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E30 Petrol Standard Notified: India Advances to 30% Ethanol Blending

20 May 2026 · ECONOMY · ENVIRONMENT · SCIENCE & TECH · GS3

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20 May 2026 · 14 min read · 3 tags

WHY IN NEWS

The **Bureau of Indian Standards (BIS)** notified a new Indian Standard for **E30 petrol** — a blend of 30% ethanol and 70% petrol by volume — in the official Gazette of India in May 2026. The notification formalises the quality and technical specifications that fuel manufacturers, blending facilities, and automakers must meet before E30 can be commercially rolled out, marking the next milestone in India's Ethanol Blended Petrol (EBP) Programme.

WHAT IS E30 PETROL?

E30 refers to motor gasoline containing **30% anhydrous ethanol (absolute ethanol)** blended with **70% petrol** by volume. It is the next step beyond the **E20** standard (20% ethanol + 80% petrol) that India is currently scaling under the National Biofuel Policy.

Key chemical and performance characteristics of E30:

PROPERTY	E20	E30	IMPLICATION
Ethanol content (% by volume)	20%	30%	Higher biofuel proportion
Octane number (Research Octane Number)	Higher than E10	Higher than E20 (~RON 95+)	Better knock resistance; potential engine efficiency gain
Energy density (MJ/L)	Slightly lower than E10	~5–8% lower than pure petrol	Marginal increase in fuel consumption by volume
Oxygen content	~6.5%	~10%	Cleaner, more complete combustion
Reid Vapour Pressure (RVP)	Elevated	Further elevated	Requires seasonal/regional blending adjustments
Water tolerance	Lower than pure petrol	Lower than E20	Stricter moisture control in supply chain
Material compatibility	May affect older seals/gaskets	Requires E30-rated materials	Engine modification needed for older vehicles

E30 vs E20 — what changes:

- E30 has a **higher oxygen content**, enabling more complete combustion and lower carbon monoxide (CO) and hydrocarbon (HC) emissions from tailpipe
- Energy per litre **drops slightly** (~3–4% compared to E20), meaning vehicles may see a marginal reduction in km per litre — but this is partially offset by E30's higher octane enabling better ignition timing
- E30 **is not "drop-in"** for most existing vehicles: fuel system components (fuel pumps, injectors, seals, fuel lines) must be rated for 30% ethanol; current E20-rated vehicles may not be certified for sustained E30 use without OEM (Original Equipment Manufacturer) validation

BIS AND THE INDIAN STANDARD NOTIFICATION

The **Bureau of Indian Standards (BIS)** is the national standards body of India established under the **Bureau of Indian Standards Act, 2016** (which replaced the Bureau of Indian Standards Act, 1986). BIS operates under the **Ministry of Consumer Affairs, Food and Public Distribution**.

BIS's role in the fuel standards chain:

1. **Sets Indian Standards (IS):** BIS drafts technical specifications for fuel quality — chemical composition, flash point, distillation range, octane number, water tolerance, stability — in consultation with the **Petroleum and Explosives Safety Organisation (PESO)**, oil marketing companies, automakers, and research institutions like the **Indian Institute of Petroleum (IIP), Dehradun**
2. **Gazette notification:** Once a standard is approved by BIS's Petroleum, Coal and Related Products Division Council, it is notified in the **Gazette of India** (Part III, Section 4), making it the official reference standard
3. **Precedent — IS 17021 (E20 standard):** BIS notified **IS 17021:2018** (Motor Gasoline — Specification for E20 grade) in 2018, enabling the commercial roll-out of E20. The new E30 notification follows the same process and establishes **IS specifications for E30 grade motor gasoline**
4. **Certification and enforcement:** Once the IS is notified, fuel blending plants, retail outlets, and OEMs must comply with BIS-certified fuel quality parameters. Non-compliant fuel can be penalised under the **Motor Spirit (Regulation of Supply, Distribution and Prevention of Malpractices) Act** and state petroleum rules

Why gazette notification matters: Without a BIS-notified standard, petroleum companies cannot commercially sell E30 fuel, automakers cannot warranty E30 compatibility, and state regulators cannot enforce quality at the pump. The notification is therefore the legal foundation for the entire E30 ecosystem.

