

Executive Summary

Mid-Level Ethanol Blends: Opportunities and Constraints in the Move Beyond E15

The Transportation Energy Institute's white paper examines the opportunities and challenges associated with expanding ethanol use beyond E15 into so-called "mid-level" blends, generally ranging from 16% to 50% ethanol. As gasoline demand is projected to decline over the coming decades while ethanol production remains robust, policymakers, fuel suppliers, automakers, agricultural interests, and retailers are increasingly evaluating whether higher ethanol blends can play a larger role in the U.S. transportation fuel market.

Key Findings

Growing Pressure to Move Beyond E10 and E15

Ethanol currently represents approximately 10.5% of the U.S. gasoline pool, with E10 serving as the dominant blend. However, declining gasoline consumption and continued ethanol production create pressure to increase ethanol's share of the fuel pool. According to EIA projections cited in the paper, maintaining current ethanol volumes could require ethanol to represent nearly 19% of the gasoline market by 2050.

Environmental Benefits Are Significant but Not Uncontested

Research reviewed in the paper shows that ethanol delivers meaningful life-cycle greenhouse gas reductions compared with gasoline. Depending on the blend level, ethanol can reduce carbon emissions from approximately 6% for E10 up to more than 50% for E85. Additional benefits include reductions in carbon monoxide, certain hydrocarbon emissions, and aromatic compounds associated with particulate matter.

However, some emissions impacts remain debated, including effects on NO_x emissions and other pollutants. The paper emphasizes that while ethanol's lower carbon intensity is widely recognized, stakeholders continue to debate the extent of its overall environmental benefits.

Ethanol Enhances Energy Security

Proponents argue that greater ethanol use strengthens U.S. energy security by diversifying transportation fuel supplies and reducing dependence on petroleum. Since 2005, ethanol consumption has increased dramatically while petroleum imports have declined substantially. While some attribute these trends partly to biofuel growth, others point out that the expansion of domestic shale oil production has also played a major role.

The paper concludes that ethanol has increased fuel supply diversity and displaced roughly 10.5% of petroleum-based gasoline consumption by 2025.

Octane Benefits Create Opportunities for Advanced Engines

One of ethanol's strongest technical advantages is its high octane rating. Higher octane fuels can support more efficient, higher-compression engines that deliver improved fuel economy, lower emissions, and better performance. For vehicle manufacturers facing increasingly stringent efficiency and emissions requirements, mid-level ethanol blends may offer an attractive pathway.

At the same time, most vehicles currently on the road are only approved for E15 or lower blends. While research suggests many modern vehicles may technically tolerate E20, regulatory approvals and manufacturer warranties generally lag behind the available engineering data.

Vehicle Compatibility and Misfueling Remain Major Challenges

The largest practical constraint to mid-level ethanol adoption is vehicle compatibility.

- E15 is approved for model year 2001 and newer light-duty vehicles.
- Mid-level blends above E15 are generally approved only for flexible-fuel vehicles (FFVs).
- FFVs account for only about 7% of vehicles currently in operation.

This creates concerns about misfueling, where consumers inadvertently use higher ethanol blends in vehicles not approved for them. Future optimized engines designed specifically for higher-octane fuels could further complicate the issue if those engines

Economic Impact Is Complex

Ethanol generally trades at a lower volumetric cost than gasoline blendstocks and can contribute to lower pump prices. Additionally, Renewable Identification Number (RIN) credits under the Renewable Fuel Standard affect the economics of ethanol blending.

However, ethanol contains less energy per gallon than gasoline. As blend levels increase, fuel economy typically declines unless engines are specifically optimized to capitalize on ethanol's octane advantages. The paper cautions that lower retail prices do not automatically translate into greater value for consumers when energy content is considered.

Agriculture Benefits Are Substantial

The ethanol industry continues to generate significant economic benefits for rural America.

According to data cited in the report, in 2024 the ethanol industry:

- Contributed approximately \$53 billion to U.S. GDP.
- Supported nearly 314,000 jobs.
- Generated approximately \$28 billion in employment income.

The paper also reviews food-versus-fuel concerns and notes studies suggesting that while biofuels influence agricultural commodity prices, their impact on overall consumer food costs is relatively modest. Technological improvements in agriculture have also increased productivity, reducing pressure on land use.

Infrastructure and Retail Adoption Are Significant Barriers

Expanding mid-level ethanol blends would require substantial investments throughout the fuel distribution chain.

Challenges include:

- Storage tank and dispenser compatibility requirements.
- Regulatory compliance obligations.
- Insurance and liability considerations.
- Potential replacement of older fuel-handling equipment.

The paper highlights a classic "chicken-and-egg" problem: automakers are hesitant to support new fuels without widespread retail availability, while retailers are reluctant to invest in infrastructure without sufficient vehicle demand.

Conclusion

The paper concludes that mid-level ethanol blends offer meaningful opportunities to reduce transportation-sector greenhouse gas emissions, improve octane quality, diversify fuel supplies, and support rural economic development. However, significant challenges remain, including regulatory uncertainty, vehicle authorization, infrastructure compatibility, misfueling concerns, and market adoption barriers.

To enable broader deployment of mid-level blends, the industry would need:

1. A standardized definition of mid-level ethanol fuels.
2. Clear federal and state regulatory frameworks.
3. Widespread compatible fueling infrastructure.
4. Consensus on misfueling prevention strategies.
5. Vehicle standards defining approved applications.
6. Coordinated industry and government action to support market development.

Bottom line: The paper does not advocate for or against mid-level ethanol blends. Rather, it can serve as a referenced starting point for discussions about the future of the ethanol market concludes that expanding beyond E15 presents both significant potential benefits and significant practical obstacles, requiring coordinated action across regulators, automakers, fuel providers, retailers, and consumers before broader commercialization can occur.