IDDRI
SUSTAINABLE DEVELOPMENT & INTERNATIONAL RELATIONS

SciencesPo

What will be the role of bio-CNG/LNG in road transport by 2030 in France?

Louis-Pierre Geffray, Jean-Philippe Hermine

This *Issue Brief* examines the conditions for the development of biomethane in the French road transport sector. Setting aside the question of the availability of this energy and the environmental conditions of its production, the analysis focuses on the pathways and drivers of the industrial transformation required for the supply of heavy-duty vehicles running on biomethane. The path dependency and constraints of industrial and commercial strategies in the sector often constitute a blind spot in discussions and debates on the subject. To that extent, this analysis must be read alongside other perspectives and criteria which remain relevant: the environmental performance of biogas, the question of energy sovereignty, the ability to develop alternatives in time, the need for raw materials at the sector level, fiscal support for decarbonisation, etc.

This analysis is informed by a series of interviews with key players in the sector and market simulations as well as by the discussions within the Platform for Mobility in Transitions, which brings together industry stakeholders.

KEY MESSAGES

The continued use of methane in road transport is only advisable by a transition to 100% biomethane within a time frame which is reasonable to place around 2030, as outlined in the French Association of Natural Gas Vehicles (AFGNV)'s sector plan.

Biomethane has significant potential to develop as a replacement for fossil CNG and diesel in the transport sector, for buses and coaches in particular. Moreover, while electrification is set to grow massively, a share of long-distance truck transport could also operate on biomethane for those use cases not suitably covered by electric models.

However, developing and marketing competitive bio-NGV models compliant with future EU CO_2 standard or EURO standard requirements in the medium- to long-term in a manner that also makes industrial sense at the European level represents a strategic and economic challenge for manufacturers. This constitutes a limiting factor that will largely determine the success of this solution for the sector and thereby its long-term potential.

However, the resulting scenario must be compared with other perspectives that will play either in its favour or against it. These include the comprehensive environmental impact–i.e., not limited to greenhouse gas emissions–across the whole life cycle of biomethane, which may become less and less favourable as its production grows towards an industrialised model integrating intermediate crops for energy purposes. In addition, the economic balance of bio-CNG/LNG must also be examined with respect to factors such as price volatility for users on the one hand and the fiscal capacity of the State to support the competitiveness of the sector on the other.

IDDRI's scenario leads to a market share of newly registered bio-CNG-compatible trucks in France of around 2.5% in 2030 and a consumption of the fleet of trucks, buses and coaches that reaches an asymptote of around 10 TWh in 2030 (i.e., about 25 times more than the consumption in 2021, but very significantly below the current National Low-Carbon Strategy scenarios)

ISSUEBRIEF
N° 01
JANUARY
2023

[Natural gas vehicles (NGVs) include vehicles that run on both Liquefied Natural Gas (LNG) and/or Compressed Natural Gas (CNG). Although it is technically possible to manufacture bio-LNG, supply of bio-LNG does not exist for road transport to date in France. The transition to biomethane discussed in the rest of this analysis thus refers only to CNG engines, for which we use the term bio-CNG].

1. BACKGROUND OF THE STUDY: NATURAL GAS VEHICLES IN FUTURE ENERGY TRANSITION SCENARIOS

Although the implications of biogas production for the French agricultural sector are real and contested, they are not the focus of the current analysis. Rather, this Issue Brief mainly seeks to uncover and identify the criteria impeding the downstream use of biomethane in road transport. Moreover, it specifically examines the capacity of manufacturers to develop and maintain a competitive portfolio of vehicles in view of the objective or strategic economic constraints and difficulties they are faced with.

This relatively new perspective is becoming particularly decisive at this stage of the sector's development, faced as it is with the definition of European regulatory objectives for the next 10 to 15 years, which are currently under negotiation. This regulatory context will be critical for manufacturers' technological investment strategies, which themselves cannot be ignored in the reflections on the potential role of bio-CNG in transport by 2030. This Issue Brief attempts to outline a scenario for biomethane in transport by identifying priority applications and those for which this energy has limited potential, with a view to guiding an appropriate role and size for this resource in the range of low-carbon solutions for road transport.

