Bennamann Ltd response to the Department for Transport's consultation on when to phase out the sale of new, non-zero emission heavy goods vehicles

Response date: 3rd September 2021

About Bennamann Ltd

Bennamann Ltd [Bennamann Ltd | Delivering a Local Clean Energy Revolution] is an SME company developing, manufacturing, marketing and deploying innovative technology for the commercially viable local production, distribution and use of "better than net-zero" carbon fuel sourced from the fugitive methane emissions of organic waste, including livestock farm manure slurry.

At Bennamann we believe that offering our customers end-to-end solutions is the key to unlocking the power of fugitive methane and the company's innovations include: patented fuel tanks for storage, transport and use of liquid biomethane; equipment to process and liquify biomethane at small-scale locally off-gas-grid and off-power-grid; proprietary engineering for optimised small-scale fugitive methane capture and processing; and satellite enabled technology for optimised methane sourcing as well as Internet of Things (IoT) enabled equipment monitoring, control, diagnosis, metering and customer billing.

When integrated around the 'Bennamann Cycle'[1] and deployed through our innovative business models, our technologies create a circular economy that delivers a wide range of environmental and economic benefits, which add value for our customers and help unlock a local clean energy revolution.

Bennamann is based in Cornwall, United Kingdom.

Consultation questions

Question 1: Do you agree or disagree that introducing a phase out date for the sale of new non-zero emission HGVs will help us meet our legally binding net zero target? Please explain your answer.

Bennamann disagrees that introducing a phase out date for the sale of new non-zero emission HGVs will help the UK meet its legally binding net zero target because the policy as proposed in the consultation conflates two separate issues – namely air quality degradation resulting from tailpipe emissions: and reducing greenhouse gas (GHG) emissions to net zero.

Zero emission at the tailpipe is required to help solve air quality problems, particularly in urban areas and alongside road corridors with high levels of HGV movements. This requirement can be achieved through mechanisms such as the use of clean air zones / zero

[1] https://bennamann.com/downloads/videos/Bennamann_Process_and_Cycle.mp4

emission zones, more specifically by extending and/or tightening those already being rolled out and introducing new implementations where necessary. Whereas net zero carbon emission can be achieved with net zero carbon vehicles and does not necessarily require zero emission at the tailpipe. To help the UK meet its legally binding net zero target, the Department for Transport (DfT) should develop decarbonisation policy that considers the carbon intensity (i.e. gCO2e/MJ) of the energy used in vehicles based on a full well-to-wheel (WTW) analysis that accounts for the GHG emissions incurred from its sourcing, processing, distribution and use.

Phasing out the sale of all new non-zero emission HGVs will make the transition to net zero harder than necessary by excluding from the marketplace HGV technologies that can help deliver net zero carbon despite not necessarily being net zero emissions at the tailpipe. Further, by introducing a phasing out policy, HGV technologies that include those based on liquid and gaseous fuels with an overall "better than net zero" carbon emissions profile will potentially be excluded from helping the UK achieve its net zero target. There are proven examples of such fuels and technologies, including those based on the use of Biomethane, that are already available to achieve net zero carbon through commercially attractive business models[2] [3] [4] [5] and, when using fugitive methane captured from organic materials such as livestock manure as the fuel source, deliver a carbon footprint that is negative and thus better than net zero[6]. For example, under REDII the biomethane default value for manure is associated with a large methane credit of 206%; this significantly lowers the carbon intensity of biomethane production to -85gCO2e/MJ.

The introduction of a phase out date for the sale of new non-zero emission HGVs will send a signal to the marketplace that will act as a brake on the uptake of these ready-to-use technologies as well as on investments in the fuel production and delivery infrastructure required to support them. In the case of the latter, investors will be reluctant to provide funding to assets that are liable to become "stranded" after implementation of the phase out date. Such an outcome will hinder the transition to net zero in the short-term and make achieving the net zero target more difficult than necessary in the longer term. For example, according to modelling work recently undertaken by Element Energy[7] , rapid deployment of biomethane technologies over the next decade could deliver a 38% reduction in GHG emissions from HGVs, whereas deferring decarbonisation while focussing on the development of electric and hydrogen technologies will result over the same time period in a 6% reduction.

