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# ELECTRIFIED FLEX FUEL VEHICLE (FFV) launched

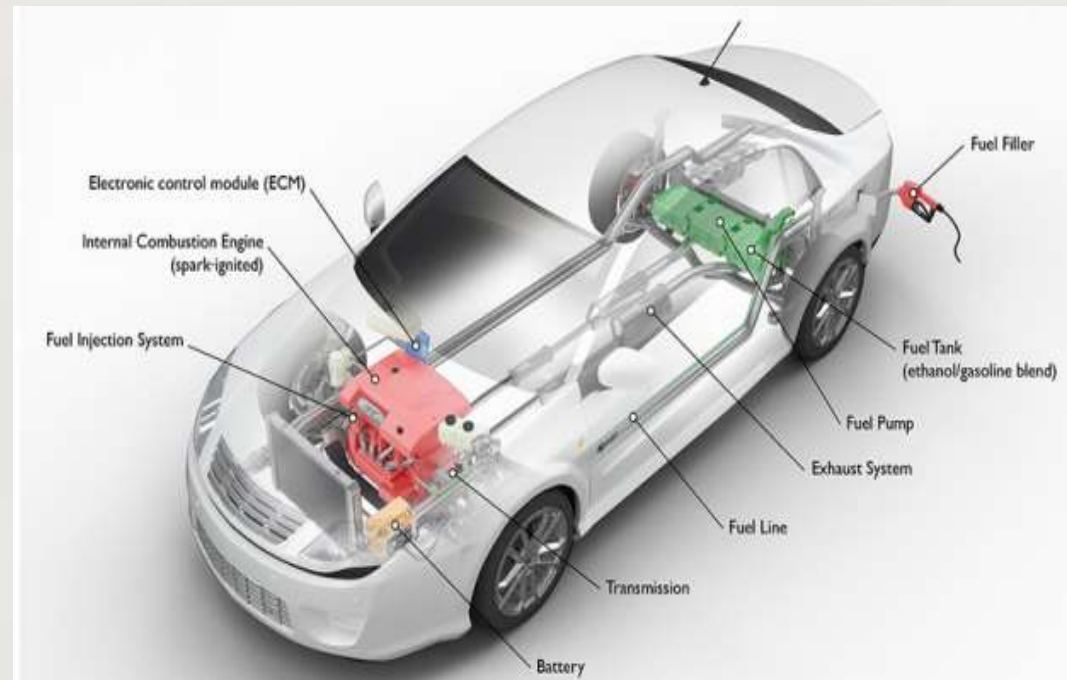


## About Electrified Flex fuel vehicle:

It is the **World's first BS-6 (Stage-II) Electrified Flex fuel vehicle.**

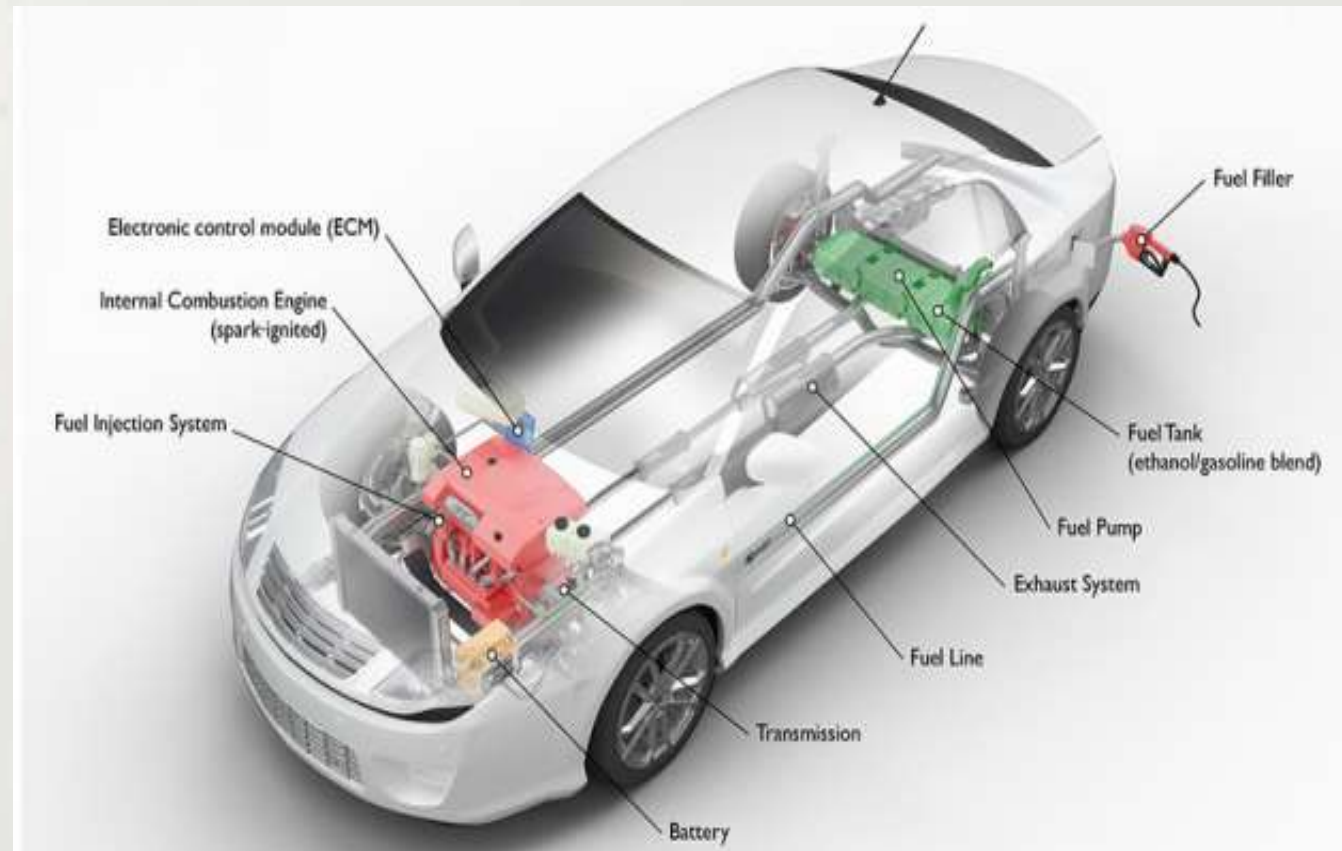
### Flex-fuel vehicles (FFV)

They have engines that can run on flexible fuel - a combination of **Petrol/Diesel/Electric and ethanol**