The European decarbonisation trajectory (cf. "Fit for 55" legislative package), combined with the challenges presented by the procurement of fossil gas supply on the international market and resulting price volatility suggest–as all players in the sector unanimously foresee–that fossil NGVs are likely to completely disappear from all road transport uses in the long term. In this context, the development potential of bio-NGVs and their ability to replace fossil NGVs in this sector is at the centre of discussions.

Moreover, the transport sector is on a trajectory of electrification, which can be easily seen by a glance at the announcements and trade shows dedicated to the release of new models in the next 5 years. Despite this, the persistence of certain economic and technical constraints means that all the use cases of industrial and road freight vehicles are not likely to be covered by electric models. It is therefore important to consider transitional options or alternative long-term solutions to decarbonise the sector, with the aim of moving away from fossil fuels–especially diesel–as soon as possible. In this context, the third edition of the French national low-carbon strategy (SNBC) and the French Agency for Ecological Transition (ADEME) have proposed scenarios for the allocation of a supposedly growing production of bio-CNG, mainly directed towards transport, at levels that could reach 35 TWh_{LHV} in 2035. This level of demand corresponds to a jump in registrations of new bio-NGV-compatible heavy-duty vehicles of the order of 20% of sales in 2030, which is very significant. Overall, such scenarios entail a ten-fold increase in methane consumption for transport in 10 years and a hundred-fold increase in biomethane consumption for the entire vehicle fleet, if we wish to completely ban fossil gas from road transport by this date.

The scenarios for the evolution of the vehicle fleet adopted by the public authorities in keeping with the SNBC roadmap are intended to guide policies for subsidising and deploying both private and public transport infrastructure. As a result, they partly determine the prioritisation and earmarking of public, industrial and capacity investments (recharging infrastructure) with respect to the various competing energy options for transport (electric, hydrogen, biomethane, etc.).

Furthermore, if these scenarios generate consensus, they could have a major influence on the positions taken by France at the Council of Europe in the crucial upcoming discussion on the adoption of decarbonisation targets for heavy-duty transport by 2025, 2030 and 2035 (Regulation setting CO_2 emission performance standards for new heavy-duty vehicles, scheduled for discussion in 2023). Finally, the public visibility and reach of the SNBC in terms of signalling the sectoral trajectory will play a role in influencing the strategic, technological and investment decisions of truck manufacturers and transport companies.

The applicability and ambition of this process of scenario development in view of the desired environmental transition will determine the long-term future of an entire sector. As such, it is important to move beyond strictly partisan or black-and-white positions and objectively assess the value and limitations of each energy solution. For this, the intrinsic potential of solutions must be measured and weighed against the relative environmental, social, economic and industrial advantages they offer over their alternatives. The goal of this analysis is thus to examine the role of biomethane in road transport with a view to guiding public and private actors towards positive use cases that can be identified and retained on the one hand, and away from unrealistic or over-optimistic scenarios on the other. To this end, the current analysis examines the pathways and scenarios of the industrial transition and vehicle product portfolio in detail. Indeed, players in the heavy goods vehicle and bus manufacturing industry, which are of particular interest for this energy solution, have already announced some strategic technological decisions that impact the future of the sector. These decisions accompany and anticipate the negotiations underway at the European Commission in Brussels on adopting CO_2 standards for the sector, which should be completed in 2023. These transformative developments mean that the subject of future vehicle portfolios, which has rarely been considered in the scenarios produced in recent years, is becoming increasingly key. It will have a significant impact on the probable evolution of the market in the next ten years and will, in turn, determine the potential of these energy solutions in the longer term.

2. THE PROMISE OF UPSTREAM BIOMETHANE PRODUCTION CAPACITY

A number of scenarios have been produced to identify the potential for biogas production in France to date. The methodological approaches diverge, but are mainly top-down-driven and essentially focus on estimating the available or potentially available supply of biogas resources. Thus, the trend-based scenario in the ADEME Transition(s) 2050 report estimates a biomethane production of 77 TWh_{LHV} in 2050 as compared to the 434 TWh_{LHV} of gas consumed in France in 2015 for all applications. Biomethane demand in the transport sector in 2050 would thus range between 13 TWh_{LHV} and 35 TWh_{LHV} depending on the scenario, with more than 29 TWh_{LHV} of freight transport demand alone for the high-production scenario S3. Other scenarios are much more ambitious in terms of biomethane and synthetic methane production, estimating a potential capacity of up to 327 and 425 TWh in 2050 by drawing on multiple methods of production such as methanisation, hydrothermal gasification, pyro-gasification, and power-to-gas.

