

## Initiatives in Energy Transition and Climate Action to drive Praj's Global Growth.

**Pune, February 22, 2023:** Praj Industries' Founder Chairman Dr. Pramod Chaudhari interacted with media to apprise them about company's various initiatives on the business growth and social commitment. This press briefing commemorates Praj's entry into the Ruby year (40<sup>th</sup> Year) of its journey. Also present on this occasion were Mr. Shishir Joshipura, CEO & MD and Mr. Sachin Raole, CFO & Director (Resources).

Emphasizing importance of sustainable development, Dr. Chaudhari underlined dire need to combat evils of climate change. He cited that insurance industry's losses fueled by climate change are now regularly exceeding \$100 billion a year. He stressed that bioeconomy has emerged as one of the most promising sustainable climate actions. He also shared progress of number of initiatives Praj has been taking in bioeconomy to propagate Renewable Chemicals and Materials as well as biofuels.

In the pursuit of low carbon economy, Praj is developing sustainable solutions in the form of Renewable Chemicals and Materials (RCM). To curb evils of plastic menace and to support government of India's single use ban on plastic Praj has developed technology to produce bioplastics i.e. Polylactic Acid (PLA) as part of its Bio-Prism™ portfolio. To accelerate commercialization of bioplastics, Praj is setting up first of its kind demo plant for Polylactic Acid (PLA) at Jejuri in the outskirts of Pune. This pilot facility will be used for scaled production of Food Grade Lactic Acid and Polylactic Acid. [\(1\)](#)

While ethanol blending in petrol is already established as a strong solution to decarbonize surface transportation, Sustainable Aviation Fuels (SAF) is emerging solution for cleaner skies. Earlier, Praj had developed technology with US based GEVO Inc. and had entered into MoU with IOCL for production of SAF. Recently in an MoU with Axens of France for building SAF projects, Praj is developing resilient industry ecosystem to capitalize promising opportunities in SAF. [\(2\)](#)

To address growing opportunity basket from Energy Transition and Climate Actions (ETCA) agenda, Praj is setting up most modern manufacturing facility to be housed into a new subsidiary. The new facility will be setup near a major port with an investment of Rs. 100 crores. The existing Kandla facility will continue to serve the current market of Oil & Gas and Fertilizers while new facility will be dedicated to opportunities from the ETCA segment. [\(3\)](#)

To build on the rich legacy of four decades of leadership in global bioeconomy and to secure new opportunities ushering on the horizon, Praj has launched a comprehensive Transformation program. BAIN & Co, a top tier management consulting firm has been roped in to develop strategic blueprint to ensure sustainable growth in the coming decade, to strengthen Praj’s global leadership in bioeconomy.

As part of its social commitments, Praj has undertaken a project to create a model Net Zero and Climate Resilient village at Mandede in Mulshi taluka near Pune. Praj has engaged Gokhale Institute of Politics and Economics, for validation. [\(4\)](#)

Talking about all these developments, Dr. Pramod Chaudhari said, “We have unprecedented business opportunities ahead on the back of rising awareness about climate change and strong global mandates. We believe we are in good position to capitalize these, given our unique business philosophy of R&D to D&D i.e. design & deployment and formidable track record. We are also gearing up for the next phase of growth by making strategic investments to enhance our delivery capabilities.”

Founded in year 1983 as an agri processing venture to facilitate inclusive growth of the farming community, Praj is credited with one of the most successful IPO in 1993. With introduction of biofuels as *swadeshi indhan* in 2003, Praj strode into the biofuels industry to propagate positive socio-economic-environmental impacts globally. Biofuels industry in India started gaining momentum around 2013 and has achieved ethanol blending in excess of 11% by early 2023. [\(5\)](#) In past 4 decades, Praj has over 1000 customer reference in more than 100 countries across all 5 continents.



### **Praj Industries Limited:**

Praj, India's most accomplished industrial biotechnology company is driven by innovation, integration and delivery capabilities. Over the past four decades, Praj has focused on the environment, energy, and agri-process industry, with 1000++ customer references spanning 100+ countries across all 5 continents. BioMobility™ and Bio-Prism™ are the mainstays of Praj's contribution to the global Bioeconomy. The BioMobility™ platform offers technology solutions globally to produce renewable transportation fuel, thus ensuring sustainable decarbonization through circular bioeconomy. The company's Bio-Prism™ portfolio comprises of technologies for production of renewable chemicals and materials, promises sustainability, while reimagining nature. Praj Matrix, the state-of-the-art R&D facility, forms the backbone for the company's endeavours towards a clean energy-based Bioeconomy. Praj's diverse portfolio comprises of Bio-energy solutions, Critical process equipment & skids, Breweries, Zero liquid discharge systems and High purity water systems. Led by an accomplished and caring leadership, Praj is a socially responsible corporate citizen. Praj is listed on the Bombay and National Stock Exchanges of India.

