burning**, depending on wind and inversion conditions.

REPUBLIC TV INDIA TODAY

India’s stubble crisis is a massive untapped energy resource



Punjab & Haryana burn 35 million tonnes of crop residue every year.

Burning 1 tonne of stubble emits CO_2, PM2.5 & black carbon equal to burning 400+ kg of coal.

India generates 700+ million tonnes of agro-residue annually, but a huge portion remains uncollected, unused, or burned.

Did you know?

Redirecting even 20% of Punjab–Haryana stubble can produce ~7 million tonnes of biomass pellets, replacing coal and cutting emissions drastically.

Meanwhile, India’s power sector needs millions of tonnes of biomass pellets for co-firing, with a demand curve rising every year.

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India’s Biomass Pellet Revolution: Massive Market Opportunity Awaits

Net Zero Target
2070

Current Coal Usage
792 Million tonnes/year

Biomass co-firing Manadate
7% (FY 2025-26)

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Current Status

Pellets co-fired (FY 24-25)	Pellet Manufacturers
1.62 Million tonnes	230

Pellets co-fired (Cumulative)	Plants with Co-firing
42,08,000 tonnes (3% of required capacity rate)	73 Plants

Untapped Potential

Required pellets due to mandate:
50 Million tonnes/year

TPP’s needing biomass integration:
150+

TAM from Power Sector:
95,000 Crores

Source: Bioenergy International, Ministry of Coal, SAMARTH portal data, PwC, 2024
TPP - Thermal Power Plants

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Section 2

Solution: Biomass Pellet Manufacturing

- Manufacturing & Value Proposition
- From Raw Materials to Renewable Energy
- Details of the Manufacturing Process
- Benefits of Leveraging India’s Transition to Sustainable Energy

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From Raw Materials to Renewable Energy: Pellet Manufacturing process and Industry Applications

Production Process

Acquisition of High Quality Raw Materials

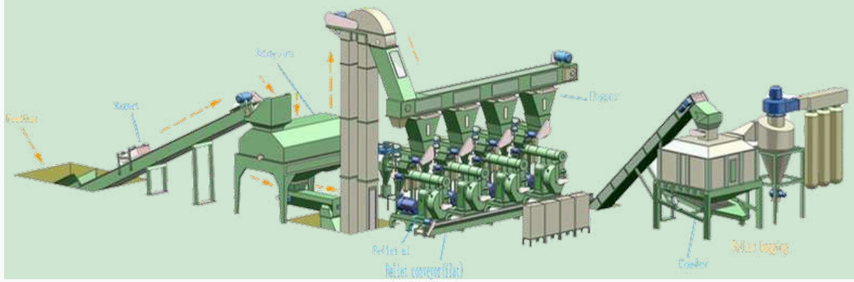
Agri-Residue

Paddy Straw
Wheat Straw
Bagasse
Press Mud
Cotton Stalk
Rice Husk

Forest-waste

Wood
Pine Needle

Processing in Vertical Ring Die Pellet Machine



Products

Biomass Pellets

6 mm
8 mm
10 mm

Industry Applications

Thermal Power

Coal replacement, emission reduction

Food Processing

Industrial heating and steam generation

Gasification

Clean energy generation

Steel

Blast furnace fuel replacement

Chemicals

Alternative fuel and heat processing

Pharmaceuticals

Controlled heat generation

Cement

Kiln fuel replacement and thermal energy generation

Color

Energy for color processing

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Details of the manufacturing process

Raw Material Preparation

Agricultural residues such as Paddy Straw are collected and shredded to facilitate drying.

Drying

The shredded biomass undergoes drying to reduce moisture content to around 10-15%, crucial for palletization.

Pelletization

Dried biomass is compressed through a pellet mill under high pressure, forming cylindrical pellets.

Cooling and Sieving

Newly formed pellets are cooled and sieved to remove fines and ensure uniform size.

Packaging and Storage

Pellets are packaged in bags or stored in bulk under dry conditions to maintain quality.

Quality Control

Throughout the process, quality checks verify pellet size, moisture content, and durability.

Distribution

Finished bio pellets are distributed for use in commercial boilers, industrial furnaces, and biomass power plants.

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Benefits of leveraging India’s position to transition to sustainable energy

Resource Utilization

There is a huge **surplus** of **230 Million Tonnes** of biomass that can transform agricultural waste into a sustainable energy resource

Energy Efficiency

Biomass pellets with a Gross Calorific Value (GCV) of **3,800-4,500 kcal/kg** making them an energy efficient alternative to traditional fuels

Emission Reduction

Enabling a potential reduction of **38 million tonnes** of CO2 emissions annually while simultaneously addressing **assisting India with the Net Zero 2070 target**

Job Creation

A 2 TPH capacity biomass pellet plant can generate approximately **70 direct and indirect sustainable jobs** in rural areas, supporting local entrepreneurship through FPOs

Sustainable Waste Management

By converting agricultural residues into biomass pellets, farmers can **prevent stubble burning, reduce air pollution, and transform waste into a valuable energy resource, with companies**

Source: Press Information Bureau , EAI, Biomedical Research

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Section 3

Government Enablement & Market Demand

- Government Support & Market Adoption
- Enabling Biomass at National Scale
- Government Incentives Powering the Bioenergy Ecosystem
- India’s Industrial Backbone Is Turning to Biomass

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Enabling Biomass at National Scale

What is Samarth Mission?

