

# Fossil fuels driving towards slow lane

Petrol and diesel demand growth to decelerate by 2030 as CNG and electric vehicles vroom



## CRISIL Research analytical contacts

**Hetal Gandhi**

Director

hetal.gandhi@crisil.com

**Drishti Chugh**

Senior analyst

drishti.chugh@crisil.com

**Niharika Gudadur**

Senior Analyst

niharika.gudadur@crisil.com

**Abhishek Pal**

Senior Analyst

abhishek.pal@crisil.com

**Priti Choudhary**

Analyst

priti.choudhary@crisil.com

## India's energy shift to show up in key transportation fuels

The United Nations' Climate Change Conference, better known as COP26, has emphasised yet again the pivotal role India will play in the global energy transition matrix.

Over this decade, the focus is expected to shift from sources of energy to major areas of energy use such as transportation, and the energy mix it runs on. Indeed, CRISIL Research's assessment across usage categories suggests transportation will play a prominent role in India's energy transition plan.

To be sure, investments in renewables will continue to shrink the share of coal. But crude, which contributes ~28% to the overall energy mix and is a large source of carbon emissions, will see changing dynamics as we migrate to meet the emission target for 2030. Notably, ~50% of crude consumption in India is for transportation.

Within crude, petrol and diesel have a share of 14% and 39%, respectively. Also, petrol and diesel together account for ~93% of the overall transportation fuel basket.

An analysis shows government initiatives to control emissions will impact the transportation sector on three major counts this decade. Through fiscal 2025, aggressive adoption of compressed natural gas (CNG) and ethanol blending will help slow down growth in demand for petrol. Beyond that year, there will be further flattening as electric vehicles (EV) hit the road rapidly.

These initiatives will, in turn, have three broad effects.

One, they will displace a significant portion of diesel and petrol sales in coming years. Diesel consumption will log a compound annual growth rate (CAGR) of ~4% between fiscals 2022 and 2025, but slow to ~2.5% between fiscals 2025 and 2030, given continuous penetration of CNG vehicles. The brakes will slam harder on petrol sales, slowing it from an already low CAGR of ~2% between fiscals 2022 and 2025 to a mere 1% CAGR between fiscals 2025 and 2030.

Two, 40-60 million tonne per annum (MTPA) of capacity addition lined up by refiners — over and above ~110 MT that will come on-stream by fiscal 2030 — may need to be trimmed as these may not be needed. Even excluding these 40-60 MTPA capacities, we see utilisation of refiners remaining below 100% through most of this decade for the first time in years.

Three, refiners are trying to re-invent themselves through diversification and revenue-stream expansion by producing more value-added products such as petrochemicals. With such large-scale, planned petrochemical and crude-to-chemical capacities bringing in more efficiencies, India will be better-placed to export surpluses over the longer term. From being a net importer of many petrochemicals so far, it will shift to becoming an exporter amid plant shutdowns in Europe and continued demand from China.

The viability of such integrated capacities in the global landscape remains a monitorable. However, it is expected to evolve further, firming up India's value proposition in the global landscape.

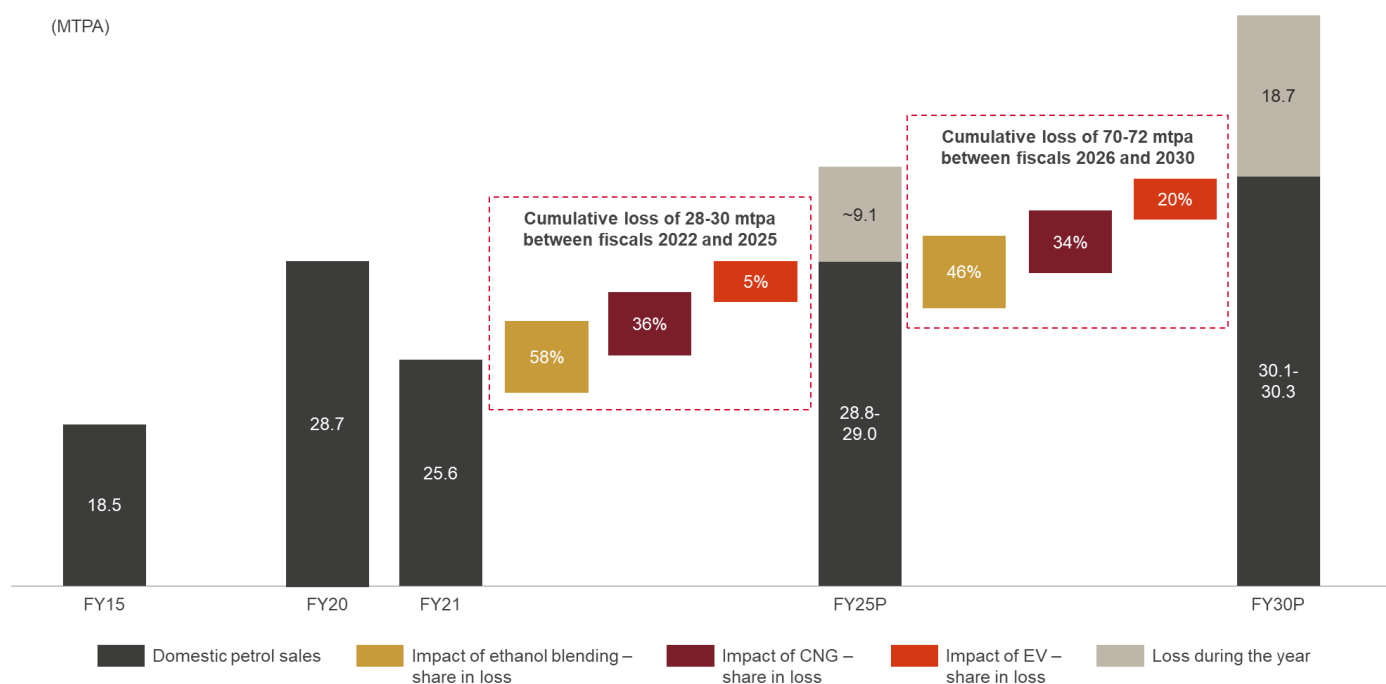
## Petrol demand to idle by fiscal 2030, diesel growth to moderate

Domestic demand for petrol (excluding ethanol) is expected to grow a mere 2% between fiscals 2022 and 2025. Between fiscals 2020 and 2025, it is expected to be flattish at 28.8-29 MTPA.

