E85 Impact: Ethanol Overcapacity to Persist as Flex-fuel Transition to Remain Gradual

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Synopsis

- **Capacity Expansion Outpacing Demand**
  India's ethanol capacity has scaled to ~2000 crore litres, with an additional 400 crore litres expected to be operational by FY27. The demand under E20 blending is only ~1100 crore litres, with nonfuel demand of around 300-350 crore litres, leaving significant capacity unutilised. This structural mismatch is reflected in allocation trends, with only ~60% of offered ethanol being absorbed, indicating persistent utilisation pressures across the sector.
- **Regional Imbalance & Logistics Dependence**
  Capacity addition is concentrated in select states (UP, Maharashtra, Karnataka), leading to regional surpluses ranging from 277 crore litres surplus in Maharashtra to 77 crore litres deficit in Tamil Nadu. This creates dependence on long-distance transportation and supply redistribution, increasing logistics costs and affecting realisations even when aggregate national capacity is adequate.
- **Demand Growth Hinged on Higher Blends**
  At present, ethanol demand is largely capped at ~1100 crore litres under E20 blending, with non-fuel applications contributing only ~300-350 crore litres. Meaningful demand expansion depends on scaling up higher ethanol blends (E85/E100) and Flex Fuel Vehicle (FFV) adoption. In the absence of these demand-side triggers, incremental capacity additions are unlikely to be absorbed in the near term.
- **Infrastructure Constraints**
  The ethanol ecosystem remains constrained by a single-grade retail network of ~1.03 lakh outlets, limited storage capacity of ~77.8 crore litres, and reliance on ~300+ centralised depots for blending and distribution. This infrastructure is adequate for E20 rollout but not aligned with multi-blend requirements, thereby restricting the scalability of higher ethanol blends.
- **Shift to Consolidation Phase**
  Given the gap between capacity (~2000 crore litres plus upcoming 400 crore litres) and demand (~1100 crore litres for fuel and ~350 crore litres for nonfuel uses), the sector is transitioning into a consolidation phase, with utilisation levels likely to remain in the ~65–75% range for the next three years. Correspondingly, EPC activity has begun to moderate, with industry focus shifting toward brownfield capex, debottlenecking, and operational efficiencies. Allocation dynamics—evidenced by ~700 crore litres of excess supply relative to absorption—are expected to keep margins under pressure in the near to medium term.

From E20 to E85: Policy Signals for Next Phase of Ethanol Transition

After achieving a major milestone under the EBP by reaching an average 20% ethanol blending level in December 2025, five years ahead of schedule, the Ministry of Road Transport and Highways (MoRTH) came out with draft amendments to create ground for increasing the Ethanol Blended Petrol (EBP) to E85 or exclusive ethanol fuel. The draft released on April 27, 2026, indicates a policy direction and the government's push for preparing the vehicle ecosystem for progressively higher ethanol penetration.