As of now, the annual Panorama Bio-NGV report of the French Natural Gas Vehicle Association (AFGNV) noted that the consumption of the entire gas-powered vehicle fleet in France reached 3.23 TWh_{LHV} in 2021, only 0.46 TWh_{LHV} of which was bio-CNG. Taking into account the aforementioned ADEME estimates, the potential for the substitution of fossil gas in the CNG vehicle fleet therefore appears particularly promising. These estimates imply that the quantities of CNG used for transport would be multiplied by 4 to 11 times their current figures by 2050, with 100% of the supply coming from renewable production sources.

However, the real added value of biomethane in the field of road transport is a question worth considering, as it will remain a limited resource which can just as well be directed towards other sectors that are equally under pressure to decarbonise, such as industry, buildings or electricity production.

The approach developed here consists of setting out complementary criteria for analysis, starting with the availability and evolution of the supply of heavy-duty vehicles given the imminent introduction of new European regulatory requirements. Moreover, it appears that the subsidies projected to be necessary to ensure the continued competitiveness of NGV compared to diesel imply a lock-in to a captive and supported market.

3. A HETEROGENEOUS AND DECLINING PORTFOLIO OF INDUSTRIAL CNG VEHICLES

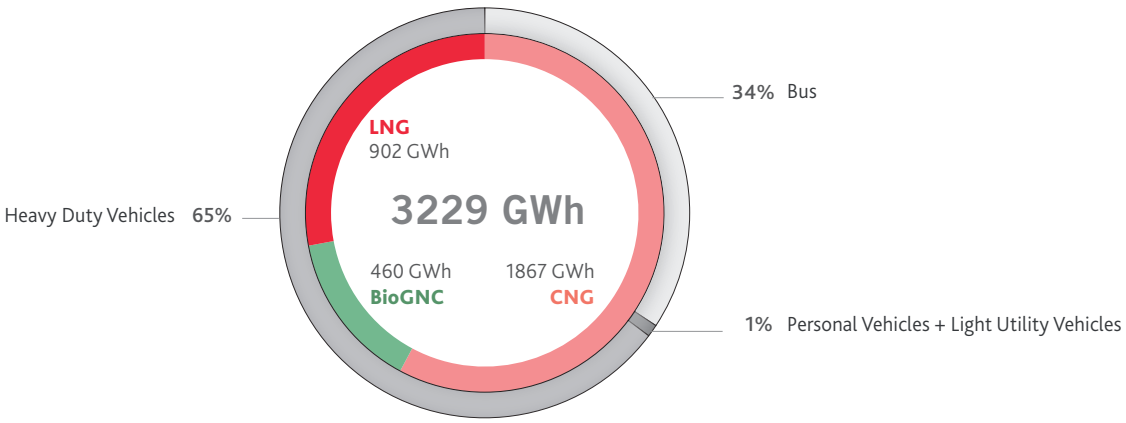
Gas-powered vehicles accounted for 4.5% of heavy-duty (over 5t) vehicle sales in France in 2022.[1] Although this figure seems low, CNG & LNG remains the leading alternative energy to diesel for heavy mobility to date.

First of all, it is worth drawing up an inventory of the manufacturers continuing to offer CNG and LNG engines on the market, as these can be used to approximately gauge trends for the coming years.