Additionally, one potential unintended consequence of a policy that introduces a phase out date for the sale of new non-zero emission HGVs will be a stimulation of sales of existing non-zero emission technologies, particularly conventional diesel fuelled vehicles, as the deadline approaches, followed by a sharp collapse of the market for zero emission HGVs thereafter. (Witness for example that in Q3 & Q4 of 2013, the sales of Euro V vehicles were at record high

[2] ADBA-Biomethane-to-transport-report-June-2021-FINAL.pdf (bennamann.com)
[3] Market_opportunities_decarb_HDVs using HBRF_2021.pdf (bennamann.com)
[4] RenewableFuelsGuide_March2020.pdf (bennamann.com)
[5] Intro-to-Biofuels.pdf (cenex.co.uk)
[6] LowCVP-WTT_GHG_Emission_Factors-Review_and_recommendations.pdf (bennamann.com)
[7] 20210325-CADENT_HYDROGEN_TRANSPORT_REPORT.pdf (element-energy.co.uk)

levels and sales of Euro VI vehicles in Q1 &2 of 2014 were extremely low.) Such an outcome will create 'lock-in' of a non-zero emission asset base in the UK's HGV parc at the phase out date, thereby hindering the transition to net zero while these vehicles continue to be utilised well beyond normal replacement cycles in a bid by operators to delay the adoption of unfamiliar technologies and infrastructure. Unless the supporting infrastructure for zero emission HGVs is fully proven, broadly deployed and commercially attractive, and new zero emission HGV technologies are widely proven by early adopters ahead of the phase-out date, fleet operators will keep non-zero emissions (diesel) vehicles running as long as technically and commercially possible, thereby making it harder for the UK to achieve its net zero target.

Phasing out non-zero emission vehicles can only work when zero emission alternatives are fully compatible with the incumbent technologies in terms of capital costs of purchase, total cost of operation, supporting infrastructure availability, operational, maintenance and servicing requirements, workforce skills etc. The technology readiness levels of DfT's cited zero emission technologies for HGVs (i.e. Battery Electric; Electric Road Systems; Hydrogen Fuel Cells) is currently low. To prepare for the manufacture of fully developed and commercially attractive applications of zero emissions technologies at appropriate volumes before a proposed non-zero emissions phase-out date in the UK, the HGV sector's OEMs will have to focus almost exclusively on these candidates to the detriment of others. However, as most of the sector's OEMs work at a pan-European and Global level, it is unlikely that they will prioritise their efforts on meeting UK requirements, particularly as it only represents circa 10% of the total European market.

The recently published Physical Science findings of the IPCC Sixth Assessment Report[8] highlights the need for immediate action on climate change mitigation through GHG emissions reduction. Such action requires the maximum use of existing proven technologies and business models over the next decade through to 2030 as well as the achievement of net zero GHG emissions by 2050. UK transport decarbonisation policy focussed on zero tailpipe emissions and the setting of a phase out date for the sale of new non-zero emissions HGVs will not help achieve either. Analysis that considers the carbon intensity (i.e. gCO2e/MJ) of the energy used in vehicles based on a full understanding of well-to-wheel (WTW) GHG emissions incurred from its sourcing, processing, distribution and use should be adopted as the foundation of net zero related UK policy making.

Question 2: Do you agree or disagree with our approach to split the phase out dates for new non-zero emission HGVs into two weight categories? Please explain your answer.

