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Study of Flex-Fuel (BIOFUELS)

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ABSTRACT

A flexible-fuel vehicle (FFV) or dual-fuel vehicle (called a flex-fuel vehicle) is an alternative fuel vehicle with an internal combustion engine designed to run on more than one fuel, usually gasoline blended with either ethanol or methanol fuel, and both fuels are stored in the same common tank. Modern flex-fuel engines are capable of burning any proportion of the resulting blend in the combustion chamber as fuel injection and spark timing are adjusted automatically according to the actual blend detected by a fuel composition sensor. Flex-fuel vehicles are distinguished from bi-fuel vehicles, where two fuels are stored in separate tanks and the engine runs on one fuel at a time, for example, compressed natural gas (CNG), liquefied petroleum gas (LPG), or hydrogen.

The new technologies to a concept of engines, which allows for the use of different types of fuel. The multi-fuel engines available in the market display only one compression ratio, therefore being subject to optimization, as to obtain maximum efficiency the engine must work with a variable compression ratio. Although technically possible, this procedure is not considered feasible for a low-cost product. This work proposes a system, which allows for each type of fuel to attain peak efficiency through a variance in the engine intake pressure and without changing its compression ratio, a feature that can be added to a low cost product.

Introduction

Ethanol or ethyl alcohol is an important organic compound. In general, it is also referred to as alcohol spirit, spirit of wine, grain alcohol, absolute alcohol, and ethyl hydrate. Its chemical formula is C2H5OH and has a molecular mass of 46.07g/mol. It is a colourless liquid with a characteristic odour. It is a psychoactive substance and is the main component of alcoholic beverages.

Ethanol is used as a solvent in the lab and has many industrial uses. Recently ethanol has been in the news headlines highlighting the economic value of ethanol usage. This has attracted new energies in the industrial production of ethanol. It has been used as car fuel as an alternative to gasoline. Certain countries such as Brazil have been using it as light vehicle fuel. In the USA, ethanol is either used alone or mixed with gasoline.

I. A flexible-fuel vehicle (FFV) or dual-fuel vehicle is an alternative fuel vehicle with an internal combustion engine designed to run on more than one fuel, usually gasoline blended with either ethanol or methanol fuel, and both fuels are stored in the same common tank. Modern flex-fuel engines are capable of burning any proportion of the resulting blend in the combustion chamber as fuel injection and spark timing are adjusted automatically according to the actual blend detected by a fuel composition sensor.

II. In addition to flex-fuel vehicles running with ethanol, in Europe and the US, mainly in California, there have been successful test programs with methanol flex-fuel vehicles, known as M85 flex-fuel vehicles.The energy demand in our country is rising due to an expanding economy, growing population, increasing urbanization, evolving lifestyles and rising spending power. About 98% of the fuel requirement in the road transportation sector is currently met by fossil fuels and the remaining 2% by biofuels.

III. Currently petrol with 10% ethanol blend (E10) is being retailed by various Oil Marketing Companies (OMCs) in India, wherever it is available. However, as sufficient quantity of ethanol is not available, therefore, only around 50% of petrol sold is E10 blended, while remaining is unblended petrol (E0). The current level of average ethanol blending in the country is 5% (Ethanol Supply Year 2019-20). Due to several interventions in the supply side of ethanol, the Ministry of Petroleum aims to achieve 10% ethanol blending levels in the Ethanol Supply Year (ESY) – 2021-22 i.e. April, 2022.

IV. This step along with achieving E20 targets will require emission norms for nationwide standardization and adoption. The MoRT&H has notified BS- VI emission norms in Central Motor Vehicle Rules 1989 which are applicable to all vehicles post 1st April 2020. Newer vehicles on E-20 will have to meet BSVI norms. MoRT&H has notified GSR 156(E) on 8th March 2021 for adoption of E20 fuel as automotive fuel and issued mass emission standards for it. MoRT&H has also notified Safety standards for ethanol blended fuels vide GSR 343(E) dated 25th May,

2021 on the basis of Automotive Industry Standard3 (AIS 171).