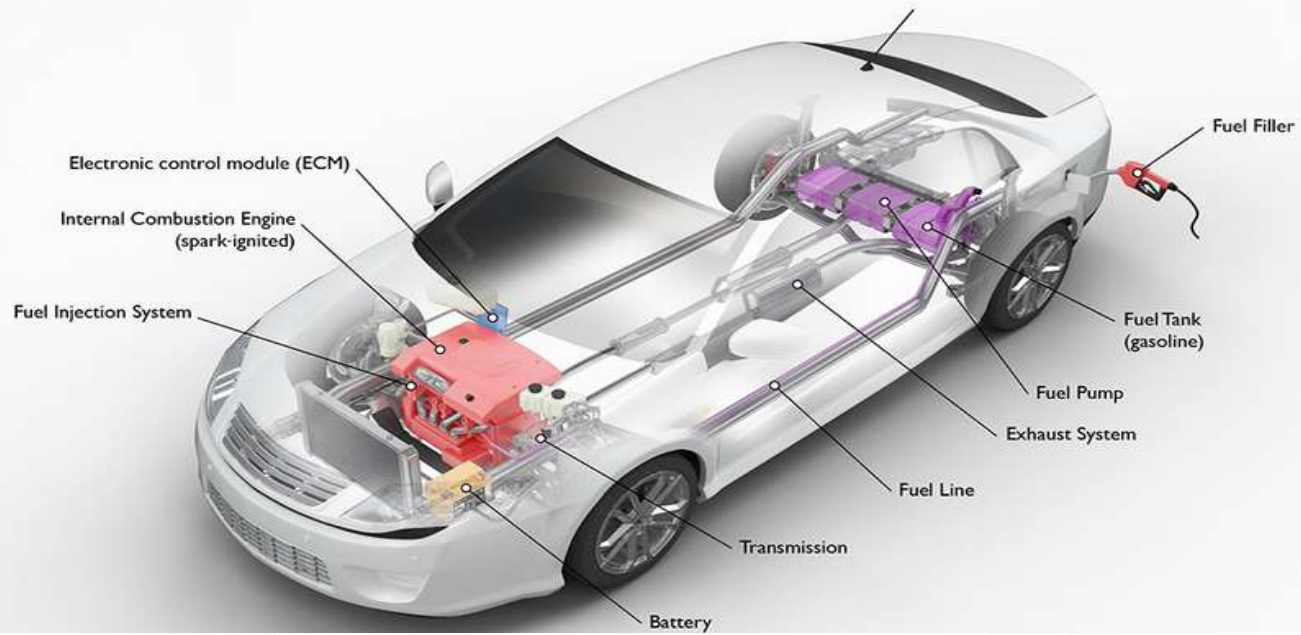




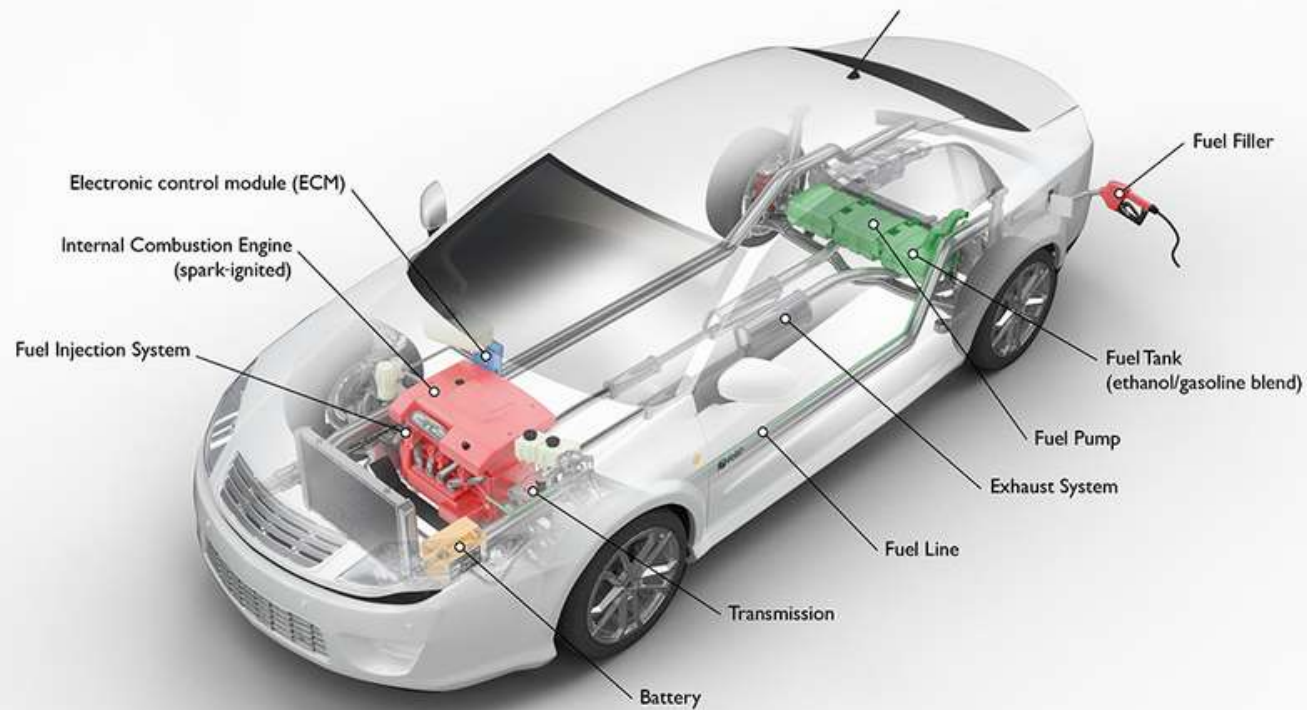
- o This **vehicle has both the fuel engine as well as an electric powertrain**
- **FFV has an internal combustion engine that can run on more than one type of fuel, or even a mixture of fuels such as petrol and ethanol.**
- This vehicle is capable of **running on up to 85% ethanol blended petrol**