Bennamann disagree with the approach to split the phase out dates for new non-zero emissions HGVs into two weight categories because 26t does not align with any internationally recognised split in today's actual vehicle market. Additionally, using an arbitrary weight category does not differentiate between urban and rural, short distance and long distance. For example, technology for a 26t rigid vehicle is likely to be the same as a 44t 6x2 artic, the only difference is the space available for fuel / energy storage and the potential

[8] AR6 Climate Change 2021: The Physical Science Basis — IPCC

range. If the aim is to speed up adoption in the urban areas, then a split at N2 and N3 would be more logical and technically acceptable.

If a weight category is used, it needs to be clear if it is GVW or GCW.

Question 3: Do you agree or disagree that 26 tonnes and under, and more than 26 tonnes are the right categories? What evidence do you have for or against?

Please refer to our response to Question 2.

Question 4: Do you agree or disagree with our proposal to end the sale of new non-zero emission HGVs, for vehicles weighing from 3.5 up to and including 26 tonnes, by 2035? What evidence do you have for or against?

Please refer to our response to Question 1.

Question 5: What do you consider the main challenges and barriers to meeting this target for HGVs 26 tonnes and under?

Zero emission vehicle availability is unlikely to be the main issue, the infrastructure to support them will potentially be the bigger challenge and barrier. Infrastructure investors will require a return on their investment from the first day that facilities are operational. Consequently, they will not invest until vehicles are being adopted at scale. On the other hand, fleet managers will not purchase new technologies until the supporting infrastructure is widely available. This classic “chicken and egg” scenario will inevitably delay widescale adoption of HGVs based on zero emission technologies.

The conservative nature of the UK commercial vehicle operators will be extremely difficult to overcome and should not be underestimated. Operators will not adopt technologies that have a total cost of operation more than existing and require unfamiliar maintenance, servicing, and operational practices to be embedded in the workforce. The example of natural gas fuelled HGVs, which have been proven over the last 20+ years to be a viable alternative to diesel with positive impact on emissions and commercially attractive, serves as a useful guide. Despite the clear economic and environmental benefits to be accrued, sales of natural gas HGVs only represent a very small percentage of the overall UK HGV parc due to the reasons cited above.

Question 6: How can these barriers be addressed?

No response.

Question 7: Do you agree or disagree with our proposal to end the sale of new non-zero emission HGVs, for vehicles weighing more than 26 tonnes, by 2040? What evidence do you have for or against?

Please refer to our response to Question 1.

Question 8: What do you consider the main challenges and barriers to meeting this target for HGVs weighing more than 26 tonnes?

Our response to Question 5 applies equally here but additionally we note that engineered technical solutions and the commercial business models for long distance operation are still unproven. The provision of infrastructure to support of DfT's cited technologies for zero emissions HGVs (i.e. Battery Electric; Electric Road Systems; Hydrogen Fuel Cells) will be especially challenging, particularly in terms of technical and commercially viability, beyond the UK's central regions (i.e. bounded by London, Leeds, Greater Manchester and Bristol and effectively the M1, M62, M6, M5 and M4 corridors) with spurs to key ports such as Dover, Southampton and Felixstowe. As a result of likely infrastructure deficits outside of these urban conurbations and heavily trafficked transport corridors, many zero emission HGV technologies will potentially not be viable, this will likely be the case in rural and less populated areas where air quality degradation is not the principal issue but contributions to global warming remains a major concern. The potential result will be that the North of England, Scotland (other than Glasgow Edinburgh belt), Wales, East Anglia and the South West beyond Bristol will suffer from a lack of solutions, which setting aside the barrier this will pose to transport decarbonisation and achieving the UK's net zero target, is fundamentally contrary to the Government's "Levelling Up" agenda.

Question 9: How can these barriers be addressed?

No response.

Question 10: Do you agree or disagree that these phase out dates should be extended to all non-zero emission HGVs, including those using low carbon fuels, in their respective weight categories? Please explain your answer.

Bennamann disagrees that these phase out dates should be extended to all non-zero emissions HGVs, including those using low carbon fuels, in their respective weight categories. The phase out should not apply to vehicles that are net zero carbon or better than net zero carbon.