V. It lays down safety requirements for type approval of pure ethanol, flex-fuel & ethanol-gasoline blended vehicles in India.Currently the gasoline vehicles (2 wheelers & 4 wheelers) in the country are designed for running on pure gasoline and can be tuned to suit ethanol blended fuels ranging from E0 to E5 depending on the vehicle type. On the material compatibility front, the rubber and plastic components are compatible with E10. However, with the proposed target of E20, the vehicles are now required to become both material compatible and tuned for use of E20 fuel

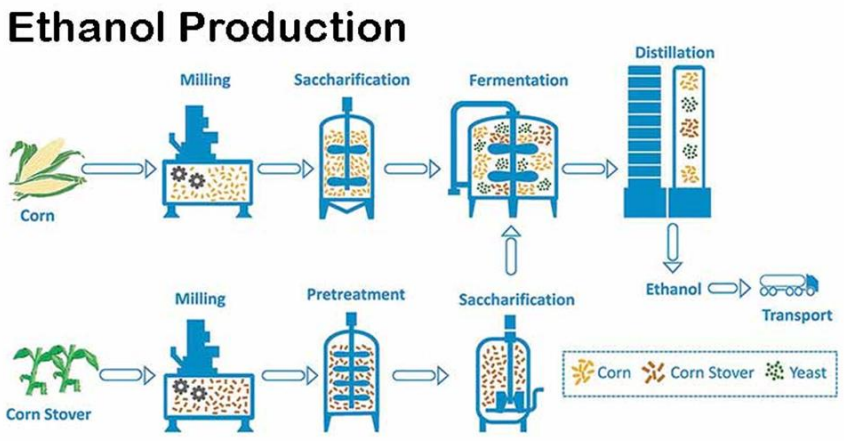
Processs of production of Ethanol

Fermentation is a biochemical process carried out by bacteria, yeast, or other organisms converting sugar such as glucose and fructose into cellular energy and producing ethanol and carbon dioxide as by-products. The whole process also releases heat energy. Alcoholic fermentation is one the oldest and most important industrial processes known to mankind. Humans learned this process thousands of years ago. Traditionally fermentation has been used to make alcoholic beverages, but today it adds a lot of economic value to the global economy. As mentioned earlier, ethanol today is used as a source of energy for vehicles. Thus its demand has increased in recent years. Other than ethanol, scientists have developed various other techniques to make other chemicals of pharmaceutical and biological importance using fermentation. Today, vitamins, various antibiotics, enzymes, and other industrial chemicals are also made by fermentation at an industrial scale.

To make alcoholic beverages, traditionally, we have been using cereals, barley, and grapes. Basically, we need a source of starch that can be cereals, corn, or even some suitable wood stocks. However, with its production now at a large industrial scale, using barely and grapes is not economically viable. A new feedstock in the USA market has been corn. The government agencies have been proposing to use wood stock or corn to make ethanol. Though even this process is not cost-effective compared to ethene-based industrial synthesis, still, government subsidies and incentives are encouraging industrialists to use the fermentation process as a green and sustainable operation for ethanol production.

Steps Of Profuction Of Ethanol

1. **Milling**: Whole corn kernels are ground into a form of flour, or **meal**. The meal is mainly starch. A **starch** is a **carbohydrate** made up of long chains of sugar molecules.
2. **Liquefaction**: Water is added to the meal to make 'slurry.' The slurry is heated to break the long starch molecules into smaller pieces. The **enzyme** alpha-amylase is added to **catalyze** (or speed up) the breakdown of the starch molecules.
3. **Saccharification**: Starch molecule pieces are broken down into the simple sugar **glucose**. This reaction is catalyzed by an enzyme called glucoamylase.
4. **Fermentation**: Single-celled microorganisms called **yeast** are added to the slurry. Fermentation is the biochemical process that occurs when yeast break down glucose. Yeast gets energy from glucose. As a result, ethanol is produced.
5. **Distillation and Dehydration**: The product of the fermentation process is only 10-15% ethanol. It must be **concentrated** to become pure (100%) ethanol. Ethanol has a lower **boiling point** than water. It is selectively **evaporated** and **condensed** in a process called **distillation**. This process produces ethanol that is 95% pure. The remaining 5% of the mixture is water. The mixture is strained and **dehydrated** to produce pure ethanol.
6. **Denaturation**: A small amount of gasoline is added to fuel ethanol to make it undrinkable.