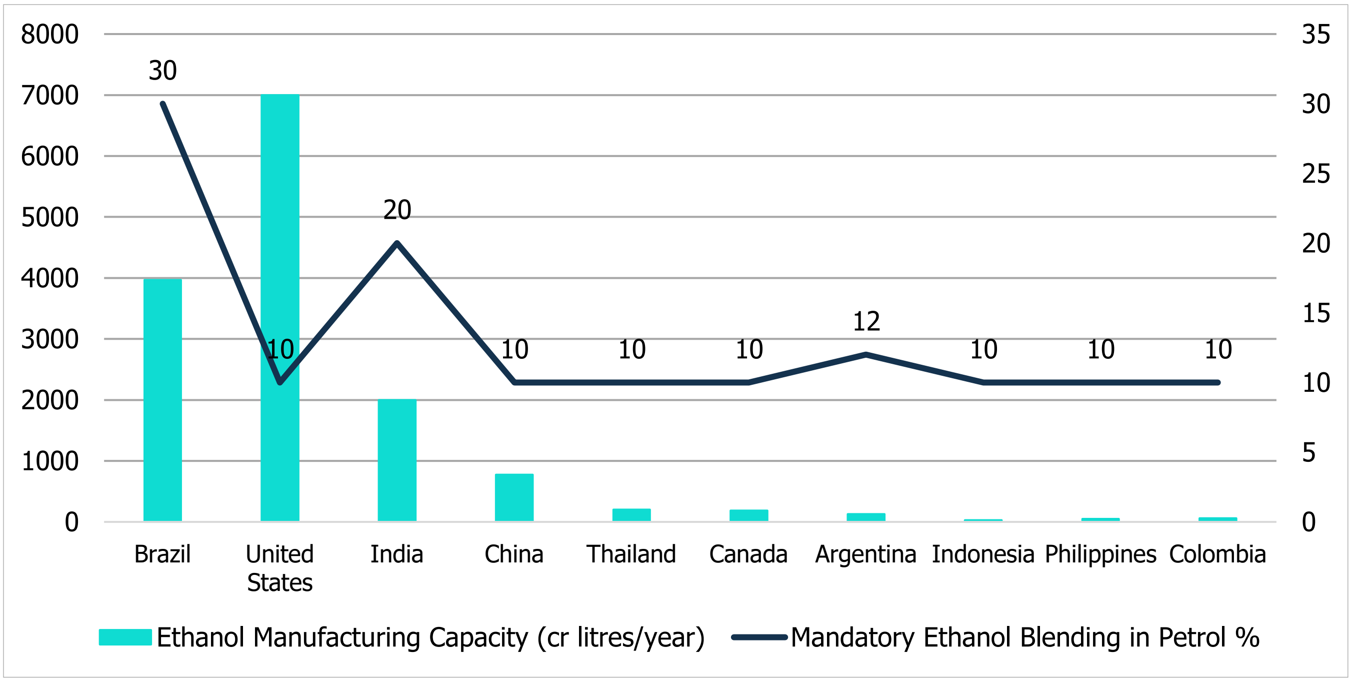
While the policy intent may appear ambitious, it cannot be considered unprecedented. Globally, there has been sustained progress in developing biofuels as a viable and sustainable alternative to fossil fuels, which are characterised by pronounced price volatility, geopolitical risks, and long-standing environmental externalities. Countries have pursued biofuels to enhance energy security and decarbonise transport systems. Brazil, for instance, has been a pioneer since 1970, systematically building a comprehensive ethanol ecosystem encompassing feedstocks, fuel supply, vehicle technology, and infrastructure, providing a long-standing reference point for large-scale ethanol adoption.

Global Shift Toward Ethanol as a Sustainable Fuel Alternative

Ethanol has emerged as a globally preferred sustainable fuel, offering significant benefits in reducing greenhouse gas emissions, enhancing energy security, promoting agricultural demand, and supporting cleaner, renewable energy transitions across major economies worldwide.

The following chart illustrates the ethanol blending mandates and manufacturing capacities of major countries that have implemented EBP as part of their long-term energy transition strategies.

Exhibit 1: Ethanol capacity across major countries and blending mandate



Source: USDA, MoPNG-India

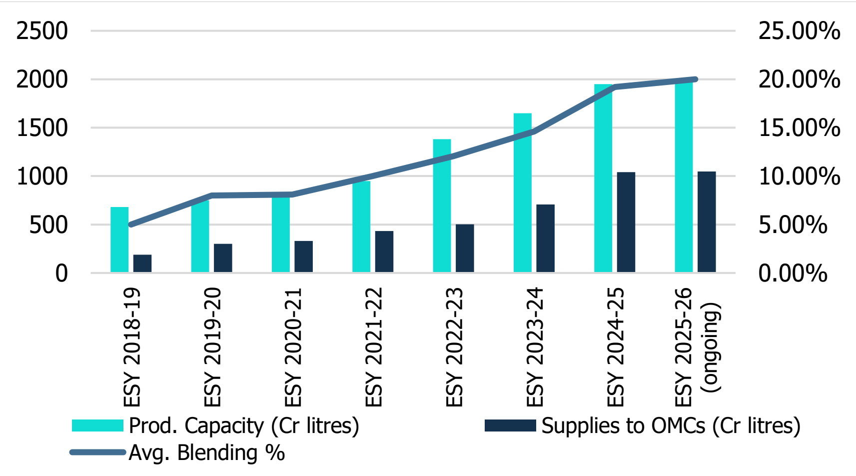
Policy Interventions Driving Rapid Scale-up of Ethanol Capacity

In India, though the Ethanol Blended Petrol (EBP) Programme was formally launched in 2003, progress remained limited—reaching only 1.53% blending by 2014 due to low installed capacity. Over the past decade, the government has implemented several key interventions to accelerate adoption. Since 2014, administered pricing has ensured stable, feedstock-based ethanol rates for producers. The 2016 amendment to the Industries Act streamlined the movement of interstate ethanol. Financial incentives, including the Interest Subvention Scheme (2018, expanded in 2020), supported capacity expansion. Long-Term Offtake Agreement (LTOA) by oil marketing companies (OMCs) improved investor confidence. At the same time, policy measures such as easing environmental clearances and advancing the E20 target to 2025 have significantly boosted ethanol production capacity, making India the 3rd largest ethanol producer in the world.