Over the next three years, 28-30 MT of domestic sales is expected to be displaced: 16-18 MT because of ethanol blending, 9-11 MT due to CNG and 1-2 MT by EVs.

As EV penetration gains momentum post fiscal 2025, largely led by the two-wheeler segment, the fuel displacement is likely to get sharper. We expect a total loss of 70-72 MTPA between fiscals 2026 and 2030 — 46% attributable to ethanol blending, 34% to CNG, and 20% to EVs.

### Nearly a third of potential petrol demand to evaporate by FY30, ethanol blending a leading cause



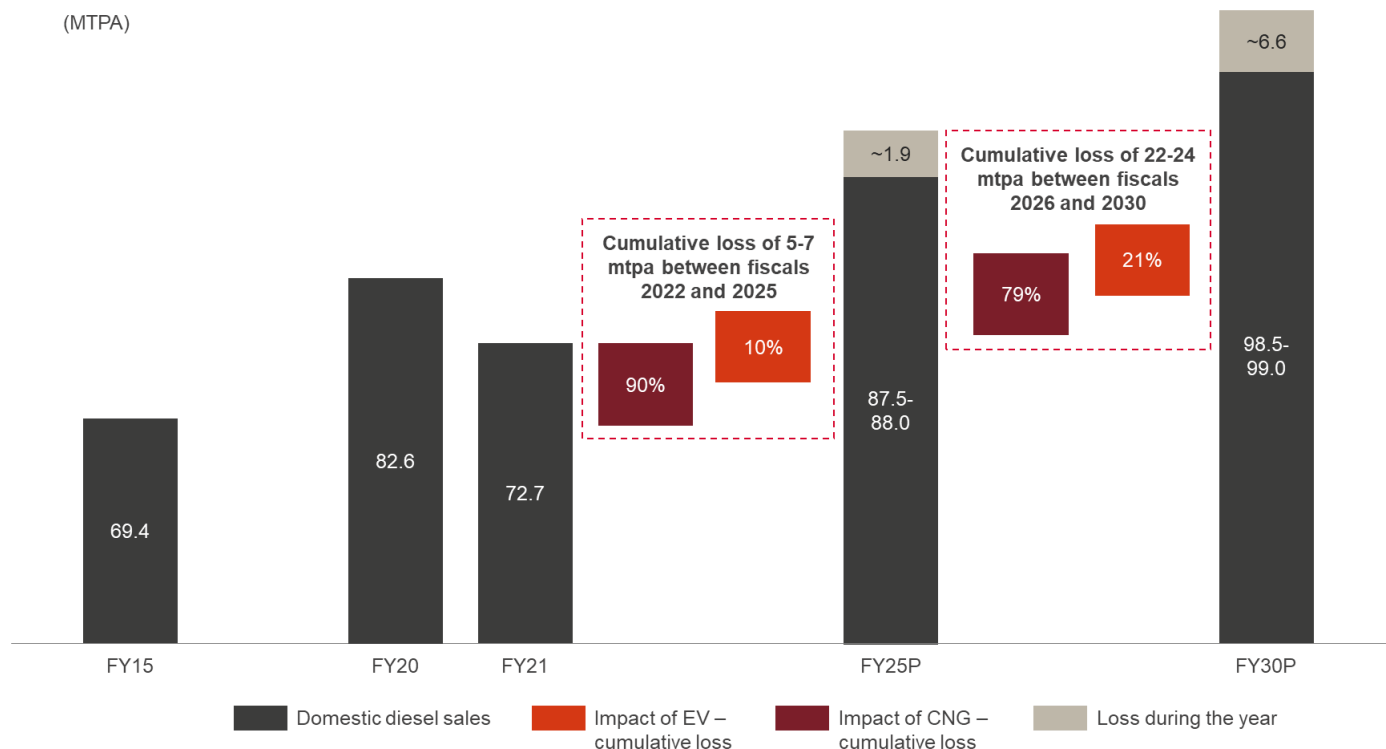
Source: CRISIL Research, Petroleum Planning and Analysis Cell (PPAC)

A similar trend is visible in diesel as well. However, given that commercial vehicles account for the major share of diesel consumption (~75%), where the shift towards alternative fuel is expected to be lower, the loss in diesel consumption is estimated to be less than that in petrol.

Of the total expected loss of 5-7 MT in diesel consumption between fiscals 2022 and 2025, 5-5.5 MT is expected to be on account of CNG, and 0.5-1 MT due to EVs.

Between fiscals 2025 and 2030, the potential loss is expected to be sharply higher at 23-24 MT, of which 18-19 MT will be on account of CNG alone.

**Potential loss in diesel demand restricted to ~3% by FY30**



Source: CRISIL Research, PPAC

Traditionally, refineries have been set up with the expectation of maximising production of fuels such as petrol and diesel. However, as discussed, regulatory pressure and technological advances are likely to have a significant bearing on demand growth for transportation fuels.