This table is based on interviews with manufacturers at the Solutrans industrial vehicle exhibition held towards the end

1 C-Ways via data from the Vehicle Registration System (SIV) of the French Interior Ministry.

FIGURE 1. Quantity of CNG consumption by sector in France in 2021



Source: AFGNV - Panorama bioGNV 2021

TABLE 1. Market share of heavy-duty vehicle manufacturers in France in 2022 and their NGV portfolios

	Scania	Volvo	Mercedes	Man	Renault	Iveco	Daf
FR Market share in 2022*	9.6%	14.0%	13.4%	9.0%	29.3%	8.5%	14.2%
CNG	19t-44t	19t-26t	No models	No models	19t-26t	3.5t-44t	No models
LNG	19t-44t	19t-26t	Discontinued	No models	No models	19t-44t	No models

* CCFA, Industrial vehicle registrations of more than 5.1t in France in December 2022, available online: https://ccfa.fr/wp-content/uploads/2023/01/2022-12-vu51t-france.pdf

of 2021 in Lyon. Their recent strategic decisions clearly show that (1) only some premium and high-volume manufacturers can/will continue to propose a diversified portfolio of engines including CNG, (2) generalist manufacturers who continue to offer these engines only do so to cater to existing and long-standing regional pockets of demand, and (3) some manufacturers such as Mercedes have already stopped the marketing of CNG vehicles.

3.1. Inventory of current and prospective brand positioning

Volvo Trucks (123,000 sales in 2021) has invested in bi-fuel gas LNG/diesel technology for its long-haul range, which should be profitable for the brand as it provides better engine efficiency when operating on diesel and offers increased range. This product is unlikely to disappear from the French market in the short term.

Scania (85,900 sales in 2021) just presented its new 13-litre CNG engine at the international IAA show in Hanover (Germany) at the end of 2022, evidently in anticipation of the introduction of particulate filter requirements and to enter new power segments. Scania's product is likely to be maintained on the French market in the coming years. It should be noted that particulate filters (GPFs) will increase the purchase price of all NGVs, which are already 30% more expensive than their diesel equivalents.

Finally, Iveco offers the widest range of NGV engines, from light commercial vehicles to 44t trucks, with a solid track record in this field since 1997. This choice is in keeping with the history of the Italian brand which has a strong presence in its national market, where natural gas engines have always been supported by public policy. It is clear that Iveco will be counting on CNG to develop its market share in France and across Europe.

As for the rest, all other manufacturers (Mercedes, Man and Daf) have chosen not to offer NGV engines. Mercedes, for instance, has decided to discontinue its CNG engine programme in order to focus exclusively on an ambitious programme of electrification for all its heavy-duty vehicles. This decision appears to indicate the industrial and economic trade-offs that are becoming increasingly difficult to avoid for manufacturers. Finally, Renault Trucks has settled for proposing a very limited range of rigid chassis vehicles for specific applications such as refuse collection vehicles. It is clear that CNG is on the way out for the brand in the future.

In total, brands that no longer offer NGV engines–Mercedes, Man, Daf, Renault Trucks (excluding rigid chassis vehicles)–will account for 66% of the market share of new heavy-duty vehicles over 5t GVW sold in France in 2022.

3.2. Market development conditions for achieving the initial simulation of the highest ambition scenario of the SNBC3 "AMS 23 scenario »

Although NGVs have a Crit'Air 1 sticker allowing them to enter low-emission mobility zones (LEZ-M), they will no longer be able to skirt increasingly restrictive European regulations around CO_2 and exhaust emissions.

The current Euro VI standard already sets a CH_4 emission limit for natural gas-powered vehicles. This limit could be further tightened by the future Euro VII standard, due to come into force at the end of 2025. NGVs will therefore have to contend with stricter pollution control requirements, which will make vehicles all the more expensive even as future markets and other drivers of economic viability remain weak. Moreover, the CO_2 emission standards for heavy-duty vehicles, which will soon be discussed at the European level, do not currently take into account the carbon content of the fuels used in internal combustion engine vehicles, as this regulatory realm comes under the RED directive[2]. CNG engines operating exclusively on biogas therefore do not currently help heavy-duty vehicle manufacturers to comply with the CO_2 standards. A change of metric and calculation methodology on this regulatory parameter is highly unlikely at this stage of the European negotiation process, for several reasons:

— Regulatory stability regarding standards and norms is an industrial necessity, given their consequences for sector-defining investment strategies.