For more information, visit [www.praj.net](http://www.praj.net).

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## ANNEXURE (1) : RENEWABLE CHEMICALS & MATERIALS (RCM)

Praj's strategy has been to expand its business horizons by leveraging its innovative, technology solutions in Bioeconomy. As a part of its Bio-Prism™ portfolio, Praj is developing technologies to produce bio-based Renewable Chemicals and Materials (RCM). RCM produced from bio-based feedstocks, are sustainable alternatives to products made from fossil resources.

Today most of the chemicals and materials are derived from fossil sources which are neither ecofriendly nor biodegradable. BioPrism™ portfolio comprises of cluster of technologies to produce renewable chemicals & materials that promise sustainability.

Praj's Bio-Prism™ portfolio comprises a variety of bio-industrial products, including bioplastics as a priority, along with cellulose-lignin refinery products and specialty products. These products have applications in industry sectors such as automotive, packaging, furnishing, construction, agriculture, and food. Over the short to medium term, Praj plans to commit substantial resources for technology and application development with its strategic partners.

Praj has ventured into the renewable chemicals space by developing multiple successful technologies like Furfural technology, leveraging lignin to obtain lignosulfonates and bio-bitumen. Lignosulfonates and Bio-bitumen are the only bio-based alternative for Asphalt/Bitumen used in cement and road construction.

Biopolymer, an important element in Renewable Chemicals and Materials (RCM), is produced from agricultural resources and can be used as sustainable alternative to plastic. Being biodegradable in nature, it helps conserve environment. Praj's technologies for Polylactic Acid (PLA), Polyhydroxyalkanoates (PHA) & Polyhydroxybutyrate (PHB) are bio-based polymers. In Oct 2022, Praj entered into an MoU with ICT Mumbai to set up "Center Of Excellence & Innovation" (CoEI) for Biopolymers.

Praj also presents an additional segment of bio-based specialty products including Hyaluronic acid, natural waxes, and antimicrobial peptides.

All the efforts are aimed to develop technologies with a focus on three C's i.e. Best in Class, Lowest in Cost, and Carbon.

## ANNEXURE (2) : Sustainable Aviation Fuels (SAF)

Globally civil aviation industry generates approx. 1 billion tons of GHG emissions per year, which is around 2 to 3% of total global emissions. Emissions from global aviation sector are rising at the rate of 2.5% per year, affecting mankind as a whole. To limit the global warming to 2 deg. C, it is imperative to decarbonize this 'hard to abate' aviation sector, and this requires national as well as international goals/policies.

### **What is SAF?**

SAF is a biofuel that has similar properties as that of conventional jet fuel, but has lower carbon footprint. It is produced using sustainable and renewable feedstock such as biomass, sugars, starches, waste lipids and organic waste.

SAF is considered as a priority solution to decarbonize aviation in near term due to its high greenhouse gases (GHG) savings potential, availability of sustainable feedstock and rapidly maturing technologies for processing the feedstock to SAF.

### **SAF production technologies**

Technologies for SAF production are making rapid progress towards commercialization worldwide. In India, SAF produced via ATJ pathway great potential due to surplus availability of feedstock, such as agricultural residues, sugary streams and damaged grains and high level of technology readiness for converting these feedstocks into SAF. There is estimated surplus availability of 178 Mt of agricultural residues and sugarcane, equivalent to 6 million tons of refined sugars.

The technology for production of SAF through ATJ pathway a two-step process, where feedstock such as Agricultural Residues or surplus sugary streams or damaged grains are first converted into Alcohols and Alcohols are further processed into SAF.

### **Regulations/ policy landscape for SAF**

International Air Transport Association (IATA) has estimated that SAF will contribute reduction of around 65% of emissions required, to achieve Net-Zero by 2050 globally.

There is also global momentum for use of SAF, as recently USA has introduced a bill that would provide up to \$2 per Gallon of tax credit to SAF producers, while EU has proposed a mandate to blend 2% of SAF by 2025, gradually increasing to 63% by 2050.

### **SAF Market potential**

- a. Targeted SAF production in USA: 3 billion Gallons (9 million tons per year) per year by 2030 – Low CI First Gen Ethanol as primary feedstock
- b. SAF demand in EU: ~1.3 million tons per year – as per proposed mandate to blend 2% SAF by 2025 - feedstock limited to waste & residues.
- c. The market potential of SAF in India: 0.1 million tons per year (~12 Cr. Ltrs per year or ~300 TPD) – Considering 1% SAF blending mandate by 2025, and projected demand in India by 2030 will be around 0.35 million tons per year (~42 Cr. Ltrs per year or 1125 TPD).
- d. Apart from India, there are likely opportunities for SAF projects in LatAM, Asia Pacific & Africa where sugary feedstock or Ethanol is available for conversion into SAF. Apart from CORSIA, likely domestic policies in these regions will drive up SAF demand.