INDIA'S ETHANOL BLENDING JOURNEY

India's Ethanol Blended Petrol (EBP) Programme has been a phased policy exercise spanning over two decades, driven by energy security, farmer income, and environmental goals.

Chronological milestones

PHASE	YEAR	BLEND	STATUS	KEY POLICY ACTION
EBP Programme launch	2003	E5 (5%)	Pilot in 9 states	Ministry of Petroleum pilot; limited supply
E5 nationwide	2006	E5	Partial rollout	Supply gaps limited real-world blending to 1–2%
E10 target	2013–14	E10 (10%)	Notified but under-achieved	National Policy on Biofuels 2009 set E10 as target
EBP Programme relaunch	2018	E10	Active scaling	National Biofuel Policy 2018 — comprehensive framework
E20 standard notified	2018	E20 (20%)	BIS IS 17021:2018 notified	E20 fuel launched at select pumps Nov 2022
E20 nationwide push	2023–25	E20	Expanding rollout; ~18–19% blending achieved by late 2025	PM Modi launched E20 fuel April 2023 at Bengaluru
E30 standard notified	**2026**	**E30 (30%)**	**BIS gazette notification; commercial rollout pending**	**Current news event**
E30 commercial rollout target	2027–28 (projected)	E30	Roadmap phase	Automotive industry validation + supply scale-up needed

National Biofuel Policy 2018 (Amended 2022)

The **National Biofuel Policy 2018** (notified June 4, 2018) is the overarching framework governing India's biofuel strategy. It was significantly **amended in 2022** (April 2022) to accelerate timelines and expand feedstock eligibility.

Key provisions:

ASPECT	ORIGINAL 2018	AMENDED 2022
E20 target year	2030	**Advanced to 2025**
Feedstock eligibility for ethanol	Sugarcane juice, B-heavy molasses, C-heavy molasses	Expanded to include surplus rice (FCI stocks), maize, millet, damaged foodgrains
Biodiesel	Jatropha, used cooking oil	Added algae, agricultural residue
Advanced biofuels	2G (second generation) from lignocellulosic biomass	2G + 3G (algae-based); compressed biogas (CBG) incentivised
Governing body	Inter-Ministerial Committee on Biofuels	National Biofuel Coordination Committee (NBCC) chaired by Cabinet Secretary

Feedstock hierarchy for ethanol (priority order):

1. Sugarcane juice and syrup (first priority — surplus sugar season diversion)
2. B-heavy molasses (intermediate product; higher ethanol yield than C-heavy)
3. C-heavy molasses (residual; lower yield; was the original dominant feedstock)
4. Damaged/surplus foodgrains — FCI surplus rice, maize, ragi
5. Agricultural residue (2G route — cellulosic ethanol; commercially being scaled)

Sugar-to-ethanol conversion: Approximately **11.1 litres of ethanol per 100 kg of sugarcane juice** (or ~6.2 litres per 100 kg via the C-heavy molasses route). One tonne of sugarcane produces roughly 55–60 litres of ethanol (via juice route).

ENGINE COMPATIBILITY AND AUTOMOTIVE INDUSTRY IMPLICATIONS

This is the most critical near-term challenge for E30 scale-up. Unlike E20, which current-generation fuel-injected petrol vehicles can broadly handle (with BIS-certified validation), E30 formally requires **flex-fuel engine technology** or **E30-certified engine management systems**.

Technical requirements for E30

- **Fuel system materials:** E30 requires ethanol-resistant elastomers (seals, gaskets, O-rings), stainless steel or plastic fuel lines (ethanol corrodes certain aluminium alloys and rubber compounds), and upgraded fuel pump wetted components
- **Engine control unit (ECU) calibration:** The ECU must be able to read ethanol content sensors (or use pre-calibrated maps) to adjust air-fuel ratio, ignition timing, and injection pulse width — because ethanol's stoichiometric air-fuel ratio (9:1) differs from petrol (14.7:1)

- **Cold-start performance:** Ethanol has lower vapour pressure and higher latent heat of vaporisation — at low temperatures, E30 engines may need an auxiliary start assist system or dedicated cold-start injector (less relevant in India's tropical climate)
- **Lubrication:** Higher ethanol blends can dilute engine oil more than pure petrol; oil change intervals and formulations may need recalibration