PROCUREMENT OF ETHANOL AND ITS PRICING

From the inception of the EBP Programme, various pricing models have been adopted by the government which were based on the prevailing macro-economic situation of the sugar industry and the oil sector. The ethanol procurement gained momentum after the introduction of Administered Pricing Mechanism for Ethanol from ESY 2014-15. Prices of ethanol produced from sugarcane sources is approved by the Cabinet Committee on Economic Affairs (CCEA), while that from foodgrains is decided by OMCs. Since ESY 2018- 19, Government has introduced a differential pricing policy wherein higher rates were offered to sugar mills for production of ethanol from B-heavy molasses and sugarcane juice. Further In ESY 2019-20, even higher prices were offered for conversion of sugar/sugarcane juice to ethanol. The ex-mill price of ethanol being paid to ethanol suppliers for ESY 2020-21 produced from various variants of sugarcane and food grains is given in Table 5.1 below..

Raw material Source	Ex-mill Ethanol Price(Rs./litre)
B-Heavy	57.61
C-Heavy molasses	45.69
Sugar/Sugar Syrup	62.65
Damaged Food Grains/ Maize	51.55
Surplus Rice (FCI)	56.87

Administered Price of Ethanol by Source

Pricing Mechanism of Ethanol From Sugar Sector

- **Sugar/Sugarcane Juice/Sugar Syrup:** The pricing model is based on Fair and Remunerative Price (FRP) of Sugar Cane on which cost of conversion, depreciation and cost of capital is added to compute the ex-mill price of ethanol(Rs. 62.65/litre).
- **B Heavy:** The pricing model followed for B Heavy is linked to the normative cost of sugar on which cost of capital is added to compute the ex-mill price of ethanol (Rs.57.61 per litre).
- **C Heavy:** The pricing model followed is based on prices of molasses and ex- mill price of sugar. For ESY 2020-21, an estimated all India average recovery rate of 11.2% has been considered per metric ton of sugarcane and C heavy rate of Rs. 45.69 per litre has been computed.

Impact Of Existing Ethanol Pricing Mechanism

- **Central Government:** While petrol is subject to excise duty, GST is levied on ethanol. While GST would be in the range of Rs. 2.28/litre to Rs. 3.13 per litre of ethanol based on an ex-mill price in the range of Rs. 45.69/litre to Rs. 62.65/litre, excise duty on petrol is Rs. 32.98/litre. Considering total national ethanol blending volumes of 332 crore litre, revenue loss to the central government due to replacement of petrol by ethanol amounts to Rs. 10,950 crore per annum.
- **Oil PSUs:** OMCs pass on to the consumers any change in the price of fuel due to blending of ethanol and are therefore not impacted by the pricing of ethanol. At present, excise duty on landed cost of petrol at oil depots is higher than GST

  on the landed cost of ethanol and the benefit is being passed on to the retail consumers. However, in the future, should the price of ethanol increase beyond that of petrol, consumers may have to pay more for ethanol blended fuel. In such a scenario, tax (GST) breaks on Ethanol may become necessary.
- **Environmental Cost:** Sugarcane is a water intensive crop. On an average, one tonne of sugarcane can produce 100 kg of sugar, and 70 litres of ethanol. Cultivation of each kg of sugar requires 1600 to 2000 litres of water. Hence, one litre of ethanol from sugar requires about 2860 litres of water11. It is estimated that sugarcane and paddy combined use 70% of irrigation water of the country12. Keeping in view the need for water conservation, it is advisable to shift some of the area under sugarcane to less water intensive crops by providing suitable incentives to farmers. The Task Force on sugarcane and sugar Industry constituted under the

Chairmanship of Professor Ramesh Chand, Member (Agriculture), NITI Aayog has suggested ways to minimize water consumption through various means to encourage farm diversification.

- **Ethanol production from non-sugar sources:** Share of production of ethanol from non- sugar sources like damaged food grains and FCI rice is relatively small. The net returns from sugarcane are much higher than those from food crops; for example, in Karnataka it was about Rs. 1,13,590 per hectare as compared to Rs. 33,877 per hectare from paddy and 22,931 per hectare from maize during FY 2018-1913. The situation is similar in other states also. A high price of sugarcane leads to a higher price of sugar and its by-products like molasses, ethanol.