**Not enough demand for some 40-60 MT of incremental refining capacities; crude demand to come off ~1 MBPD**

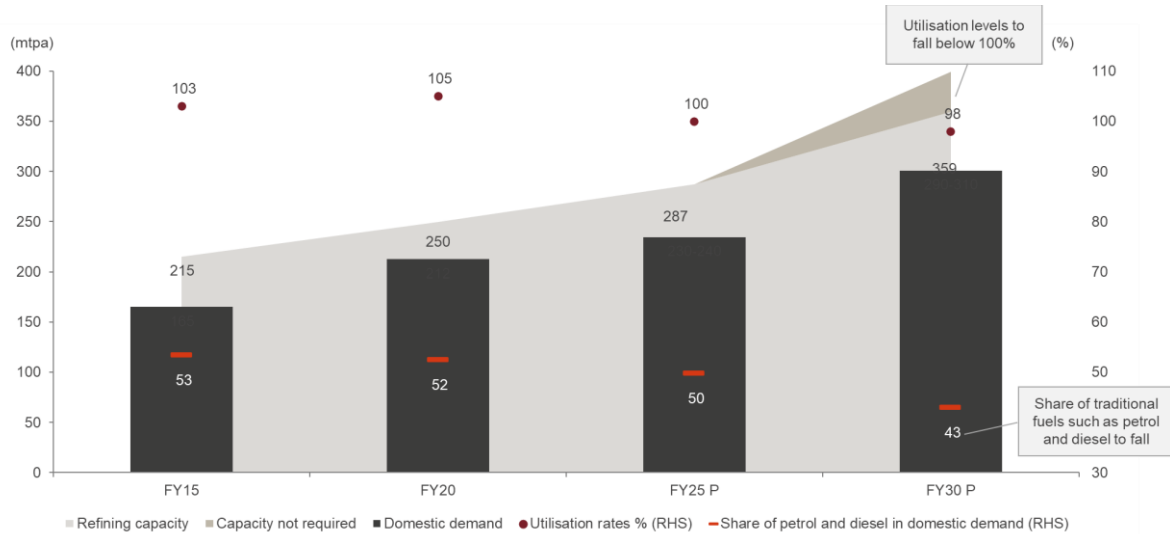
From the supply point of view, the current refining capacity stands at ~250 MTPA. By fiscal 2030, domestic refining capacity is expected to increase ~110 MT, taking the total capacity to ~360 MTPA.

Against this, domestic demand for petroleum products is expected to grow from ~214 MT in fiscal 2020 to 290-310 MT by fiscal 2030.

Clearly, domestic demand is unlikely to keep up with capacity growth. Besides, exports of petrol and diesel are also expected to be limited. Hence, we see utilisation dropping from an average of 103% between fiscals 2015 and 2020, to ~98% in fiscal 2030.

Apart from the already planned capacity additions, 40-60 MT of additional capacities have also been announced. Their commissioning, however, remains in question, given that domestic demand for transportation fuel is seeing a huge structural change.

**~110 MTPA refining capacity to go on-stream between FY20 and FY30; slower demand growth to pull down utilisation**



Source: CRISIL Research, PPAC

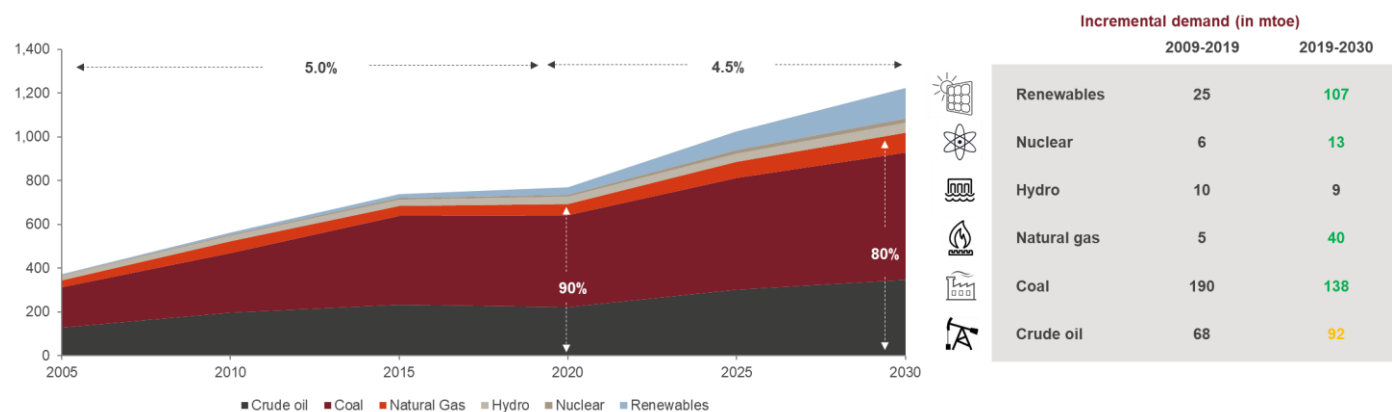
Based on the expected displacement by alternative fuels, the additional unwanted capacities, as well as lower utilisation, CRISIL Research estimates a loss of ~1 million barrels per day (MBPD) of oil demand by fiscal 2030.

But despite the potential loss in demand from the road transport segment, incremental oil demand is expected to increase 1.8 MBPD this decade, taking the total oil demand to ~7 MBPD in fiscal 2030 from 5.11 MBPD in fiscal 2020. This will be majorly driven by growth in naphtha, supported by increase in petrochemicals capacities.

**India’s energy demand to log 4-5% CAGR through next decade, met largely through crude oil and coal**

India’s energy mix is largely dominated by fossil fuels. In 2020, ~55% of primary energy was met through coal, and ~28%, crude oil. Given a strong impetus on improving the share of cleaner energy such as renewables, natural gas and hydrogen, the share of coal is expected to decline to ~47% by 2030. However, despite efforts to bring down dependence on oil, its share is expected to remain high, given capacity additions in petrochemicals.

**~83% of India’s energy mix dominated by coal and crude oil**






Source: CRISIL Research, Industry reports

Global CO<sub>2</sub> emissions have increased at 1.0% CAGR between 2010 and 2019. In 2020, CO<sub>2</sub> emissions declined ~7% on-year due to the pandemic's impact on economic activity. However, India's share in global CO<sub>2</sub> emissions has increased from 5.3% in 2010 to 7.3% in 2019, or at 4.6% CAGR, clearly implying that India's emissions are growing at a faster pace than the world average (Source: BP Stats).