Automaker responses in India

OEM (ORIGINAL EQUIPMENT MANUFACTURER)	E30 / FLEX-FUEL STANCE
Maruti Suzuki	Committed to flex-fuel (E20 to E85) capable vehicles under MoU with Ministry of Petroleum; has petitioned for E30 timeline clarity; Wagon R FFV (flex-fuel vehicle) prototype demonstrated
Tata Motors	Has flex-fuel technology roadmap; Nexon, Altroz platforms being evaluated for E30+ compliance; TATA's 2G ethanol plant at Bongaigaon adds supply-side synergy
Bajaj Auto	Launched the **Bajaj Freedom 125** — India's first CNG-petrol flex-fuel motorcycle (though CNG-based, demonstrated flex-fuel ECU capability); also in E85-compatible research for two-wheelers
Hero MotoCorp	Has flex-fuel two-wheeler prototypes; 100 cc to 125 cc platform evaluation ongoing
Toyota Kirloskar	Parent Toyota has global E30/flex-fuel expertise; Innova HyCross (strong hybrid) runs on E20; flex-fuel version possible
Honda Cars India	E20-compliant across current range; E30 ECU reprogramming under evaluation

Key bottleneck: Most pre-2023 vehicles on Indian roads were designed and type-approved for petrol (up to E5 or E10). Even E20-certified vehicles may not carry OEM warranty for sustained E30 use. A phased transition will likely require a **grandfathering period** — E30 fuel sold at select pumps first (as was done with E20), with full nationwide rollout only after a critical mass of E30-certified vehicles enters the fleet.

ECONOMIC ANGLE: IMPORT SUBSTITUTION AND FARMER INCOME

Crude import displacement

India is the **world's third-largest oil importer**, importing approximately **4.7–5 million barrels per day (mb/d)** of crude oil. India's crude oil import bill stood at approximately **$130–140 billion in FY2024–25**, making it the largest single item in the import bill and the primary driver of the current account deficit.

UPSC RELEVANCE

Every additional 1% blending nationally (~1 billion litres/year of additional ethanol at scale) displaces approximately and saves roughly

$250–300 MILLION IN FOREX

annually (at prevailing crude prices).

India's **E20 achievement (FY2025)** of ~18–19% average blending displaced approximately **5–6 billion litres of petrol**, saving an estimated **$3.5–4 billion in forex**. Moving to E30 would raise this saving proportionally.

Cumulative savings since EBP Programme (2013–2025): Petroleum Ministry estimates indicate **over ₹1 lakh crore (approximately $12 billion)** in cumulative forex savings from ethanol blending since 2013–14 — though the bulk of this accrued post-2018 as blending percentages rose meaningfully.

Farmer income and rural economy

Ethanol production in India is dominated by the **sugar sector** (sugarcane belt: Uttar Pradesh, Maharashtra, Karnataka, Punjab) and increasingly **maize** (Bihar, Karnataka, Andhra Pradesh).

Price support mechanism: The Union Cabinet's **Committee on Economic Affairs (CCEA)** fixes **Fair and Remunerative Prices (FRP)** for sugarcane and announces **ex-mill ethanol procurement prices** for oil marketing companies (OMCs) annually. For sugar season 2025–26, the C-heavy molasses-based ethanol procurement price was set at approximately **₹57.61/litre** and B-heavy molasses at **₹60.73/litre**, while the sugarcane juice/syrup route was at **₹65.61/litre** — making it more remunerative for sugar mills than selling raw sugar in a depressed domestic market.