## Gasoline Vehicle



## Flexible Fuel Vehicle



## Significance of Electrified Flex fuel vehicle

- The integration of an electric powertrain **reduces reliance on conventional fuels,**
- contributing towards India's '**Aatmnirbhar Bharat**' initiative as **production of ethanol increases.**
- this vehicle can achieve significantly **higher fuel efficiency, optimizing the use of ethanol and electricity.**
- The vehicle represents a significant stride towards **decarbonisation and greener mobility,** aligning with global efforts to **combat climate change.**





## Ethanol Blending

**Ethanol**, a key biofuel **produced through fermentation of sugars** by yeasts or petrochemical methods.

The **National Policy on Biofuels – 2018** targets **20% ethanol blending**



# National Policy on **Biofuels** 2018

## Salient features



An indicative target of **20%** blending of ethanol in petrol and **5%** blending of biodiesel in diesel is proposed by 2030.



With a thrust on **Advanced Biofuels**, the Policy indicates a viability gap funding scheme for **2G ethanol Bio refineries** of **Rs.5000 crore in 6 years** in addition to additional tax incentives, higher purchase price as compared to **1G biofuels**.



Setting up of National **Biofuel coordination committee (NBCC)** under **Ministry of Petroleum & Natural Gas** and Working Group on Biofuels.



Increase scope of raw material for ethanol procurement by encouraging Intermediate ( **B-Molasses**), Sugarcane Juice, other Sugar containing materials and damaged as well as surplus food grains.



Develop **National Biomass repository** by conducting appraisal of biomass across the Country.



Bio diesel production to be encouraged from non edible oilseeds, **used cooking oil**, short gestation crops and development of supply chain mechanisms.



Thrust on **research, development and demonstration** in the field of **Biofuel feedstock** production, advanced conversion technologies from identified feedstock.



Categorization of Biofuels into **Basic Biofuels** - First generation(1G) Bioethanol & biodiesel and "**Advanced Biofuels**"- Second Generation(2G) ethanol, drop-in fuels, **algae based** Third Generation( 3G) Biofuels.