A sectoral breakup of CO<sub>2</sub> emissions in India reveals, the share of electricity/power has declined from 53% in 2005 to 51% in 2018. On the other hand, share of transportation has risen from 10% to 13%. Given India's under penetrated vehicle market, this share is expected to climb further in the future.

**Share of transportation and manufacturing in carbon emissions up 3% between 2005 and 2018**

**Share in CO<sub>2</sub> emission by sector — India**

	2005	2018
 Electricity/Heat	53%	51%
 Manufacturing	20%	23%
 Transportation	10%	13%

*Note: 2019 data is not available*

*Source: CRISIL Research, Industry reports*

The rising share of transportation in carbon emissions, and its large consumption of energy, especially crude, makes it an area of focus for the government over the next decade. In the context, even as vehicle sales growth remains high, the transportation sector will be impacted by initiatives on three major counts — EV-focused policies, building CNG infrastructure, and ethanol blending.



## EV sales to pick up gradually till fiscal 2025, gather pace thereafter

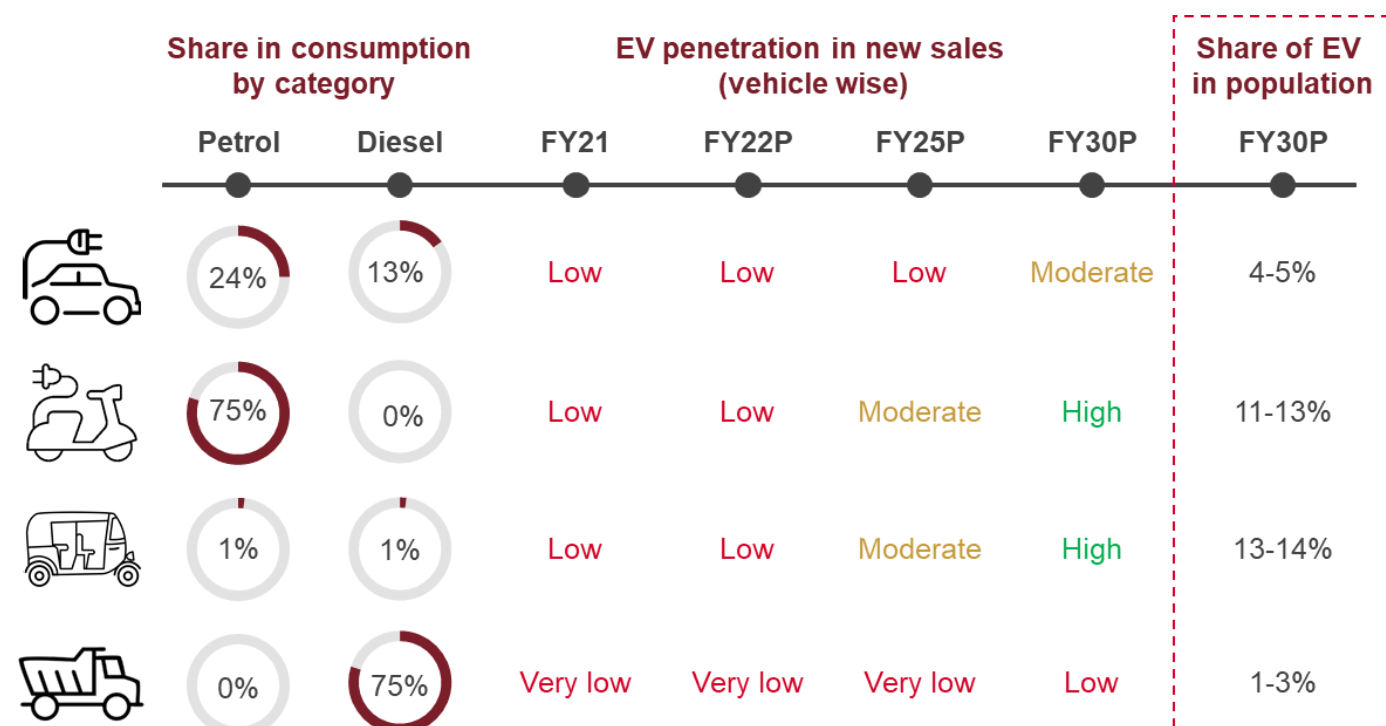
India's road to EV adoption has been bumpy. The government initially targeted 30% EV penetration (in volumes) by fiscal 2025, and later on redefined the target to 30% by fiscal 2030, citing unpreparedness of the ecosystem. Since then, however, its stance on direct subsidy for purchase of vehicles has shifted positively. Revision of FAME II incentives for two-wheelers, and additional purchase incentives announced by state governments in different forms, seem to be catching pace. Vehicle costs are, therefore, seeing sharper reduction.

Declining battery costs, evolving technologies, and the Indian government's push for localisation will drive the final-cost-of-ownership dynamics. That, in turn, will decide the adoption curve. CRISIL Research's assessment of five segments across 15 states in its special report **Electric Vehicles 2030** shows adoption will be sharp for segments such as two- and three-wheelers, followed by taxis. The transition is expected to be steep post fiscal 2025.

To put it in perspective, in fiscal 2021, EV penetration in new vehicle sales stood at less than 1%. By fiscal 2030, this is expected to rise to over 10%.

That said, due to poor cost economics and the lack of demand incentives under FAME II, electric passenger car offtake for personal mobility will be subdued. Taxi fleets, though, will shift gears. Within two wheelers, it is expected that scooters, which are more urban-centric, will adopt electrification earlier than motorcycles, as the cost of ownership is less than internal combustion engine scooters even today.