This mechanism:

- Provides mills a **floor price** for excess sugarcane
- Reduces the chronic sugar sector's **excess stock problem** (which suppresses raw sugar prices)

- Helps mills clear **Sugarcane Arrears** to farmers — arrears have historically been a major distress factor in UP and Maharashtra
- Extends the **remunerative crop base** to maize and damaged rice farmers, expanding income support beyond the sugarcane belt

ENVIRONMENTAL ANGLE: BENEFITS AND CONCERNS

Benefits

- **Lower CO_2 on a lifecycle basis:** Ethanol produced from sugarcane or maize absorbs CO_2 during plant growth; lifecycle emissions of sugarcane ethanol are typically **50–70% lower** than equivalent petrol on a well-to-wheel basis (ICMR, NITI Aayog estimates)
- **Reduced tailpipe CO and HC emissions:** Ethanol's higher oxygen content improves combustion completeness; E30 vehicles show measurably lower CO and hydrocarbon emissions vs E5 baselines in Indian test cycles
- **Particulate matter (PM) reduction:** Ethanol blends reduce aromatic content in petrol, which is linked to PM formation; E30 could contribute to air quality improvement in urban areas
- **Carbon intensity of the transport sector:** India's transport sector accounts for ~14% of total GHG emissions; ethanol blending is one of the few scalable near-term levers alongside EVs and CNG

Concerns

- **Land use change:** Scaling E30 requires a significant increase in sugarcane and maize cultivation. Diverting agricultural land from food crops to fuel crops risks **food security trade-offs**, particularly in drought years when the same water-intensive crops compete with food requirements
- **Water intensity:** Sugarcane is among the most water-intensive crops. Producing one litre of sugarcane-based ethanol requires approximately **1,500–2,000 litres of water** (including irrigation water). Expanding production in water-stressed regions (western Maharashtra, parts of Karnataka) could exacerbate groundwater depletion
- **Soil degradation:** Mono-cropping sugarcane at scale reduces soil biodiversity; pesticide and fertiliser runoff into rivers and water bodies is a documented concern in major sugarcane belts
- **Air quality nuance — acetaldehyde:** Ethanol combustion produces **acetaldehyde** as a byproduct — a toxic air pollutant. At E30 levels, acetaldehyde emissions could rise, requiring updated emission norms that specifically cap aldehyde emissions (current Bharat Stage VI norms do not specifically regulate aldehydes from ethanol blends at E30 levels)
- **2G ethanol vs 1G:** Cellulosic (second-generation, 2G) ethanol made from agricultural residue (rice straw, wheat straw, bagasse) avoids food-fuel competition and has a far better land-use profile — but 2G plants remain costly; India's first commercial 2G plant (Praj Industries-designed plant at

Bathinda, commissioned 2022) is still scaling up

UPSC RELEVANCE

GS Paper 3 — Energy, Economy, Environment, Agriculture:

- **Energy Security:** India's crude oil dependency; EBP as an import substitution lever; National Biofuel Policy 2018 (amended 2022) — targets, feedstock, governance
- **Agriculture:** CCEA-fixed ethanol procurement prices; FRP for sugarcane; sugarcane arrears; maize and rice as alternative feedstocks; food vs fuel debate
- **Environment and Ecology:** Lifecycle CO_2 of sugarcane vs petrol; water intensity of sugarcane cultivation; land use change and biodiversity; Bharat Stage VI norms and aldehyde gap; 2G vs 1G ethanol sustainability comparison
- **Science and Technology:** Ethanol chemistry (octane number, oxygen content, stoichiometry); flex-fuel vehicle technology; BIS standard-setting process; IS 17021 precedent; E30 engine compatibility challenges
- **Industry and Infrastructure:** Oil marketing companies (IOC, BPCL, HPCL) as ethanol buyers; supply chain logistics (ethanol is miscible with water — transport requires dedicated tankers); automaker investment timelines

Prelims angle: BIS full form and parent ministry; year of National Biofuel Policy; E20 target year (originally 2030, advanced to 2025); sugarcane-to-ethanol conversion ratio; India's crude import quantum; IS 17021 (E20 standard); BIS Act year (2016); CCEA role in ethanol pricing.