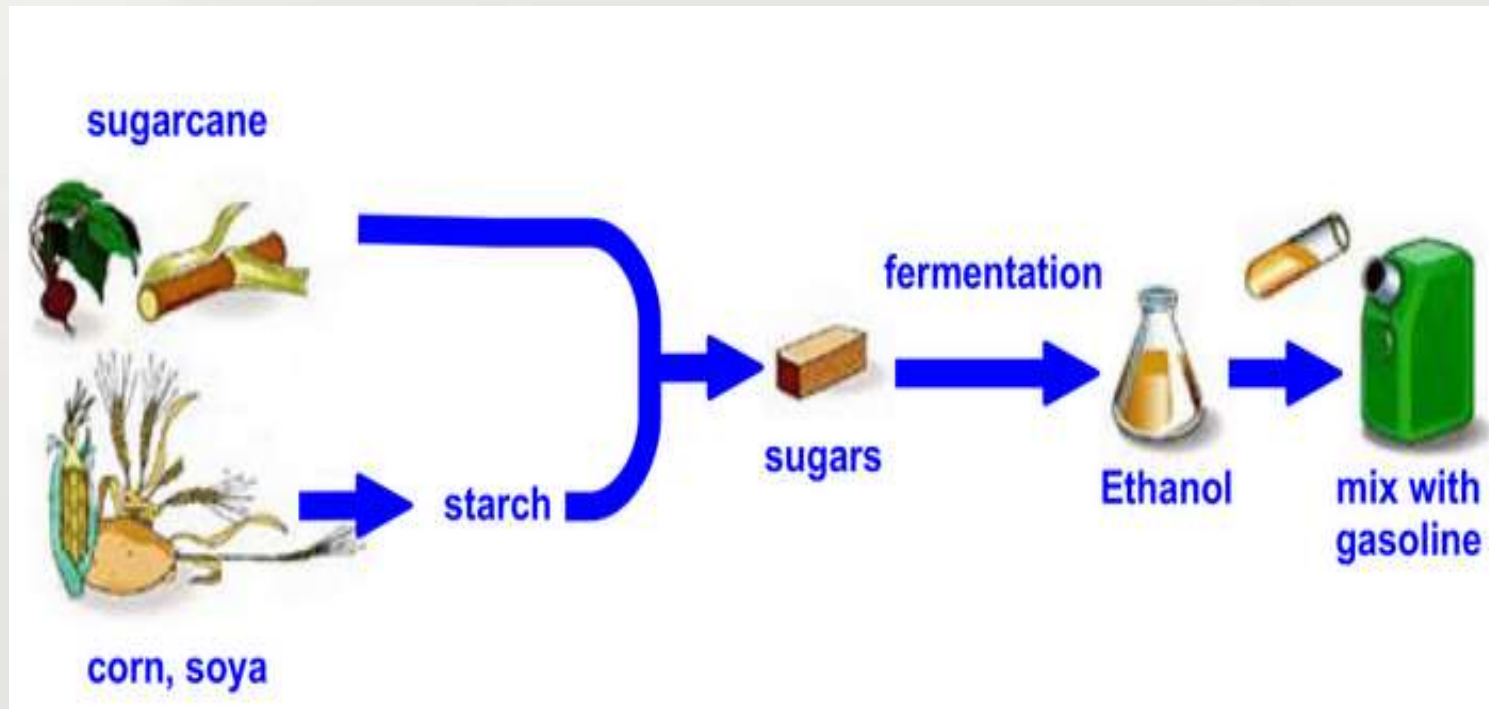




# Classification of Biofuels

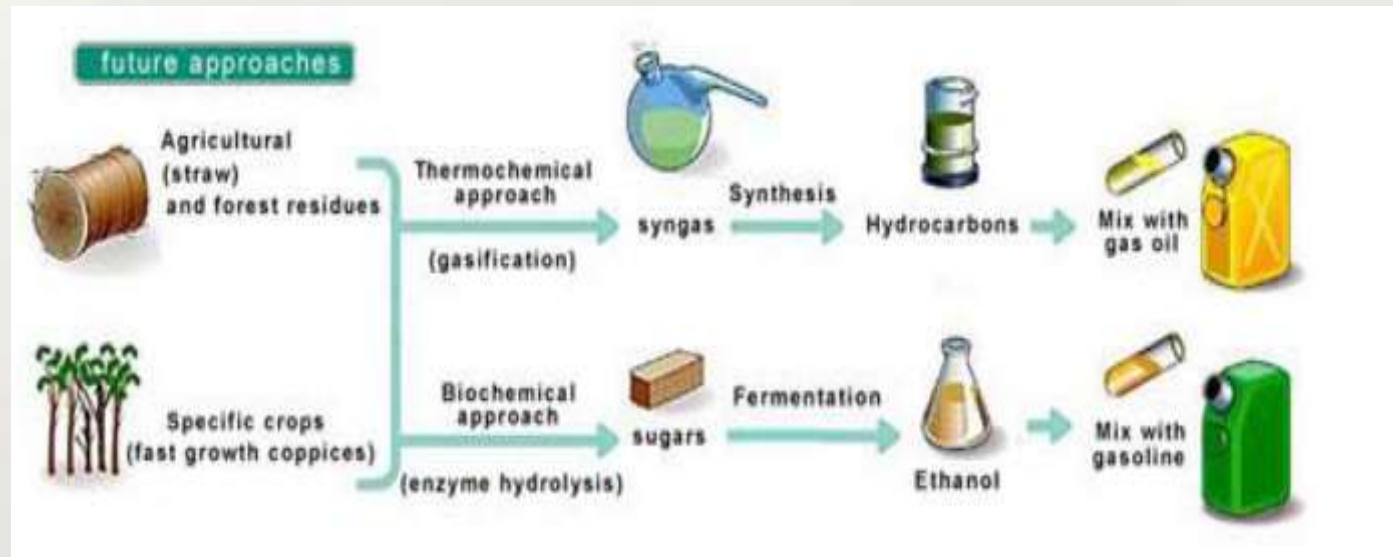
## 1st generation biofuels

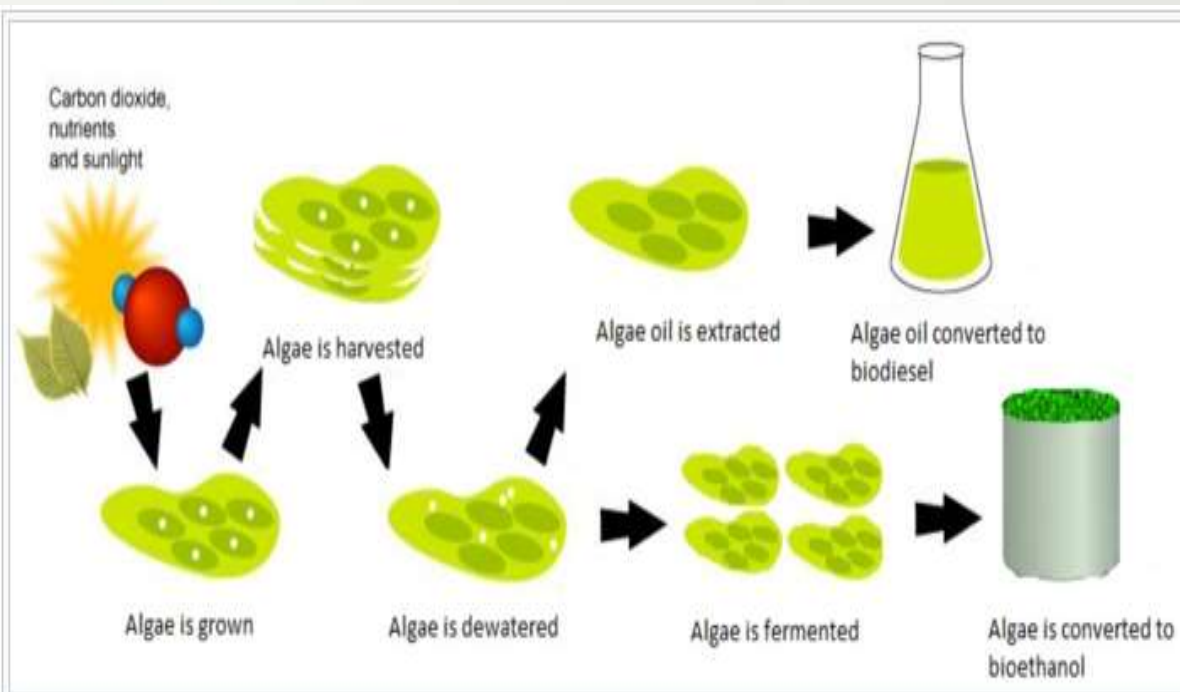
- Any biofuel made from a **feedstock that can also be consumed as a human food** is considered a first-generation biofuel.
- these are made of all food products (**sugar, starch, or vegetable oil**).
- also called **conventional biofuels**.
- Eg **bioethanol, biodiesel**



## 2nd generation biofuels

- produced **from sustainable feedstock**.
- They are **not food crops**
- Second generation biofuels are often **called “advanced biofuels.”** it can be made from **feedstock such as wood, straw etc**





## 3rd generation biofuels

➤ derived from algae.