### Projected EV penetration FY25 and FY30



Note: For more information, please refer to our EV ecosystem report at:

<https://www.crisil.com/en/home/our-analysis/reports/2021/11/crisil-ev-sector-report-registration-form.html>

Source: CRISIL Research

Currently, two-wheelers account for ~75% of petrol consumption. With EV adoption in this segment remaining high, petrol consumption will clearly drop through fiscal 2030. Thus, we expect 14-16 MT of petrol to be displaced between fiscals 2022 and 2030, attributable to higher EV penetration across different vehicle categories.



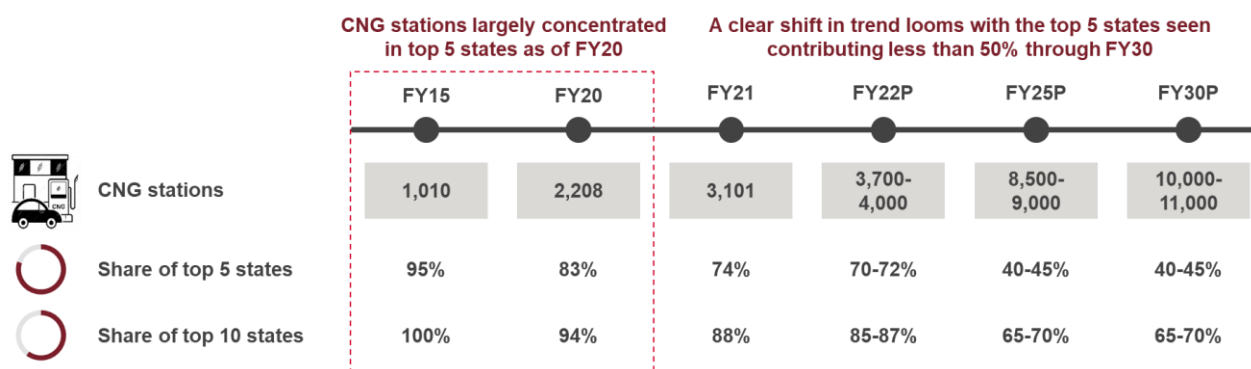
Significantly, contribution of EVs to fuel displacement is expected to be negligible till fiscal 2025, but should account for 20% of the incremental displacement thereafter.

## CNG vehicle adoption to displace 58-60 MT of fuel sales by fiscal 2030, or 5% of annual demand on average

CNG demand logged a healthy 10% CAGR between fiscals 2015 and 2020. During this period, total number of CNG vehicles on road increased from ~2.5 million units to ~3.5 million units. Growth is expected to accelerate at 14-16% CAGR between fiscals 2020 and 2030.

One of the key reasons for slower penetration of CNG vehicles in the past was the limited city gas distribution (CGD) network connectivity. However, after development of CGD network under rounds 9 and 10, we expect the total number of stations to increase to ~8,500 by fiscal 2025 from 3,101 stations in fiscal 2021. Also, an additional 65 geographical areas are to be announced under Round 11 of CGD, thereby improving connectivity further.

Along with this, CNG continues to be price competitive vis-à-vis petrol and diesel. As of November 15, 2021, the price of CNG was at Rs 52.04/kg (Delhi), while that of petrol and diesel (Delhi) were at Rs 103.97/litre and Rs 86.67/litre, respectively.



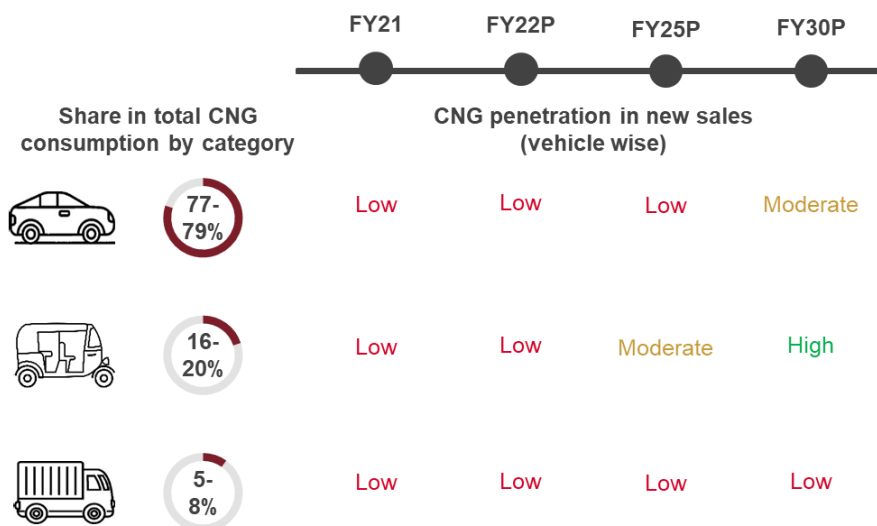
Source: CRISIL Research, PPAC

With an increase in the number of stations, the number of CNG vehicles launched by OEMs will rise, too. OEMs are already launching CNG variants along with petrol and diesel variants. Further supporting the preference for CNG vehicles will be the shift from diesel vehicles, the prices of which have gone up since the implementation of BS-VI.

CRISIL Research expects availability of stations to lead to a three-fold increase in the number of CNG vehicles on road between fiscals 2021 and 2030. This, in turn, will lead to the average number of CNG vehicles per station to range at 700-750 between fiscals 2020 and 2030, compared with ~2,000 between fiscals 2015 and 2020.

The growth in infrastructure, in turn, will translate to higher penetration of CNG vehicles, particularly in the cars segment, largely led by the cab aggregator segment. By fiscal 2030, penetration is expected to reach ~30%. However, a further increase beyond fiscal 2025 will be restricted by stiff competition from EVs in the cab aggregator segment. A similar trend will also play out in the three-wheeler segment.