### **Benefits of SAF**

- Decarbonization of hard to abate Aviation sector
- Import saving
- Extra revenue for farmers
- Employment opportunities
- Improved aircraft performance

### **Praj's initiative for SAF technologies**

Under its BioMobility™ platform Praj offers technology solutions globally to produce renewable transportation fuel using bio based feedstock, thus ensuring sustainable decarbonization through circular bioeconomy. Praj has partnered with globally leading technology companies to offer innovative technologies for production of SAF.

### **1. PRAJ GEVO Partnership**

Praj has signed a Construction License Agreement (CLA) with Gevo, Inc, USA dated 4th April 2019, to commercialize technology for the production of Isobutanol using sugary-based feedstocks, such as juice, syrup and molasses. Pursuant to the CLA, Praj will provide Engineering Procurement and Construction (EPC) services to 3<sup>rd</sup> parties using a process design package developed by Praj. This package uses Gevo's proprietary Isobutanol biocatalyst on sugary-based feedstock. Isobutanol derived from said proprietary process is high energy renewable intermediate product that finds application in Aviation and Racing cars.

In addition to the CLA, Praj and Gevo have also entered into a new Joint Development Agreement (JDA) dated 4th April 2019. This agreement is aimed at continuing joint development efforts to produce Isobutanol using agricultural residue such as bagasse, rice straw, wheat straw, corn stover, cotton stalk and empty fruit bunches. These 2<sup>nd</sup> generation agricultural residues are the lowest cost feedstocks in some markets and have the additional benefit of having a very low carbon footprint.

### **2. PRAJ IOCL MoU**

In Nov. 2021, Praj and Indian Oil Corporation Limited (IndianOil) have inked an MoU to explore opportunities to fast-track India's transition to cleaner and greener sources of energy by exploring avenues such as the production of Alcohol to Jet (ATJ) fuels, 1G & 2G Ethanol, Compressed Bio-Gas (CBG) and related opportunities in the Biofuels industry. Exploring these green energy horizons will be crucial for India to achieve carbon neutrality by 2070. This MOU will boost ATJ fuel production capacity and its use in India which will in turn help curb emissions emanating from the airplanes as per IATA's (The International Air Transport Association) mandate.

### **3. PRAJ Axens MoU**

Axens and Praj have signed a Memorandum of Understanding to work jointly on projects in India for production of Sustainable Aviation Fuel (SAF) from low carbon alcohols through Alcohol-to-Jet (ATJ) pathway.

Praj brings to the table proven expertise in modularized solutions, integration services for complete project and technology for production of low carbon isobutanol and ethanol from conventional bio-sourced feedstock. Axens will provide its Jetanol™ Alcohol-To-Jet technologies (dehydration, olefin oligomerization and hydrogenation steps), catalyst solution, equipment and services (training, technical assistance) for conversion of alcohols to SAF.

## ANNEXURE (3) : New Manufacturing Facility

To combat evils of climate change, nations across the globe are committed to nationally determined contributions (NDCs) as part of their commitment to COP 21 Paris Summit. Energy Transition & Climate Actions (ETCA) has emerged as promising solution in this endeavor.

All energy giants are reconfiguring their energy mix by including low carbon/ green fuels in their product portfolio. To fulfil their NetZero objectives, they are investing heavily in blue & green hydrogen projects to address the growing demand of low-carbon fuel.

This development is creating a significant opportunity for Praj's Critical Process Equipment and Modularization business.

Modularization offers several significant benefits to customers as they help save cost by reducing installation time at the project site. It becomes even more important at remote locations, and at any site contending with adverse weather/climate, lack of skilled personnel onsite, and concerns about downtime on brownfield projects.

Praj's capability to conceptualize, design and manufacture complex modules is finding increasing acceptance from leading customers across the globe. With strong market traction from ETCA sector, Modularization has emerged as yet another growth engine for Praj.

To address the growing business opportunity in ETCA sector, Praj is setting up modern manufacturing facility to be housed into a new subsidiary. The existing Kandla facility will continue to serve the current market of Oil & Gas and Fertilizers while new facility will be dedicated to opportunities from the ETCA segment.