- **National Mission under the Ministry of Power** to mandate and operationalize biomass co-firing in coal-based Thermal Power Plants.
- **Objective:** Convert surplus agri-residue into regulated fuel, reduce stubble burning, and decarbonize the grid without new infrastructure.

SAMARTH compresses time-to-scale by standardizing the product, upskilling the ecosystem, and removing go-to-market friction for pellet manufacturers.

Key Responsibilities and Support

- **Standardization:** Defines uniform biomass pellet specifications and testing protocols to enable acceptance across all TPPs.
- **Workshops & Capacity Building:** Supports R&D collaboration on biomass properties, pellet quality, and boiler compatibility for higher co-firing.
- **Streamlining of Processes:** Works with government and financial institutions to enable seed funding / initial capital for pellet plants.

8 Powerful Government Entities have joined hands for this National Mission

Indian government is taking action to empower the bioenergy ecosystem and incentivze the energy transition through the levers of financing, subsidies and technology

नवीन एवं नवीकरणीय ऊर्जा मंत्रालय
MINISTRY OF
NEW AND RENEWABLE ENERGY

National Bioenergy Programme - Central Financial Assistance (CFA) Rates

Total budget outlay - **Rs. 1715 Crores**

Maximum Project Assistance:

- Non-Torrefied Pellet Manufacturing: **Rs. 1.05 Crores**
- Torrefied Pellet Manufacturing: **Rs. 2.1 Crores**
- Briquette Manufacturing: **Rs. 45 Lakhs**

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- Mandated 5% biomass co-firing in Thermal Power Plants from FY 2024-25 and 7% in FY 2025-26

SAMARTH Mission:

- R&D activity in Biomass and boiler design to handle the higher levels of co-firing.
- Address the constraints in supply chain of biomass pellets and agro-residue and training of personnel through power sector skill council.
- Inclusion of vendor list for sourcing of pellets.

RBI approved 'Biomass pellet manufacturing' under **Priority Sector Lending (PSL)**

CPCB Grant Scheme **up to Rs. 28 lakhs per TPH** for pellet plants in NCR region

IREDA Financing scheme with a minimum loan eligibility **of Rs. 50 Lakhs** covering upto **70%** of the project

PMEGP applicable for 25% subsidy to individuals for establishing projects costing Rs. 5 to Rs. 25 lakhs in the rural areas

- **100% Depreciation** on plant and machinery in the **first year**
- **Income tax holiday for first five years**
- **Exemption of excise duty Incentives** up to 30% of initial investment

- Funding mechanisms through **Agriculture Infrastructure fund** and **Agrisure Fund**
- **Subsidy for purchase of agricultural equipment** and machinery

GeM procurement provisions for Biomass Category

20 + Labs setup for testing of pellets

Source: Ministry of Power, GOI, 2024

India’s Industrial Backbone Is Turning to Biomass

FMCG Industry

ITC Limited

Transitioned to biomass boilers for thermal energy in food factories, achieving over 50% energy consumption from renewable sources, including biomass, as of FY 2023-24

Automotive Industry

IndianOil

ASHOK LEYLAND

Collaborated on pilot trials of methanol-blended diesel (MD15) buses in Bengaluru, utilizing methanol produced from biomass, aiming to reduce crude oil imports and enhance energy security.

Cement Industry

Dalmia Bharat Cement

Aims to replace 100% of fossil-based energy with sustainable biomass by 2035, currently increasing the share of green fuel to 12% and planning to reach 20% within a year.

Hospitality Industry

TAJ

Several heritage and eco-hotels under IHCL (Taj) have transitioned to biomass-fueled boilers for clean heating and energy,

Conglomerate

ADITYA BIRLA GROUP

Announced a ₹500 crore investment in biomass projects

Textile Industry

ARVIND FASHIONING POSSIBILITIES

Arvind Fashion have entered into a partnership to build a large-scale cotton stalk torrefaction plant in Gujarat, with a capacity of 40,000+ tonnes per year

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Section 4

Execution Readiness & Unit Economics

- Technology, Operations & Execution Readiness
- Secured Feedstock & Supply Backbone
- Soft Offtake Commitments from Industry
- Technology Partnerships in Place

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We have the supply - Secured Feedstock from Local FPOs – Building a Sustainable Biomass Backbone

Locations

- **Local sourcing reduces logistics cost**
- **Long-term stable supply contract**
- **Backed by community and rural job creation**