2 https://eur-lex.europa.eu/legal-content/FR/TXT/PDF/?uri=CELEX:32014L0053&from=SV

— France's possible position on the interest of derogating from/adapting these rules to favour bio-NGV (which is only a "potential use" on a vehicle designed to run on CNG) would be relatively isolated in Europe.
— The CO_2 emissions factor of daily fuel consumption is not easily traceable for NGVs and cannot be differentiated on the vehicle registration certificate, which presents a technical challenge. While this is also true for electric vehicle registrations in most countries, the entire European electricity sector is on a decarbonisation trajectory and electric models do not present any local pollutant emissions from the exhaust.

At this stage, it is helpful to compare the above elements with the initial simulations for the SNBC3 under the AMS 23 scenario. This scenario foresees a 25% market share for new NGV truck registrations in 2030. To achieve this high figure, the following conditions would have to be met together:
— Iveco (8.5% market share) generates all its sales with NGV engines
— Scania (9.6% market share) and Volvo (14.% market share) generate 2/3 of their sales with NGV.

The market shares stated above include heavy-duty vehicles over 5.1t GVW sold in France in 2022, amounting to a total of 44,012 vehicles (source: CCFA).

If these conditions are met, it would result in a 5-fold increase of the market share of NGV engines compared to 2022. As mentioned before, these sales mixes are incompatible with the regulatory CO_2 emissions performance standards under discussion at European level (here applied to the French market that we assume to be representative of the European level). Besides, Scania[3] and Volvo trucks[4] have set a sales target of 50% zero-emission engines in use within this timeframe. Iveco has also just unveiled its electrification ambitions with the introduction of an electric truck in partnership with Nikola. This necessarily means that AMS 23 assumes a massive reinvestment by other manufacturers in bio-NGV technology just when regulatory requirements for pollution control and CO_2 standards are being added to the constraints in play (as explained above).

By 2030, the most likely hypothesis seems to be that only Iveco, Scania and Volvo will maintain a NGV vehicle offer. Based on their current market shares and considering their announcements with respect to electrification, the NGV sales mix of these three brands will not exceed 20%, 10% and 5% respectively. This would result in a maximum NGV market share of 3.6% in 2030. This is 7 to 10 times lower than the registrations currently estimated in the initial simulations of the SNBC3 AMS 23 scenario, which foresees a 25% market share for NGV by this time.

3 Scania, *Commitment to electrification*, available online: https://www.scania.com/group/en/home/newsroom/news/2021/Scanias_commitment_to_electrification_our_initiatives_so_far.html

4 Volvo Group, *Volvo Trucks ready to electrify a large part of goods transport*, available online: https://www.volvogroup.com/en/news-and-media/news/2021/apr/news-3948719.html

The current and future supply of vehicles therefore suggests that, even overlooking circumstances related to the Russian-Ukrainian war that could cause an extreme volatility in natural gas prices and potentially lower this outlook by making investments in NGV unreasonable, the French NGV fleet will comprise a maximum of 30,000 heavy goods vehicles and 15,000 buses and coaches by 2030-2035, i.e., 5% and 14% respectively of the fleet for each type of vehicle.

3.3. Retrofitting diesel Light Commercial Vehicles (LCVs) to bio-CNG

Although bio-CNG LCV supply is gradually disappearing, the conversion of existing diesel models to this engine may prove to be a worthwhile option to facilitate the transition of a fleet of more than 6 million vehicles. This is particularly important because electric solutions will not be able to meet all LCV uses in 2022 and there are significant constraints on the availability of new vehicles in this category.

For this approach to have an impact, about a hundred thousand vehicles would have to be retrofitted. The conversion of a diesel fleet to bio-NGV engines requires considerable investment (several tens of millions of euros for the development of a family of engines). Only a mono-fuel technology would be compliant with the pollutant emission standards currently in force, but this solution would imply a complete overhaul of some mechanical parts of the engine such as the cylinder head. With the added benefits mono-fuel technologies offer in terms of air quality and decarbonisation, they remain the only solution worth examining.

The entry threshold of around €10,000 to €12,000 per vehicle for this technology may seem attractive in absolute terms compared to the cost of renewing to new vehicles and in view of the introduction of the LEZs. However, the models benefiting from such a retrofit must be sufficiently recent to allow a return on investment for their owners. This scheme does not therefore meet the need to convert the oldest vehicles, even as vehicles between 10 and 17 years old represent 40% of the French LDV fleet.