- **Environmental impact of choice of feedstock:** In the interest of environmental sustainability, making ethanol available on a pan-India basis and sharing the benefits of EBP widely, measures to promote production from non-sugarcane sources, food grains, especially maize14 and second generation sources may bepromoted through suitable pricing mechanisms.

FUEL ETHANOL DEMAND IN INDIA

Ethanol (also called ethyl alcohol, or alcohol) is an organic chemical compound with chemical formula C2H5OH. Besides the EBP Programme, ethanol finds competitive usage in the portable sector and the chemical & pharmaceutical industry. Demand for ethanol as a fuel is primarily driven by blending mandates, widespread availability of fuel, and compatible vehicles and fulfilment of other infrastructural requirements.

Growth In Vehicle Population

The vehicle population in the country is around 22 crore two and three wheelers and around 3.6 crore four-wheelers (SIAM). The 2 wheelers account for 74% and passenger cars around 12% of the total vehicle population on the road. The two-three wheelers consume 2/3rd of the gasoline by volume, while 4 wheelers consume balance 1/3rd by volume. The growth rate of vehicles in this segment is pegged at around 8- 10% per annum. An estimate of year-wise addition of gasoline- based vehicles in the country is given in Table-6.1 below:
:

Units in (lakhs)	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30
Two-wheeler gasoline	174	139	167	181	195	211	227	246	265	287	309
Passenger Vehicle (gasoline)	20	20	22	24	26	28	30	33	35	38	41
*The estimate is based on the following assumptions: V-shape recovery in sales in FY22, followed by growth at CAGR of 8% in all segments.Share of petrol vehicles will be 83% of the total passenger vehicle sale											

Projected addition of gasoline vehicles (in Lakhs)

Demand Projections Of Gasoline

Based on expected vehicle population, the demand projections of gasoline inIndia are given in Table-6.2.

Projections as per the 'Report of the Working Group on Enhancing Refining Capacity by FY2040										
Product / Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Motor Gasoline (MMTPA)*	27.7	31	32	33	35	36	37	39	40	41
Motor Gasoline (Cr.Ltr.)	3908	4374	4515	4656	4939	5080	5221	5503	5644	5785

Interim figures from PPAC considering growth @ 3-4% YoY (Source: MoP&NG) Projection interval is for 5 years and the data has been linearly extrapolated. The effect ofCOVID pandemic and introduction of EVs are considered.

Gasoline demand projections

Demand Projection Of Fuel Ethanol

The projected requirement of ethanol based on petrol (gasoline) consumption and estimated average ethanol blending targets for the period ESY 2020-21 to ESY 2025-26 are calculated below:

Ethanol SupplyYear	Projected PetrolSale (MMT)	Projected PetrolSale (Cr. litres)	Blending(in %)	Requirement of ethanolfor blending in Petrol (Cr. litres)**
A	B	B1=B X 141.1	C	D=B1*C %
2019-20	24.1 (Actual)	3413 (Actual)	5	173
2020-21	27.7	3908	8.5	332
2021-22	31	4374	10	437
2022-23	32	4515	12	542
2023-24	33	4656	15	698
2024-25*	35	4939	20	988
2025-26*	36	5080	20	1016

* The petrol projections may undergo revision due various factors like penetration ofEVs, etc.

*The figures are optimistic, as the E20 fuel will be consumed by new vehicles from April 2023 only. The demand for ethanol will, however, increase due to penetration ofE100 two wheelers, which are now being manufactured in the country.

Ethanol demand projection

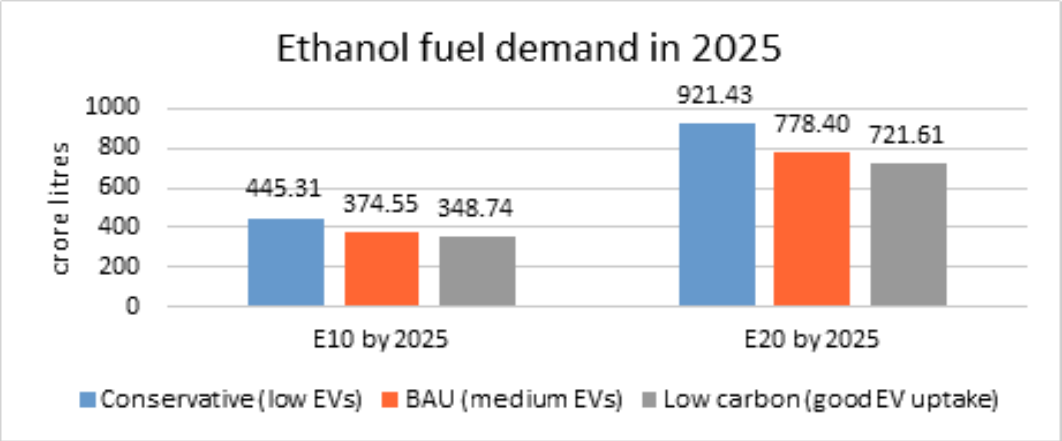
Additional Modeling of Ethanol Demand Scenarios