As shown in Exhibit 2 below, the country's ethanol capacity has grown substantially, with production capacity nearly tripling from 680 crore litres in 2018–19 to about 1970 crore litres in 2025–26. Supply to Oil Marketing Companies (OMCs) has expanded even faster, reflecting improved capacity utilisation supported by assured offtake mechanisms. Consequently, ethanol blending has increased steadily from 5% to around 20%, in line with national targets. The sharp acceleration observed post-2021 underscores the tangible impact of coordinated policy measures, financial incentives, and regulatory support in scaling up the sector.

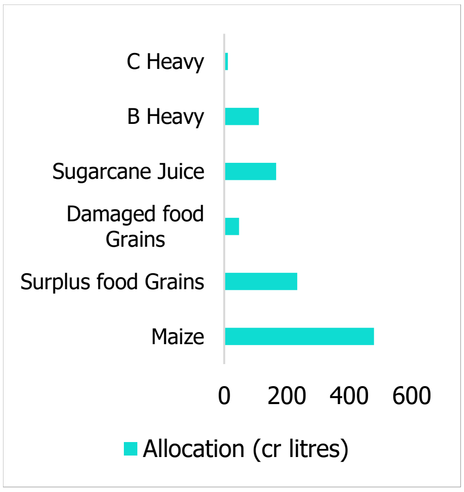
In addition to capacity expansion, CO_2 emissions have reduced by ~8.69 crore tonnes; however, shifts toward maize and high-water-use of feedstocks raise concerns about trade-offs between energy security, food security, and water sustainability.

Exhibit 2 India's Ethanol Capacity, Supply and Blending Trend



Source: Petroleum Planning & Analysis Cell (PPAC), OMCs

Exhibit 3: Feedstock-wise allocation for ESY2025-26

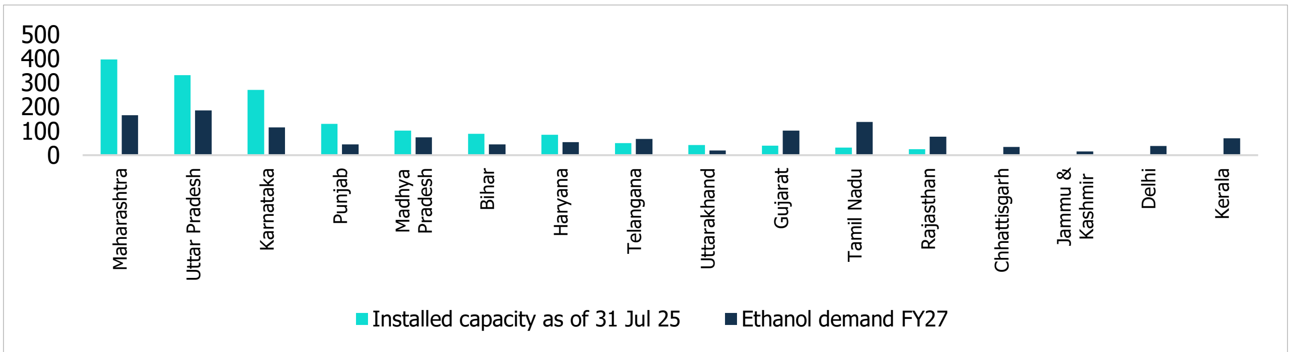


Source: Allocation by OMCs

Regional Imbalance in Capacity Creating Supply Chain Inefficiencies

While capacity has risen significantly, the imbalance remains pronounced across states, as shown in Exhibit 4 below.

Exhibit 4: State-wise demand vs capacity of Ethanol for blending (crore litres)



Source: Ministry of Consumer Affairs, Food & Public Distribution; Excluded the states where surplus/ deficit is less than 10 crore litres.

Ethanol capacity, as seen in Exhibit 4, remains regionally concentrated in India. At the same time, there is a significant surplus in states such as Maharashtra, UP and Karnataka, while several southern and western regions continue to face structural deficits. Despite overall aggregate sufficiency, this imbalance creates localised shortages, leading to logistical inefficiencies, higher supply chain dependency and sustained margin pressures across the ethanol ecosystem.

The widening gap between surplus production hubs and deficit consumption centres underscores the need for balanced capacity addition to improve supply chain efficiency and stabilise realisations.

Flex fuel vehicles: The next growth driver?

Recent draft amendments to the Central Motor Vehicles Rules (CMVR), 1989, proposing the inclusion of higher ethanol blends under emission norms, provide a regulatory basis for the formal introduction of flex-fuel vehicles (FFVs) and biodiesel-capable vehicles in India. This development is supportive for the ethanol industry, which has witnessed sustained growth over the years, driven by proactive government support through multiple policy interventions.