Biofuels already make an important contribution to decarbonising HGVs through ready-to-use technologies and can continue to provide cost effective, commercially attractive solutions for reducing carbon emissions both in the short and long term. Indeed, many studies have shown that biomethane is a proven, effective, and immediately available low carbon fuel currently being adopted by many flagship fleet operators in the UK and has the potential for substantial scale-up of production and use in the very near term[9] [10] [11] [12] [13] , thereby offering a significant pathway to meeting short term decarbonisation goals as well as helping the nation meet its legally binding net zero by 2050 target.

Biomethane can be used as a drop in replacement fuel for natural gas vehicles, both Compressed Natural Gas (CNG) and Liquified Natural Gas (LNG), and its use for HGVs is

[9] ADBA-Biomethane-to-transport-report-June-2021-FINAL.pdf (bennamann.com)
[10] Market_opportunities_decarb_HDVs using HBRF_2021.pdf (bennamann.com)
[11] RenewableFuelsGuide_March2020.pdf (bennamann.com)
[12] Intro-to-Biofuels.pdf (cenex.co.uk)
[13] 20210325-CADENT_HYDROGEN_TRANSPORT_REPORT.pdf (element-energy.co.uk)

growing in the UK freight sector. Fleet operators with biomethane vehicles and commitments include John Lewis Partnership, Sainsbury's, Asda, Howard Tenens, DHL, Ocado, Hermes, DPD, Veolia, and a range of Local Authorities including the urban examples of Islington Borough and Camden Borough as well as the rural unitary authority of Cornwall Council. It is estimated that over 1000 HGVs currently operate on biomethane in the UK (it is also popular in the bus sector, with circa 350 biomethane buses in operation in cities such as Plymouth, Nottingham, Bristol and Reading)[14] .

Natural gas vehicles will operate with methane derived from any primary source and when the fuel utilised is biomethane obtained from agricultural manures it results in a better than net zero carbon footprint[15] . This is because fugitive methane is released to the atmosphere when manure is stored in the open environment (typically as slurry in open surface pits, tanks or lagoons) and its capture for fuel use prevents this damaging GHG entering the atmosphere. Methane is 86 times (by mass) more powerful as a greenhouse gas than carbon dioxide over a 20-year period and as a result the recently published Physical Science findings of the IPCC's Sixth Assessment Report[16] emphasised the urgency in tackling fugitive methane emissions from sources such as agricultural manures. A UK transport policy of including HGVs using low carbon fuels in a phase out of non-zero emissions vehicles would be counter to the IPCC's recommendation and unhelpful in achieving both short term (by 2030) decarbonisation and the nation's net-zero by 2050 target.

To meet the UK's short-term and long-term transport decarbonisation targets, many UK biomethane suppliers are scaling up the production of fuel sourced from agricultural manures and Bennamann is leading the way in the integration of 1,000s of small-scale livestock farms into the biofuels market, whilst simultaneously tackling the issue of fugitive methane emissions from agricultural manures[17]. In this regard, the company has developed technologies and commercially attractive business models that enable small-scale livestock farms to become local energy providers based on processing their animal manure slurry. For example, in rural Cornwall, Bennamann are demonstrating the use of livestock manure to establish energy independent dairy farming (including self-sufficiency in power, heat and fuel for farm machinery, such as gas tractors[18]) whilst simultaneously generating farm business income through sales of surplus fugitive methane, either as compressed gas or liquid fuel for local HGV use[19] [20] [21]. The approach also delivers savings on farming input costs beyond those associated with energy bills, such as reducing fertiliser bills through using the soil restoring post-processed digestate (a by-product of the Bennamann process) to underpin regenerative practices.