In addition, an Ethanol Demand modelling exercise was done by CSTEP(Center for Study of Science, Technology & Policy) using their long-term simulation model called Sustainable Alternative Futures for India (SAFARI). The SAFARI model estimates India's energy demand and emissions up to 2050 under various scenarios. It is driven by socioeconomic parameters like population and GDP, as well as development goals like food, housing, healthcare and education infrastructure, transport, and power for all. Given the inherent uncertainties in projections for the future and with electric vehicle revolution on the horizon, different scenarios have been considered. To estimate the demand for petrol and consequently ethanol, three scenarios for electric mobility uptake have been considered:

- Conservative (low EVs) – negligible uptake of electric mobility up to 2030.
- Business-As-Usual (BAU, medium EVs) – medium uptake of electric mobility; around 15% of car passenger-kilometres (pkms) and 30% of two-wheeler and three-wheeler pkms are assumed to be electric by 2030.
- Low Carbon (high EV uptake) – 30% of car pkms and 80% of two-wheeler andthree- wheeler pkms are assumed to be electric by 2030.

shows the ethanol demand in 2025 under these scenarios. As per this projection, the ethanol demand will be in the range of 722-921 crore litres in 2025 to meet E20 targets. In this report, we have assumed an enhanced ethanol demand of 1016crore litres based on expected growth in the vehicle population

(Table-6.1). The SAFARI model gives us confidence that our projections would cover the most ambitious scenario of ethanol demand in the country, and thus gives a robustness to ourroadmap for rollout of E20 by 2025.



Ethanol fuel demand in 2025 under various scenarios

ETHANOL SUPPLY PROJECTIONS

Ethanol Production Capacities

- In the year 2017-18, installed capacity of molasses-based distilleries was around 278 crore litres. With a view to enhance ethanol production capacity in the country, the government in July, 2018 & March, 2019 notified two interest subvention schemes for molasses-based distilleries. Under the aforesaid scheme of DFPD, interest subvention at the rate of 6% per annum or 50% of rate of interest charged, whichever is lower on the loan sanctioned was borne by the central government for a period of 5 years. DFPD approved 368 projects for setting up of new distilleries / expansion of existing distilleries.

- Loans amounting to about Rs.3600 crore have been sanctioned by banks to 70 sugar mills so far; 31 projects have been completed creating a capacity of 102 crore litres as a result. The capacity of molasses-based distilleries has reached to 426 crore litres. 39 more projects with capacity of 93 crore litres are likely tobe completed by March, 2022 which will bring cumulative capacities to about 519 crore litres.

- With a view to achieve blending targets, DFPD is making concerted efforts to enhance the ethanol distillation capacity in the country. For this, the government had invited applications from the entrepreneurs under the ethanol interest subvention schemes in September, 2020 during a window of 30 days. Thus far, 238 projects for a capacity enhancement of 583 Cr litres with a loan amount of about Rs.16,000/- crore have been approved by DFPD. It is expected that at least 400 Cr litres capacity would be added from these projects by 2024.

Modified Interest Scheme To Enhance Production Capacity Of Ethanol

- Affairs (CCEA) in its meeting dated Cabinet Committee on Economic 30.12.2020 approved a note of DFPD for extending financial assistance for producing 1G ethanol from feedstocks such as cereals (rice, wheat, barley, corn & sorghum), sugarcane, sugar beet etc.15 Thereafter, with the approval of CCEA, DFPD has notified modified interest subvention scheme on 14.01.2021 for setting up new grain-based distilleries/ expansion of existing grain-based distilleries to produce ethanol & production of ethanol from other 1G feed stocks. About 418 applications received for capacity addition of 1670 Cr litres have been recommended for in-principle approval. It is expected that at least ethanol capacity of about 500 Cr litres (of molasses and grain-based) would be added from these upcoming projects. Further applications would be invited by DFPD as and when required.