What are flex fuel vehicles?
Flex fuel vehicles can run on multiple blends of petrol and ethanol, ranging from E20 (20% ethanol) and E85 (85%) up to E100 (100% ethanol) in compatible engines.
Note: E100 (pure ethanol) is mainly used in countries like Brazil, where vehicles are specifically designed for it. Not all flex-fuel vehicles can handle E100 unless fully calibrated for it.

With the blending mandate currently capped at 20% (E20), the supply glut is likely to persist, and the industry is looking forward to E85 and E100 fuel standards and the adoption of FFVs

We understand that all major auto manufacturers, both in India and globally, are capable of rolling out flex-fuel vehicles. A clear policy direction on E85 will drive auto manufacturers to introduce flex-fuel vehicles. This, supported by fiscal incentives such as direct purchase subsidies and waiver of road tax, for instance, will drive adoption. Technology is not a constraining factor; distribution infrastructure could be. In Brazil, the adoption of FFVs was quick due to incentives for ownership.

Exhibit 5: FFV sales % of new vehicles in Brazil

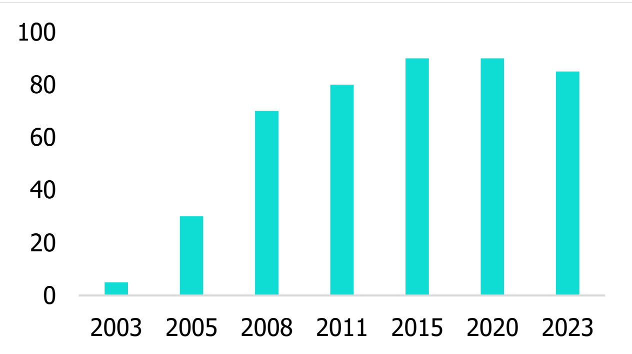
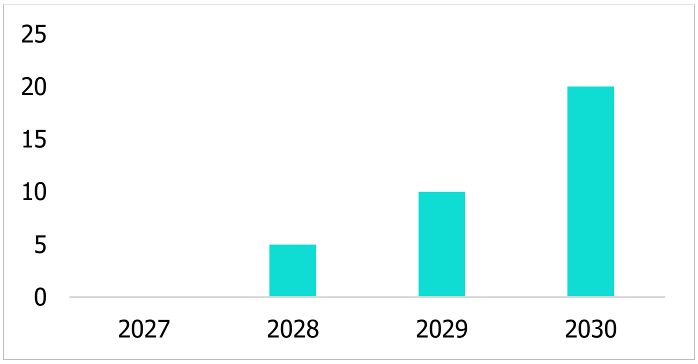


Exhibit 6: FFV sale % of new vehicles in India (proj.)



Infrastructure Constraints to FFV Adoption: Retail Rigidity, Storage Deficits, and Blending Limitations

India's fuel retail network comprises over 1.03 lakh outlets. Still, these are predominantly configured around a "one fuel–one tank" architecture, inherently limiting the ability to dispense multiple ethanol blends based on consumer preference and hindering price-based fuel choice. This rigid retail structure constrains the very flexibility that flex-fuel vehicles (FFVs) are designed to leverage.

Further, while approximately 313 depots across the country handle the blending of over 1000 crore litres of ethanol annually, the system is supported by a relatively modest ~77.8 crore litres of ethanol storage capacity, indicating inadequate buffer and storage depth. Such asymmetry between throughput and storage highlights a structurally constrained supply chain, particularly for handling multiple fuel grades simultaneously.

Taken together, these infrastructural limitations—spanning retail configuration, storage capacity, and centralised blending systems—are likely to restrict the effective penetration of FFVs. In this context, it is evident that vehicle technology or ethanol production capacity is not the primary bottleneck; rather, the critical challenge lies in developing a flexible, multi-grade fuel distribution ecosystem with adequate storage buffers and transparent, market-linked pricing mechanisms that can incentivise ethanol adoption at the consumer level.

CARE expects the Flex-fuel Transition to be Gradual

CareEdge Ratings expects ethanol demand under the EBP programme to increase from current levels to reach approximately 1,200 crore litres in ESY 2026–27 and further to ~1,600 crore litres by ESY 2029–30, driven by the gradual rollout of flex-fuel vehicles (FFVs) and the demand growth from the existing fleet of vehicles. This projection assumes FFV penetration of ~5% of new vehicle sales by FY28, rising to ~20% by FY30.