**Infrastructure improvement to deepen CNG penetration**



Source: CRISIL Research

CRISIL Research expects CNG consumption to increase at 20-22% CAGR over fiscals 2022-25, but moderate to 14-16% CAGR over fiscals 2025-30. Rise in consumption is expected to be driven by additions in CNG public transport across cities, in both existing and new fleets.

Consequently, the increase in CNG consumption will result in lower petrol and diesel offtake. We forecast CNG will affect the average annual demand for petrol by 8-10% from fiscals 2022-30. Impact on diesel will be lower, at 2-4%, as commercial vehicles (75% of diesel consumption) will continue running on the fuel.

Overall, 34-36 MT of petrol and 23-25 MT of diesel is likely to be displaced between fiscal 2022 and 2030 due to CNG alone.

**Ethanol to spoil the petrol party with aggressive demand displacement of 50-52 MT by 2030**

Along with electric vehicles and CNG, the government is increasingly focusing on ethanol blending to wean consumers away from traditional fuel. Launched in 2003, the Ethanol Blending Programme (EBP) made 5% ethanol blending mandatory. However, oil marketing companies (OMCs) continued to lag the target, given concerns over ethanol availability. In fact, the 5% mark was achieved only in ethanol supply year (ESY) 2018-19. An ESY is from December to November.

The blending percentage is set to increase 8.5% to nearly 332 crore litre in ESY 2020-21 from 38 crore litre in ESY 2013-14.

**Government’s target for ethanol blending versus actual achievement timelines**

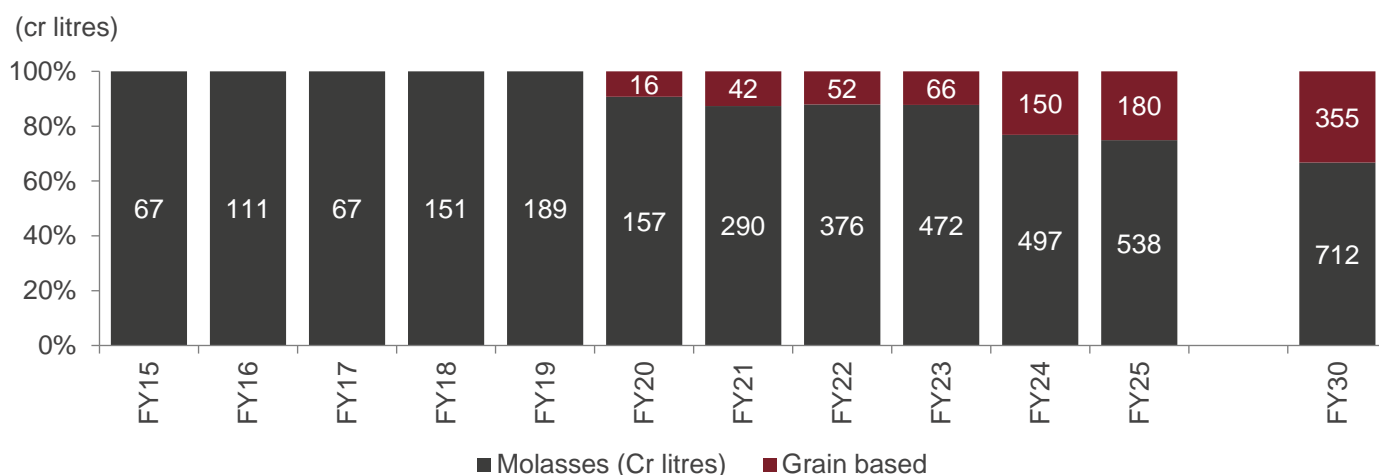
**Government target year for achieving 20% ethanol blending in petrol advanced to 2025**

	FY15	FY20	FY21	FY22P	FY23P	FY24P	FY25P	FY30P
<b>Govt targets</b>	5.0%	5.0%	8.5%	10%	12%	15%	20%	n.a
<b>Actuals/ forecasts</b>	2.3%	5.0%	8.5%	~10%	~12%	~14%	~15%	20%

Note: Years refer to ESY  
Source: CRISIL Research

Traditionally, 100% of the ethanol requirement was met through C-heavy molasses up to ESY 2017-18. Looking to increase supply, the central government allowed ethanol production from the B-heavy route as well, in June 2018. Subsequently, in ESY 2019-20, the share of C-heavy declined to ~43% while that of B-heavy increased to 39%. The balance was met through the sugarcane juice and grain-based route.

**Government incentives to support higher grain-based capacities up to fiscal 2030**



Note: Grain based includes production from maize and rice  
Source: CRISIL Research

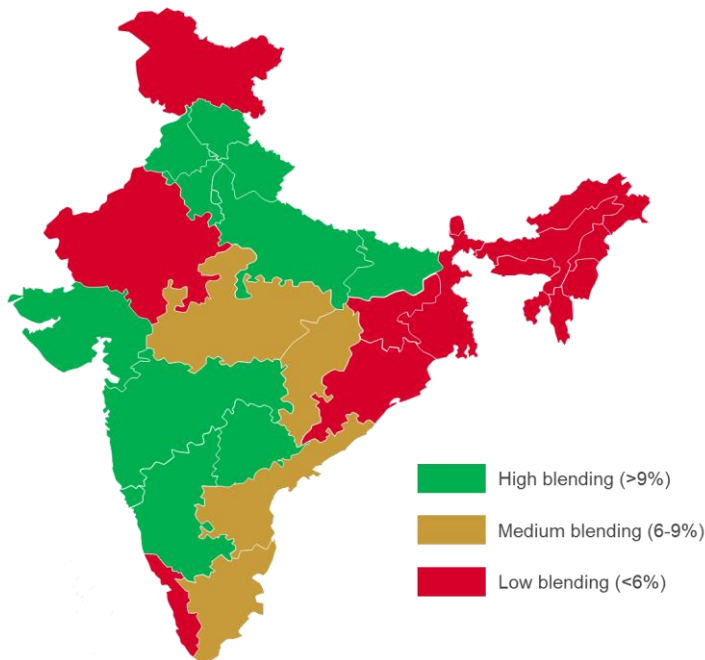
Even as the government is trying to increase ethanol production, it has advanced the target of 20% ethanol blending to 2025 from 2030. While ambitious, CRISIL Research believes India will be able to achieve the government target of 14-15% in 2024. However, the move from 15% to 20% may be delayed beyond 2025 on account of two key factors. These are:

**1. Lack of uniform pan-India availability of ethanol for blending**

Currently, the quantum of ethanol blending varies greatly across India. Therefore, grain-based capacities need to be set up in deficit states.