On the industrial side, manufacturers would have to ensure that the development costs of several motor bases can be amortised over time and over the volumes concerned. The economic calculations for profitability in such a structurally ephemeral market are by no means evident and can hardly be guaranteed. Moreover, such a development would imply regulatory changes requiring a minimum period of 2 years for the production of a supply of certified vehicles.

In light of the above, the potential represented by a massive retrofitting of diesel LCVs to CNG engines has not been included in this analysis. Retrofitting LCVs only exists as a viable option for largely customised vehicles such as food trucks, ambulances, fire trucks, etc., whose volumes remain marginal and for which there will be a sharp decline in activity and interest around the 2030s, given the current electrification trajectory for light vehicles.

4. SECURING AN APPROPRIATE ROLE FOR AND SIZE OF BIOMETHANE IN FRENCH ROAD TRANSPORT

The model presented here considers engine mixes for newly registered vehicles in order to define a rolling stock for trucks, buses and coaches up to 2035. Taking the annual mileage and unit energy consumption per vehicle from the historical data of France's Data and Statistical Studies Department (SDES) combined with projected technological improvements, it is possible to estimate the demand for biomethane in the first simulation of the SNBC3 AMS 23 scenario and the IDDRI scenario. The resulting vehicle fleet figures are as follows:

TABLE 2. Heavy-duty vehicle fleet for each simulation

SNBC3	2025	2030	2035
HDVs + Special HDVs	27,600	80,500	136,900
Bus & Cars	10,500	19,800	27,500
IDDRI	**2025**	**2030**	**2035**
HDVs + Special HDVs	20,300	26,700	25,900
Bus & Cars	9,300	13,400	13,600

The biomethane demand for these fleets is shown in Figure 2. The energy efficiency gains assumed for the truck fleet are -14% between 2020 and 2035. 4 percentage points are achieved by renewing the fleet at the 2022 technology level and 10 percentage points are achieved by introducing the latest generation of NGV engines from 2022 onwards. This is a conservative hypothesis as it is not certain that NGV engines will benefit from equally substantial investments as the latest diesel technologies.

Biomethane demand in the SNBC3 scenario amounts to 35 TWh_{LHV} in 2035. This level of demand is achieved 15 years before the highest demand scenario of ADEME in its Transition(s) 2050 Report reaches a comparable level. Such a development of NGV motorisation would therefore jeopardise the starting hypothesis, i.e., exclusive supply with bio-NGV.

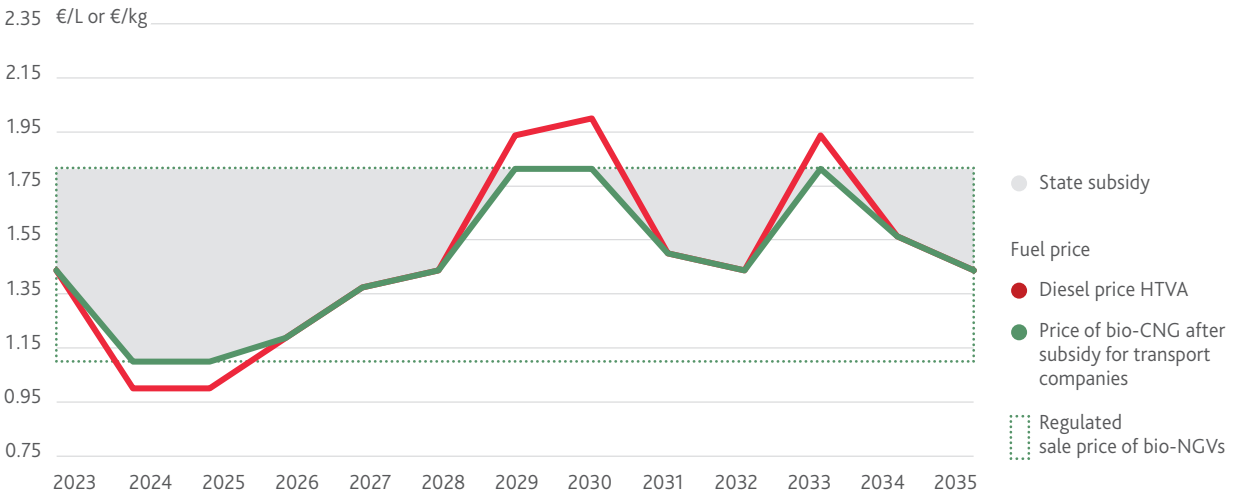
Conversely, the IDDRI scenario results in a demand of approximately 9 TWh_{LHV} in road transport from 2030-2031, followed by a slight and progressive decline in consumption. This level of demand, which has yet to be evaluated in terms of the consequences on the agricultural system and the challenges of allocation to other uses, especially industry, would also have to be secured so that stakeholders in the road transport sector have the necessary visibility to make strategic decisions.