## ANNEXURE (4) : DEVELOPMENT OF NET ZERO AND CLIMATE RESILIENT VILLAGE

### **Background:**

Villages and agro economy are known as backbone of Indian economy. In recent years, villages on the fringes of metropolitan cities have seen drastic changes in lifestyles and have semi-urbanized themselves. Traditional practices of sustainable resource management have been observed weakening over the upcoming generations and natural resource exploitation has been observed. This is coupled with intense impact of Climate Change such as drought, heavy rainfall resulting in flash flood, landslides and crop damages, low quality yield in agriculture etc. As a cyclic effect, it is resulting in increased use of chemical fertilizers in farms, migration to cities, deforestation and weakened economy of the villages. On this background, it is an urgent requirement to initiate local level efforts to minimize these effects by reducing the village level greenhouse gas emissions and take efforts to create climate resilient agro-economy along with promoting Lifestyle for Environment by reviving traditional practices of sustainable lifestyle in villages so as reduce local impact of climate change.

### **Introduction to the initiative:**

Praj in collaboration with Grampanchayat of Mandede and Gokhale Institute of Politics and Economics aims to create a model Net Zero and Climate Resilient village. Mandede is in Mulshi taluka of Pune district and is nestled in beautiful watershed that feeds Mula river. Praj has worked on various aspects of village in the past. With insights from previous work, readiness and enthusiasm of the villagers to take-up the activity forms firm base to build the initiative further. The village has seen adverse impact of climate change in the form of intensified water scarcity, erratic behaviour of rain disrupting the traditional agricultural practices and impacting the agri-dependent families. This has also caused local migration of the villagers to city in search of jobs and steady supply of other resources such as water.

## **Methodology:**

This initiative aims at developing solutions with holistic approach to reduce the overall Green House Gas emissions at the village level. These emissions coming out from various identified and tracked sources within the village boundary by providing bio-based solutions such as Compressed Bio Gas. Praj being leader in the field of Bio-based solutions, we wish to extend solutions based on our Bio-Mobility™ and Bio-Prism™ platforms as ready alternatives to achieve the emission reduction in the village.

To develop climate resilience in the village, we aim to provide know how and intervene in the sectors such as water, waste management and resilient farming practices through watershed management initiative, energy crop cultivation and establishing supply chain for various bio-based solutions available in the village such as surplus agri-residue, raw material for various industrial requirements etc. This we envision will contribute to increase livelihoods for existing population in the village and shall motivate migrated population to reverse migrate with better opportunities available in the village.

## **Journey so far:**

Praj in collaboration with GIPE has initiated baseline documentation of the village on different topics such as energy requirements, present livelihood, water requirement and watershed mapping, solid waste and waste water management and health issues associated with climate impact.

Multiple deliberations with villagers has happened in different forms such as context setting with Panchayat committee, informal interactions with villagers, visioning workshop in Gramsabha to document challenges and possible solutions from villager's perspective on issues such as health, energy, water, livelihood and solid waste and waste water. Wadi wise demographics and problem statements was also documented by wadi level interactions.

To document views of all age groups and women of the village, a separate visioning session with women only was conducted in the form of 'Haldi-Kunku' event. To understand views and expectations of children in the village, essay competition was organized on topic '*Mazyra Swapnatil Mandede*' (My dream village: Mandede). These views of all groups of villagers will feed in planning the strategy of the project and also forms a inclusive approach of project design.

## ANNEXURE (5) : India Ethanol Demand: EBP20 & Beyond

### Ethanol Blending Program

India's Ethanol Blending Program is aimed at reducing the country's dependence on crude oil imports, cutting carbon emissions, and boosting farmers' income. The government has target of ethanol blending of 20% (EBP20) in petrol by year 2025-26. India has crossed its target of 10% ethanol blending target five months ahead of the plan and is on course to achieve 20% as planned.

Outlook for ethanol industry remains positive even beyond accomplishment of E20 target. There is clear recognition that biofuels have increasingly important role to play as they address multitude of issues across economic, social and environmental spectrum. Several policy measures under discussion that will ensure sustained demand for ethanol beyond EBP20. Below are key areas that will drive the demand for ethanol beyond year 2025.

- **EBP 27:** After implementation of EBP 20 program, we can expect the next mandate will be minimum blending of ethanol petrol can be EBP 27.
- **Introduction of flex fuel vehicles:** Flex fuel engines can run on the ethanol blend varying from 20% up to 85%. Indian automotive manufacturers are gearing up to adapt their products for flex fuel option At India Auto Expo of last month, number of automobile companies showcased vehicles that can run on ethanol blend up to 85%.
- **Ethanol driven power generators:** Existing power generators run on diesel. Ethanol can be used to for the same purpose.
- **Ethanol blending in diesel:** R&D suggests that blend of ethanol in diesel is easily possible upto 7.5%. Diesel consumption in India is almost four time that of petrol consumption. 7.5% blending in diesel can result in ethanol demand that is equivalent or more than existing ethanol production capacity in the country.
- **Hybrid vehicles:** Vehicles running on ethanol run IC engines along with electric batteries.
- **Sustainable Aviation Fuel:** Ethanol can be used as a feedstock for production of sustainable aviation fuels. Only USA would need 24 bn litres of ethanol for production of SAF