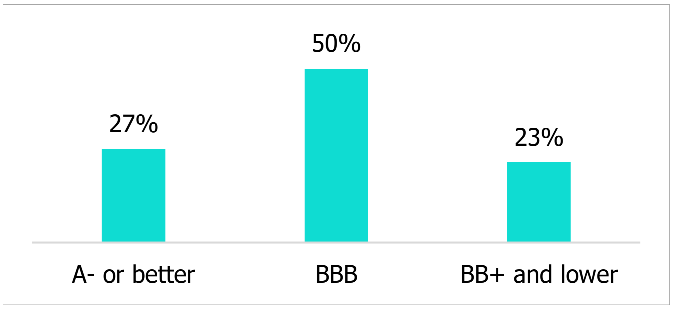
If the rollout or consumer acceptance of flex-fuel vehicles (FFVs) is delayed, the demand for ethanol for blending is expected to remain capped at around 1,200 crore litres in ESY 2026-27, rising modestly to approximately 1,500 crore litres by ESY 2029-30. At E85 blending with the absence of FFVs, India's ethanol demand structurally undershoots current installed capacity by ~20-35%, implying utilisation levels remain capped at ~65-75% unless FFV adoption accelerates. As such, at 20% FFV penetration, the incremental demand is estimated to be below 10% of overall ethanol consumption by OMCs.

However, any upward revision in blending limits beyond the current E20 cap could accelerate capacity absorption. For instance, under an E25 blending scenario, utilisation levels are expected to reach above 80% by FY28, advancing the absorption cycle well ahead of the base-case scenario.

Glance at the Key Metrics of the Rated Ethanol Producers

Based on information available for 24 rated entities, the majority of companies fall in the BBB category, with strengths derived mainly from offtake agreements with OMCs and better utilisation of installed capacity. Entities in category A or higher are primarily the integrated sugar mills with forward integration of ethanol production. The balance are recently commissioned /under-construction units or those with a lower portion agreed for offtake by OMCs.

Exhibit 7: Rating distribution



Sample entities for this report have a capacity of around 350 crore litres with aggregate revenue of Rs. 16,800 crore for FY25.

While the sample size suggests capacity utilisation of upwards of 70%, factors such as existing Long Term Offtake Agreements, the location of these plants, availability of feedstock, and regional demand for ethanol play a significant role.

CareEdge Ratings' View:

"Recent aggressive capacity expansion has led to significant underutilization across distilleries. At the current 20% blending level, it will take several years for this surplus capacity to be absorbed," says Karthik Raj K, Director, CareEdge Ratings.

"The transition toward higher ethanol blending presents a complex mix of operational, consumer, and infrastructure challenges, even as demand is expected to rise to ~1200 crore litres by ESY 2026-27 and ~1,600 crore litres by ESY 2029-30. Achieving this will depend on FFV penetration increasing from ~5% of new vehicle sales in FY28 to ~20% by FY30, alongside coordinated investments in logistics, storage, and distribution to avoid supply bottlenecks and ensure smooth adoption," says Niraj Thorat, Assistant Director, CareEdge Ratings.

Yogesh Shah, Senior Director, CareEdge Ratings, says, "While the government's intent to scale up ethanol blending and transition toward higher ethanol fuels (including E85/E100) is clear, the relatively slower development of the supporting ecosystem—spanning storage, logistics, and retail infrastructure, and requiring coordination across multiple stakeholders—is likely to constrain demand realisation in the near term. This misalignment is expected to result in persistence of capacity overhang over the short to medium term, thereby exerting pressure on utilisation levels and profitability across the value chain.

Further, leading EPC players with a combined installed base of ~56,000 KLPD (~1,850 crore litres) have already indicated that existing capacity is largely adequate for current policy support around 20% blending. This has translated into a discernible slowdown in greenfield ethanol plant investments, with project activity increasingly shifting toward brownfield capex, debottlenecking, and efficiency enhancement of existing facilities, rather than fresh capacity additions"

Contact

Yogesh Shah	Senior Director	yogesh.shah@careedge.in	+91 - 79 – 4026 5603
Karthik Raj K	Director	karthik.raj@careedge.in	+91 - 80 – 4662 5555
Niraj Thorat	Assistant Director	niraj.thorat@careedge.in	+91 - 40 – 4010 2030
Mradul Mishra	Media Relations	mradul.mishra@careedge.in	+91 - 22 - 6754 3596

CARE Ratings Limited
Corporate Office: 4th Floor, Godrej Coliseum, Somaiya Hospital Road, Off Eastern Express Highway, Sion (East), Mumbai - 400 022
Phone : +91 - 22 - 6754 3456 I CIN: L67190MH1993PLC071691

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