4.1. Targeting the required fiscal support

The Russia-Ukraine conflict has served as a reminder of the volatility of energy prices in an environment of geopolitical instability. Price visibility is an essential condition for the transition of the road sector. Biomethane, which has a relatively stable cost price, suffers greatly from its marketing price structure, which depends on natural gas prices, at least in the short term, which is the time frame for the take-off of this solution relevant for the purposes of this analysis.

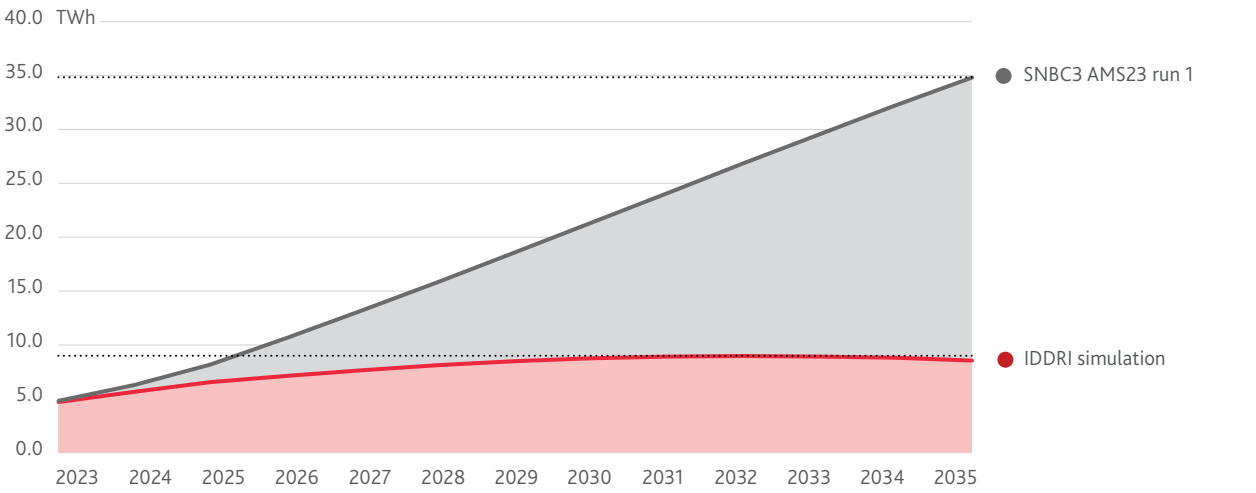
To be competitive, the bio-NGV sector requires a strong fiscal commitment from the State, both upstream for the development and viability of the methanisation sector, and downstream to prevent cost differentials and volatility at the pump for transport applications. In addition, substantial support will be required for at least the next 8 years to account for the accelerated depreciation tax deduction subsidising this technology at

FIGURE 2. Proposed public support mechanism for bio-NGV



Source: authors

FIGURE 3. Evolution of biomethane demand in the road transport sector



Source: authors

purchase (which ultimately means reduced corporate tax collections); this measure is also available for B100, H2, ED95 and electric vehicles.