This is essential because molasses-based ethanol is a regionally available product. Our interactions suggest viability of transporting such ethanol is only until 100-150 km. With higher ethanol content in petrol demanding modifications to vehicles, ethanol-blended petrol needs to be available across India. Hence, cluster-based incentives to aid uniform blending patterns across states are critical if India is to realise its ethanol-blending target.

**Ethanol blending highest in sugar producing regions**



Note: Period considered - 1st December 2020 to 31st May 2021  
Source: PPAC

met through molasses. Some 350-400 crore litre or 32-37% of the total requirement is to be met through the grain-based route. Additional grain-based ethanol can be produced if more capacity addition plans are announced.

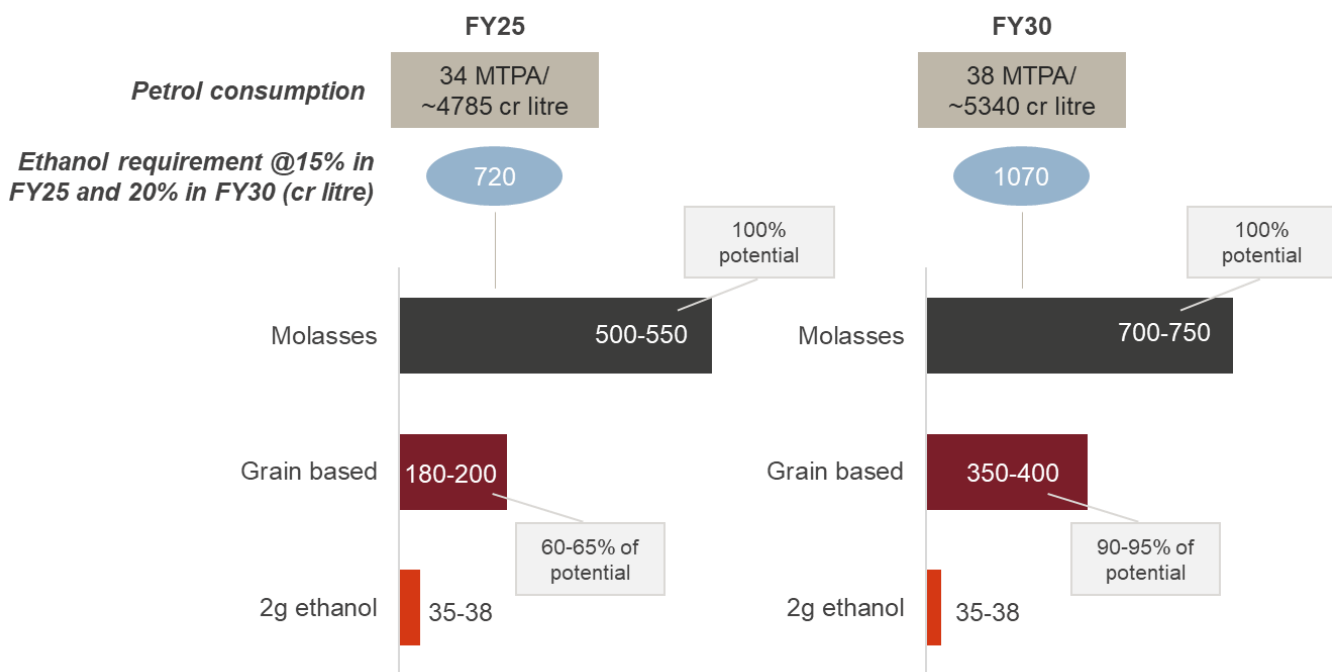
Given the area under sugarcane cultivation, 500-550 crore litre ethanol requirement can be met through molasses, while 180-200 crore litre can be met through the grain-based route by 2025.

The government has announced incentives for grain-based distilleries as these will play a crucial role for improving blending beyond 2025.

Newer avenues such as 2G ethanol are emerging; however, capital cost keeps capacity additions from this route restricted. Based on planned announcements by OMCs, up to 35-38 crore litre of ethanol can be met through the 2G route. Considering this, 720 crore litre fuel-grade ethanol is likely to be available in 2025, ensuring 14-15% of ethanol blending in petrol.

The trend in 2030 will be similar. Of the total requirement of ~1,070 crore litre of ethanol (to achieve ~20% ethanol blending), 700-750 crore litre or 65-70% of the ethanol requirement is being

**As per CRISIL estimates, only 14-16% blending ratio can be achieved by fiscal 2025**



Note: Grain based includes production from maize and rice; Petrol consumption is after displacement from CNG and EV, but before ethanol blending Source: CRISIL Research

## 2. Technology upgradation for vehicle ecosystem beyond E20 inevitable

Ethanol has a higher octane number and lower calorific value compared with petrol. Therefore, a vehicle needs to undergo changes to use higher ethanol blends; else, it may result in an inefficient combustion process. While E12 and E15 fuel need marginal component changes, blending beyond that will need changes on the vehicle side, primarily to fuel injection systems, to avoid knocking and engine failure.

Therefore, enabling over 20% ethanol blending till these issues are addressed will be challenging. Considering the impact of 15% blending by fiscal 2025, and 20% blending by fiscal 2030, we expect a cumulative loss of 48-50 MT between fiscal 2022 and 2030 for petrol.