Agro Waste Type	Paddy Straw
GCV (Kcal/Kg)	3600
Ash (%)	10-15%
Moisture (%)	8-10%

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We have the demand - Soft Offtake Commitments Secured with Leading Industry Players

Stakeholders Expressing Offtake Interest

ITC Limited

BIKANERVALA

SUPER SHAKTI

एनटीपीसी NTPC

- All buyers seeking ESG-aligned, traceable, and clean energy alternatives
- Pellets priced at ₹9–11/kg present a cost-efficient, emission-reducing solution
- Buyers are eligible for carbon credit co-benefits, enhancing climate disclosures

Additional sectors in our target pipeline

Pharmaceuticals & Chemicals: Use in controlled thermal processes

Cement Industry: Pellet use in kilns

Hotels & Hospitals (NCR Region): Clean fuel

GOVERNMENT OF INDIA
MINISTRY OF POWER

Biomass pellet adoption expected to grow from 0.32% to 5%+ in FY25 in TPPs as per SAMARTH Mission.

SUSTAINABLE AGRARIAN MISSION ON USE OF AGRI-RESIDUE IN THERMAL POWER PLANTS
SAMARTH

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We have the technology - Technology Partnerships in Place – Ready to Build, Commission, Operate

Engaged Vendor

GATTUWALA
ENERGY SOLUTIONS PRIVATE LIMITED

Area for Industrial Setup

5500-6000 Sq. Ft

System Design

Fully automated 7 TPH pellet production line

Core Equipment

- Cutter
- Hammer Mill
- Cooler
- Packing Unit
- Dryer
- Pelleting Unit
- Screener

Equipment Samples

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Feedstock & Operations – Structured, Scalable, Secure

Cost/MT	₹ 4700
Yield Efficiency	98%
Run Time	16 hrs/day 330 days/year
Machine Capacity	4 TPH
First Year Production	10,349 MT @ 80% capacity

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Feedstock & Operations – Structured, Scalable, Secure

Operational & Manpower Plan

Shift: Single 8-hour shift
Production Capacity: 5 tons/hour
Annual Target: 10,000–12,000 MT
Manpower: 12 workers + 2 supervisors per shift

Project Implementation Timeline

Milestone Schedule:
Total Duration: ~4–5 months
Month 1–2: Procurement & civil works
Month 3–4: Equipment installation
Month 5: Commissioning & operations

Scenarios Modeled

Variable feedstock prices: ₹1800 to ₹2200 per MT
Power/fuel costs factored with grid and DG scenarios
Pellet market pricing assumed at ₹9–10/kg

Regulatory & Statutory Readiness Approvals

Land ownership documents and electricity connection
No NOC or EC required (project classified under Green Category)
Pollution control norms met through dust collectors

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We’ve got the straw. The spark. The steam. Now we just need you on the team.

Focus Areas

Project Finance
Debt/equity partnership

Tech Collaboration
R&D for pellet testing, torrefaction

Distribution/Channel Partners
Sell via agritech, logistics networks

Corporate CSR/Carbon Credits
Companies to co-own pellet sourcing

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Section 5

Team & Governance

- Core Team
- Advisory Board
- Thank You

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Core Team

Tushar Narula

Director - Zero Way

tushar@zeroway.in

www.tusharnarula.in

- **Sustainability Consulting:**

pwc

EY Parthenon

- **Sustainability Research Affiliations:**

Harvard University Graduate School of Design

MIT Climate CoLab

UNIVERSITY OF CAMBRIDGE INSTITUTE FOR SUSTAINABILITY LEADERSHIP

- **Education:**

Berkeley UNIVERSITY OF CALIFORNIA

Imperial College London

- **Representation and Published Works:**

G20

CNN NEWS18

COP26

COP28 UAE

ALDAR

Sanjay Narula

Director - Zero Way

sanjay@zeroway.in

- **Business Ventures:**

apexOne

Apex Travel & Tours

- **Work Experience:**

KMD

- **Industry Leadership:**

TAAI

IATA

35+ years work experience at the intersection of travel hospitality and re-insurance industries

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Advisory Board

Suresh Batra

Senior Advisor - Zero Way Bioenergy

- Over **four decades of leadership in India's energy sector,** advising on upstream project execution, asset operations, and cross-border joint ventures with premier institutions like ONGC, Vedanta, and GNPOC (Sudan), bringing **deep regulatory and techno-commercial insight to Zero Way Bioenergy's pellet manufacturing strategy.**
- Expertise in **policy interfacing and government engagement** ensures alignment with India's biomass co-firing mandates and eligibility for subsidies, central financial assistance, and priority sector lending.
- **Proven track record of setting up and managing high-capacity energy production units**; instrumental in guiding Zero Way's roadmap for optimized raw material supply chains, safety standards, and industrial heating applications for pellet utilization.
- **Brings vital experience from early-stage energy projects and international partnerships to foster Zero Way Bioenergy's collaborations with NTPC, thermal power plants.**

Thank You

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