## 4<sup>th</sup> generation biofuels

➤ genetically engineered crops to take in high amounts of carbon are grown and harvested as biomass. Eg. Engineered algae







## National policy on biofuel-2018

- The **Government of India** has advanced the target for 20% ethanol blending in petrol to 2025 from 2030.
- The **target of 10% ethanol blending** for Ethanol Supply Year (ESY) 2021-22 has **already been achieved**.
- **India has made significant improvement in ethanol blending from 1.53% in 2013-14 to 11.8% in August, 2023**

## Benefits of Ethanol Blending

- **Lower harmful pollutant** emission like **Carbon monoxide, sulphur**, etc.

### Benefits of Adopting Ethanol Blended Petrol



Reduces  
dependency  
on crude  
oil imports



Boosts  
farmers'  
income



Reduces crop  
burning &  
pollution

## Problems with Ethanol Blending

- **Loss of mileage** from use of ethanol blends results from the **ethanol molecule containing less energy value than gasoline.**

Fuel	Lower Heating Value (BTUs/gallon)
Gasoline	115,000 <sup>d</sup> - 115,400 <sup>a</sup>
Diesel fuel	128,700 <sup>a</sup> - 132,000 <sup>b</sup>
Ethanol	75,670 <sup>a</sup> - 76,000 <sup>d</sup>
Biodiesel	117,093 <sup>a</sup> - 118,170 <sup>b,c</sup>

A NITI Aayog report suggested that in 2019-20, of the total **ethanol produced in the country**, over **90 per cent came from sugarcane alone.**

- Crops such as **sugarcane** are usually very **water-intensive**





**This Flex fuel vehicle is the World's first BS-6 (Stage-II) Electrified Flex fuel vehicle**

### **BS6 Norms**

- **The Bharat Stage (BS) norms are emission standards instituted by the Government of India to regulate the output of air pollutants from motor vehicles.**