Finally, the bio-NGV ecosystem is heavily subsidised throughout the entire value chain, from energy source to vehicle. This technology is not the only one to require this level of support but has the structural specificity that there is very little scope for this support to be reduced over time for it to continue to be competitive. A simple calculation allows us to show that the fiscal cost per ton of CO_2e avoided downstream by the level of subsidy is today more attractive for the State than that of a ton avoided via the same level of support for the electrification of heavy-duty vehicles. However, this dynamic will quickly be reversed to the benefit of electric vehicles going by the available models (see TNO report). Consequently, from a strictly fiscal point of view and with regard to the efficiency of state support mechanisms, this technology, while it may be of interest in the short term, has limited potential to maintain its competitivity independent of state support in the medium- and long-term. This must be taken into account for effective planning given limited fiscal capacity.

As such, the bio-NGV option must be seen for what it is: a complementary lever for technological and energy diversification in a transitional phase for uses that are not covered by alternative decarbonisation solutions today and for the next 10 to 15 years at most. These specific use cases can then be secured and supported by ad hoc fiscal support mechanisms. If the evolution of this solution and its limits as described in this Issue Brief are shared by stakeholders (suppliers/distributors of bio-NGV for transport, manufacturers and transporters), then the extent of state fiscal allocation towards this energy option for transport can be determined. In other words, the asymptotic (bounded) development scenario developed by IDDRI can serve as a basis for negotiating support mechanisms in such a way as to define a limited fiscal framework aimed at targeting only those uses which are not covered by other energy solutions.

4.2. Provisioning for a road transport bio-CNG support mechanism

Following this line of thought, we propose a state support mechanism for bio-CNG dedicated to long-distance heavy-duty vehicles, buses and coaches based on the principle of a pump price framework. The upper limit of this framework would be set by the cost of bio-CNG distributed in the fuelling network. The lower limit would be defined by a floor corresponding to an estimated maximum subsidy of 71 c€/kg in order to approach a price of 1.1 €/kg for bio-CNG at the pump. This mechanism is inherently designed to keep bio-CNG competitive with the fluctuating price of diesel.

A support mechanism of this type, if validated through negotiation and dialogue between stakeholders and public authorities, could be limited to a maximum volume of 10 TWh/year by 2030, going by the scenario defined above. To remain within a controlled envelope manageable for the State, this limited scope of application could be implemented through public-private agreements with beneficiary entities in the sector such as transport logisticians, shippers, road carrier associations, etc.

5. CONCLUSION AND OUTLOOK

In the current European climate characterised by tension in the supply of fossil fuel and where the cost of biomethane is likely to remain at par with fossil gas for several years, determining

and securing an appropriate role for biogas must be based on a solid understanding of the needs and transformation pathways of the various sectors which could be potential candidates for biomethane consumption (buildings, industry, transport, chemicals, etc.).

However, in view of the above analysis, current and future public policymaking must be based on desirable but realistic scenarios for the development of bio-NGV for transport. Care should be taken to avoid over-investing or creating situations that are difficult to manage or reverse (such as the assumption of linear growth in sales and the fleet until 2035 to reach 20 to 25% of sales, as currently outlined in the SNBC). The scenario developed by IDDRI outlines the limits of bio-NGV development based on environmental regulatory constraints and an overview of current industrial strategies in the road transport sector. This scenario points to a considerable growth of bio-NGV in road transport that is nonetheless limited to a defined segment of supply and use-cases, making it possible to estimate a potential peak biomethane consumption of around 10 TWh in 2030. In this context and given that biomethane constitutes a temporary transitional solution which is limited in time and scope of application, we recommend a negotiated overhaul of the support mechanisms involving all the concerned parties. This opportunity for energy diversification can thereby be secured for all use cases that are not covered by electrification in a competitive manner.

Geffray L.-P., Hermine J.-P., (2023). What will be the role of bio-CNG/LNG in road transport by 2030 in France? IDDRI, *Issue Brief* N°01/23.

This work has received financial support from the French government in the framework of the programme "Investissements d'avenir" managed by ANR (French national agency for research) under the reference ANR-10-LABX-14-01.

CONTACT
louispierre.geffray@sciencespo.fr
jeanphilippe.hermine@sciencespo.fr

Institut du développement durable
et des relations internationales
41, rue du Four – 75006 Paris – France
WWW.IDDRI.ORG
@IDDRI_THINKTANK