Mains questions to practise:

- "Ethanol blending in India is as much an agricultural policy as it is an energy policy. Critically examine." (GS3, 250 words)
- "While ethanol blending reduces India's import bill, it raises serious environmental and food security concerns. Analyse with reference to the National Biofuel Policy 2018." (GS3, 250 words)

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BUREAU OF INDIAN STANDARDS (BIS):

Full form: Bureau of Indian Standards

Governing Act: Bureau of Indian Standards Act, 2016 (replaced BIS Act, 1986)

Parent ministry: Ministry of Consumer Affairs, Food and Public Distribution

Function: National standards body; sets Indian Standards (IS) for products, systems, services; also runs hallmarking (gold, silver)

E20 fuel standard notified: IS 17021:2018 (Motor Gasoline — Specification for E20 grade)

E30 standard: Notified in Gazette of India, May 2026 (IS number to be confirmed at official gazette)

ETHANOL BLENDING PROGRAMME — KEY DATA:

Programme launch: 2003 (pilot in 9 states)

National Biofuel Policy: 2018 (notified June 4, 2018); amended April 2022

E20 target year: Originally 2030; advanced to 2025 by April 2022 amendment

E20 standard notified: IS 17021:2018; E20 commercial fuel launch: November 2022 (PM Modi launched April 6, 2023, Bengaluru — wider rollout)

Blending achieved FY2024–25: approximately 18–19% (E20 programme)

E30 standard: BIS-notified May 2026; commercial rollout roadmap pending OEM certification

ETHANOL CHEMISTRY AND CONVERSION:

E30 = 30% anhydrous ethanol + 70% petrol by volume

E30 oxygen content: ~10% (higher than E20's ~6.5%)

Research Octane Number (RON): E30 ≈ 95+ (enables better ignition timing)

Sugarcane juice route: approximately 11.1 litres of ethanol per 100 kg sugarcane juice (~55–60 litres per tonne of sugarcane)

C-heavy molasses route: ~6.2 litres of ethanol per 100 kg molasses (lower yield)

Water footprint: ~1,500–2,000 litres of water per litre of sugarcane ethanol (including irrigation)

INDIA'S CRUDE OIL IMPORT POSITION:

Import volume: approximately 4.7–5 million barrels per day (world's 3rd largest importer)

FY2024–25 crude import bill: approximately $130–140 billion

Cumulative forex saving from EBP (2013–2025): over ₹1 lakh crore (~$12 billion) — government estimate

NATIONAL BIOFUEL POLICY 2018 — AMENDMENT 2022 HIGHLIGHTS:

E20 target advanced from 2030 → 2025

Feedstock expanded to include surplus rice (FCI stocks), maize, millet, damaged foodgrains

Governing body: National Biofuel Coordination Committee (NBCC), chaired by Cabinet Secretary

2G ethanol: from lignocellulosic biomass (rice straw, wheat straw, bagasse); India's first commercial 2G plant at Bathinda (commissioned 2022, Praj Industries design)

ETHANOL PROCUREMENT PRICES (SUGAR SEASON 2025–26, CCEA-FIXED):

C-heavy molasses route: ₹57.61/litre

B-heavy molasses route: ₹60.73/litre

Sugarcane juice/syrup route: ₹65.61/litre

ENGINE COMPATIBILITY — KEY TERMS:

Flex-fuel vehicle (FFV): Can run on any blend from E0 to E85 using ethanol content sensors + adaptive ECU

ECU (Engine Control Unit): Manages fuel injection, ignition timing, and air-fuel ratio; must be recalibrated for high-ethanol blends

Stoichiometric air-fuel ratio: Petrol = 14.7:1; Ethanol = 9:1 — ECU must compensate when ethanol content changes

Bajaj Freedom 125: India's first CNG-petrol flex-fuel motorcycle (launched 2024)

ENVIRONMENTAL DATA:

Lifecycle CO_2 savings: sugarcane ethanol is ~50–70% lower than equivalent petrol (well-to-wheel)

Acetaldehyde: by-product of ethanol combustion; not specifically regulated under BS VI norms for E30 — a regulatory gap

BS VI norms implemented: April 1, 2020 (leapfrogged BS V; covers CO, HC, NOx, PM but limited aldehyde specifics for ethanol blends)

OTHER RELEVANT BODIES:

IIP (Indian Institute of Petroleum): Dehradun; CSIR institute; technical partner for fuel standard development

PESO (Petroleum and Explosives Safety Organisation): Under DIPP; safety standards for petroleum products

OMCs (Oil Marketing Companies): IOC (Indian Oil Corporation), BPCL (Bharat Petroleum), HPCL (Hindustan Petroleum) — procure ethanol from sugar mills and blend at terminals

Sources: BIS, PIB, Ministry of Petroleum

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