- Thus, it is expected that capacity of molasses-based distilleries would increase from current levels of 426 crore litres to 730 and 760 crore litres by 2024-25 and 2025-26 respectively. 75 crore litres capacity is being added by existing grain-based distilleries; further OMCs are planning to set up about 10-15 new grain-based distilleries thereby adding capacity by 100-150 crore litres. Hence, capacity of grain-based distilleries is expected to reach 350, 450, 700 and 740 crore litres during 2022-23, 2023-24, 2024-25 and 2025-26 respectively from current levels of 258 crore litres.

- DFS has impressed upon banks to expedite sanctioning and disbursal of loans. Concept of Tripartite Agreement between mills/distilleries, banks and OMCs has been introduced which is facilitating mills/distilleries to avail loans for ethanol projects. State Bank of India has also

issued Standard Operating Procedure (SOP) for sanction and disbursal of loans to molasses-based distilleries. Similar SOPs are also being issued in respect of grain-based distilleries; and by other banks. DFPD has developed a web portal viz.

- http://sugarethanol.nic.in to review the progress of upcoming ethanol projects on a real time basis. In the portal, project proponents can share the bottle-necks, if any, faced by them so that related Ministries like DFS, MoEF&CC, DFPD, MoP&NG and State Governments can sort out the problems by expediting requisite clearances and sanctioning and disbursal of loans. DFPD has held webinars with the State Governments, Industry Associations, MoP&NG, DFS, MoEF&CC, Banks, OMCs to motivate investors to set up the distilleries and expedite various approvals and clearances. DFPD plans to hold state specific webinars with State Governments, entrepreneurs, DFS, MoEF&CC, MoP&NGto assess the progress of projects and to ensure speedy clearances of projects.
- To achieve an 8.5% blending target in ESY 2020-21 (December, 2020 to November, 2021), about 332 crore litres ethanol is required against which about
- 325 Cr litres have been allocated by OMCs (till 22.02.2021) to sugar mills/distilleries. Also, in the next ESY 2021-22, OMCs need to procure 437 crore litres of ethanol to achieve 10 % blending.

Availability Of Feed-Stocks For Production Of Ethanol

- To produce 684 crore litres of ethanol by the sugar industry by 2025-26, sugarcane equivalent to 60 LMT of surplus sugar would be diverted to ethanol. In the current sugar season 2020-21 more than 20 LMT of sugar is estimated tobe diverted. To produce 666 crore litres of ethanol/ alcohol from food grains by2025-26, about 165 LMT of food grains would be utilized. At present damaged food grain availability is around 40 lakh ton in the country. In 2020-21 approximately 20 lakh ton maize is surplus; FCI Rice is also sufficient in stock (266 LMT) and it will continue to remain robust as procurement of paddy/rice at MSP continues at expected levels.
- The country is producing sufficient food grains and sugar to meet the

requirement for ethanol. Molasses-based distilleries have also been offered interest subvention to convert them to dual feed, to convert both food- grains & molasses into ethanol. Thus, it is expected that there would besufficient ethanol distillation capacity to achieve blending targets. DFPD is effectively monitoring the situation and encouraging states and investors to set up new industries and make sufficient availability of ethanol for blending.

- Under PM-JIVAN scheme, 12 commercial plants and 10 demonstration plants of Second Generation (2G) Bio-Refineries (using ligno-cellulosic biomass as feedstock) are planned to be set up in areas having sufficient availability of biomass so that ethanol is available for blending throughout the country. Already Rs. 1969.50 Crores have been earmarked for this scheme. These plants can use feedstocks such as rice straw, wheat straw, corn cobs, corn stover, bagasse, bamboo and woody biomass, etc.