### Indian Emission Standards (4-Wheel Vehicles)

Standard	Reference	YEAR	Region
India 2000	Euro 1	2000	Nationwide
Bharat Stage II	Euro 2	2001	NCR*, Mumbai, Kolkata, Chennai
		2003.04	NCR*, 13 Cities†
		2005.04	Nationwide
Bharat Stage III	Euro 3	2005.04	NCR*, 13 Cities†
		2010.04	Nationwide
Bharat Stage IV	Euro 4	2010.04	NCR*, 13 Cities†
Bharat Stage V	Euro 5	(to be skipped)	
Bharat Stage VI	Euro 6	2020.04	Entire country

\* National Capital Region (Delhi)  
 † Mumbai, Kolkata, Chennai, Bengaluru, Hyderabad, Ahmedabad, Pune, Surat, Kanpur, Lucknow, Sholapur, Jamshedpur and Agra

- **Bharat Stage (BS) norms Introduced in the year 2000.**
- **They are based on European (EURO) emission standards.**
- **Bharat Stage (BS) emission norms were first brought into effect in 2000 under the head “India 2000”.**

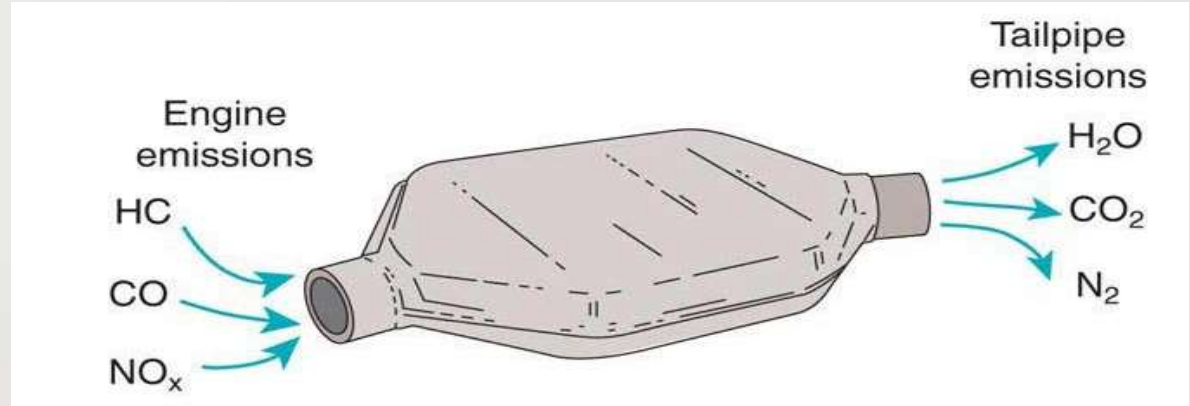


PRESCRIBED EMISSION LIMITS				
	CO	(HC + NOx)		Sulphur
	gm / Km	gm / Km		ppm
BS I	2.71	0.97		
BS II	2.3	0.5		500
		HC	NOx	
BS III	2.2	0.2	0.1	350
BS IV	1	0.1	0.08	50



## BS6 emission norms

➤ **Diesel Particulate Filter (DPF)** and **Selective Catalytic Reduction (SCR)** are being introduced with the roll-out of Bharat Stage VI norms, which were not a part of Bharat Stage IV.



- Sulphur and Nitrogen Oxide content: **Sulphur** traces in BS6 fuel is **five times lower (10 ppm)** as **compared to** sulphur traces in **BS4 fuel (50 ppm)**.
- Further, **nitrogen oxide** level for BS6-grade **diesel engines and petrol engines** will be **brought down by 70% and 25%, respectively**.
- BS VI can bring **PM** in diesel cars down by **80 per cent** .

**BS6 Stage II:** BS6(Stage II) has even **stricter emission limits** compared to the initial BS6 norms.

- BS6 (Stage II) **incorporates Real Driving Emissions (RDE)-** It will **measure a vehicle's emission in real-time conditions** against laboratory conditions.
- The new **RDE test figures will provide a more realistic estimation** of the amount **of emissions** likely to be produced by vehicles in real traffic conditions **with frequent changes in speed, acceleration, and deceleration.**



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