Thus, taking into consideration a demand loss of 120-140 MT for petrol and diesel between fiscals 2022 and 2030, refiners are trying to reinvent themselves. They are looking at diversification and revenue-stream expansion by producing more value-added products such as petrochemicals.

## Refiners peer at a future in chemicals, not so much fossil fuels

As mentioned above, the share of traditional fuels is set to go down in the future. However, this is unlikely to result in crude oil consumption falling at the same pace given an increasing focus on petrochemicals, and, hence, naphtha. Currently, naphtha accounts for ~7% of domestic consumption. However, by fiscal 2030, its share will likely increase to 17-18% of domestic consumption, led by expansion of petrochemicals capacities.

The petrochemicals industry in India has grown at a healthy 7-8% over the past two decades, mainly led by increasing consumption of plastics driven by a rise in substitution and new uses.

Currently, India's per capita consumption of plastic currently stands at ~10 kg. However, it remains lower as compared with 25-30 kg average per capita consumption in the world and ~110 kg in developed countries.

Domestic petrochemical consumption is expected to continue growing at 8-10% CAGR from fiscals 2020-30, led by an expected recovery in economic growth post the slowdown in fiscal 2021. With India's GDP growth expected to be healthy over the long term, polymer demand will tango, driven by the packaging, automobiles, consumer durables, construction, and irrigation sectors

Subsequently, India's per capita consumption is expected to nearly double to 18-20 kg by fiscal 2030.

In line with the increase in demand, India's ethylene capacity is expected increase 3x from 7.5 MT in fiscal 2021 to ~22 MT in fiscal 2030. Along with petrochemical integration, players have plans to set up dedicated crude-to-chemicals complexes. In fact, against the normal integrated petrochemicals complex which can result in a crude-to-chemicals ratio of 12-15%, Haldia has plans for as high as 60% chemicals.

India is currently a net importer for petrochemicals, especially in the polyethylene (PE) and polypropylene (PP) segments at ~10%. However, aggressive capacity addition plans by players will lead to supply outpacing incremental demand, thus turning India into a net exporter of key petrochemicals (PE and PP) by fiscal 2027.

With an increase in domestic petrochemicals capacity, demand for naphtha, which is used as an input to manufacture ethylene and its byproducts, is expected to increase nearly 3x. Currently, ~75% of naphtha is used domestically and the rest is exported. However, in future, exports of naphtha will significantly reduce with its diversion to meet domestic demand.

Given the potential loss in fuel demand, the way forward is further integration of refineries with petrochemical units, and not just co-located refining and petrochemical plants. Integration will not only meet the domestic chemical

demand-supply gap, but also push the refining sector towards optimisation despite loss in fuel demand by diversifying their portfolio.

That said, with India likely to turn into a key exporter of petrochemicals, some of the key monitorables will be India's ability to compete with its global counterparts such as the US, Saudi Arabia and South Korea. Currently, China is the largest importer of petrochemicals, accounting for over 30% of world import demand. Despite huge capacity additions by Chinese players, its import dependence is expected to continue, thus providing an opportunity for India players to meet the needs of the Chinese market.

## About CRISIL Limited

CRISIL is a leading, agile and innovative global analytics company driven by its mission of making markets function better.

It is India's foremost provider of ratings, data, research, analytics and solutions with a strong track record of growth, culture of innovation, and global footprint.

It has delivered independent opinions, actionable insights, and efficient solutions to over 100,000 customers through businesses that operate from India, the US, the UK, Argentina, Poland, China, Hong Kong and Singapore.

It is majority owned by S&P Global Inc, a leading provider of transparent and independent ratings, benchmarks, analytics and data to the capital and commodity markets worldwide.

## About CRISIL Research

CRISIL Research is India's largest independent integrated research house. We provide insights, opinion and analysis on the Indian economy, industry, capital markets and companies. We also conduct training programs to financial sector professionals on a wide array of technical issues. We are India's most credible provider of economy and industry research. Our industry research covers 86 sectors and is known for its rich insights and perspectives. Our analysis is supported by inputs from our large network sources, including industry experts, industry associations and trade channels. We play a key role in India's fixed income markets. We are the largest provider of valuation of fixed income securities to the mutual fund, insurance and banking industries in the country. We are also the sole provider of debt and hybrid indices to India's mutual fund and life insurance industries. We pioneered independent equity research in India, and are today the country's largest independent equity research house. Our defining trait is the ability to convert information and data into expert judgments and forecasts with complete objectivity. We leverage our deep understanding of the macro-economy and our extensive sector coverage to provide unique insights on micro-macro and cross-sectoral linkages. Our talent pool comprises economists, sector experts, company analysts and information management specialists.

## CRISIL Privacy

CRISIL respects your privacy. We may use your contact information, such as your name, address, and email id to fulfil your request and service your account and to provide you with additional information from CRISIL. For further information on CRISIL's privacy policy please visit [www.crisil.com/privacy](http://www.crisil.com/privacy).

## Disclaimer

CRISIL Research, a division of CRISIL Limited (CRISIL) has taken due care and caution in preparing this Report based on the information obtained by CRISIL from sources which it considers reliable (Data). However, CRISIL does not guarantee the accuracy, adequacy or completeness of the Data / Report and is not responsible for any errors or omissions or for the results obtained from the use of Data / Report. This Report is not a recommendation to invest / disinvest in any company / entity covered in the Report and no part of this report should be construed as an investment advice. CRISIL especially states that it has no financial liability whatsoever to the subscribers/ users/ transmitters/ distributors of this Report. CRISIL Research operates independently of, and does not have access to information obtained by CRISIL's Ratings Division / CRISIL Risk and Infrastructure Solutions Limited (CRIS), which may, in their regular operations, obtain information of a confidential nature. The views expressed in this Report are that of CRISIL Research and not of CRISIL's Ratings Division / CRIS. No part of this Report may be published / reproduced in any form without CRISIL's prior written approval.