Feed-stock	Annual production	Annual Consumption	Surplus
Sugar16	320	260	60
FCI rice*17	520 (Annual Procurement)	350 (Annual issue)	309#18 (Stock in central pool)
Maize**19	285	165	103##

Availability of feed-stock for Ethanol in the Country (In Lakh Ton)

Estimation Of Supply And Capacity Augmentation

During the meeting of Committee of Secretaries on 13.11.2020, DFPD informed that the fuel 20% ethanol requirement by 2025 will be met from sugar as well as grains sectors. Table provides the Year-wise and Sector-wise Ethanol Production Projections as per increasing Blending Percentages.

Ethanol Production Projections										
ESY	For Blending			Blending(in %)	For other uses			Total		
	Grain	Sugar	Total		Grain	Sugar	Total	Grain	Sugar	Total
2019-20	16	157	173	5	150	100	250	166	257	423
2020-21	42	290	332	8.5	150	110	260	192	400	592
2021-22	107	330	437	10	160	110	270	267	440	707
2022-23	123	425	542	12	170	110	280	293	535	828
2023-24	208	490	698	15	180	110	290	388	600	988
2024-25	438	550	988	20	190	110	300	628	660	1288
2025-26	466	550	1016	20	200	134	334	666	684	1350

Year wise & Sector wise Ethanol Production Projections

The following table details the Grains and Molasses based EthanolProduction Capacity necessary to meet the Production Projections above.

Capacity Augmentation (in Cr. Lt)			
Year	Capacity Requirement		
	Grain	Molasses	Total
2019-20	258	426	684
2020-21	260	450	710
2021-22	300	519	819
2022-23	350	625	975
2023-24	450	725	1175
2024-25	700	730	1430
2025-26	740	760	1500

Table : Ethanol capacity requirement by Year and Raw Material

Table below lays down the capacity augmentation plans for 2025-26, and its yearwise breakup.

Ethanol Supply			
Ethanol Supply (in Cr. Lt.)	**Fuel ethanol**	**Other uses**	**Total**
(A) From sugar sector	550	134	684
(B) From grain/ maize etc.	466	200	666
Total Supply	**1016**	**334**	**1350**
Capacity Augmentation			
Ethanol Capacity (in Cr. Lt.)	**Molasses based**	**Grain based**	**Total**
Existing ethanol/alcohol capacity	426 (231 distilleries)	258 (113 distilleries)	684
Capacity addition from sanctionedprojects	93 (will be addedby March,2022)	0	93
New capacity to be added	241	482	723
Total Capacity required by Nov 2026 toreach 1350 Cr litres supply	760	740	1500

- Additional capacity (90 % of 1500 = 1350) has been taken to account operational efficiency, raw materialavailability in various parts of the country due to natural calamity etc., increase in demand in ethanol dueto economic factors and anticipated demand of ethanol in flex-fuel vehicles.
- Molasses based distilleries can produce 20% additional ethanol if sugar rich feed stocks like B- heavy molasses are used as the same capacity can cater the higher demand of ethanol.
- Total planned capacity is 1500 crore litres per annum, distribution between grain and molasses may changedepending on various factors.
- It is relevant to mention that earlier on the inputs obtained from MoP&NG, 900 cr ltrs ethanol was estimated to achieve 20% blending and 300 Cr ltrs was the requirement of other sectors, thus total requirement was assessed to be 1200 cr litres by 2024-25. However, as per the revised estimates of gasoline consumption obtained from MoP&NG, about 988 cr ltrs is required to achieve 20% blending by 2024-25 and total requirement of alcohol including other sectors would be 1288Cr litres. For 2025-26, ethanol requirements is 1016 cr ltrs to achieve 20% blending and total requirement of alcohol including other sectors would be 1350 Cr litres.

Table: Ethanol Capacity augmentation (20% blending by 2025-26)

CONCLUSION

Ethanol is considered to be a better fuel than petrol and is an important substitute, pollution free, indigenous and cost effective. The procurement of Ethanol has seen a rise from 28 crore litres to 320 crore litres Ethanol is a sustainable energy source, and it reduces the amount of gasoline in your fuel. This is a good for the environment.
cheaper than regular gas. steady flow of raw materials. natural anti-freeze, which helps keep fuel lines from freezing. cleaner burning.
Consumers who drive flex-fuel cars receive tax credits that can significantly reduce or even eliminate their tax obligation.
Many flex-fuel vehicles run on ethanol, which is sustainably produced from ingredients such as cane sugar and corn. This makes ethanol a good alternative to purchasing foreign oil.

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