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[14] RenewableFuelsGuide_March2020.pdf (bennamann.com)
[15] LowCVP-WTT_GHG_Emission_Factors-Review_and_recommendations.pdf (bennamann.com)
[16] AR6 Climate Change 2021: The Physical Science Basis — IPCC
[17] https://bennamann.com/downloads/videos/Bennamann_Process_and_Cycle.mp4
[18] Is biomethane about to become more commonplace on UK farms? - Farmers Weekly (fwi.co.uk)
[19] Energy Independent Farming (cornwallislesofscillygrowthprogramme.org.uk)
[20] Energy Independent Farming - Bennamann Ltd
[21] Farmers-Weekly-Bennamann.pdf

The roll-out of a local supply of fuel sourced from the fugitive methane emissions of farm manure slurry processed in small-scale upgrading plants is scalable and viable in the UK. For example, there are circa 600 dairy farmers alone in the rural county of Cornwall (131,000 dairy cattle – 6% of the national herd) and many of these are in an immediate position to adopt Bennamann's technologies and business models, including the 58 dairy farms in Cornwall Council's own Council Farm Estate. Indeed, in the case of the latter, the Council has already begun a pilot installation on 6 of the dairy farms in the Estate which, if successful, is intended to lead to a wider roll-out across the county[22] [23] [24].

In terms of scalability across the UK, there are circa 2,000 dairy farms in the South-West and around circa 35-40,000 cattle farms across the UK, of which 71% (around 29,000 holdings) have herds with less than 150 cattle. With current farming practices, current AD costs and current level of low-carbon energy incentives, only 3.5% of UK dairy livestock would be linked to economically viable on-farm plants[25] . For example, there is a total of only 45 small scale ADs plants in the UK (ABDA, 2015). Alternatively, Bennamann estimates that the company's proven farm-scale fugitive methane sourcing, processing, storage and distribution technology would enable 71% of UK dairy farms to become economically viable local better than zero carbon fuel producers delivering into the nation's HGV fleets at a local level.

Bennamann's local energy economy model is viable and will result in reductions in fugitive methane emissions from livestock agriculture, as per the IPCC's recommendation to urgently tackle this source of GHG emissions, whilst simultaneously contributing to achieving the UK's short term (by 2030) transport decarbonisation goals and longer-term net zero by 2050 target. The relatively small scale of many of the UK's livestock farms is such that in the absence of this local production, distribution and use model they will effectively be excluded from participation in the nation's efforts to decarbonise transport, as well as miss out on potential business income that incentivises fugitive methane emissions abatement. The notion that all transport sector biofuels should be used for marine applications and aviation[26] will not prove tenable when the opportunities for integrating small-scale production are considered. The quantities of methane produced would not justify the cost of transport to facilities for producing bio aviation or marine fuel, either on financial or environmental grounds, and grid injection would not be possible in many cases as 1,000s of sites are remote from gas mains infrastructure.

By supporting the deployment of this type of local approach to low carbon fuels production for HGVs, the UK Government can create economic green growth and skilled jobs that help maintain the viability of farms and rural communities, whilst simultaneously helping to increase their energy security and resilience, reduce fuel poverty, and contribute to delivering

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[22] UK100 | Knowledge Hub | Cornwall Council biomethane pilot | UK100

[23] RSTA-Renew-Issue-11-210507.pdf (rsta-uk.org)

[24] Trailblazing farms to trial manure slurry as an alternative green fuel - Energy Now (energy-now.co.uk)

[25] Modelling the economics of farm-based anaerobic digestion in a UK whole-farm context - ScienceDirect

[26] Transport decarbonisation plan - GOV.UK (www.gov.uk)

a circular economy, along with meeting the nation's legally binding net zero targets. Bennamann is therefore opposed to these phase out dates being extended to all non-zero emissions HGVs, including those using low carbon fuels, in their respective weight categories.

Question 11
Do you agree or disagree that maximum permissible weights for certain zero emission vehicles (mainly HGVs) on both international and domestic journeys should increase by up to 2 tonnes (without exceeding 44 tonnes)? Please explain your answer.

No response.

Question 12
Do you agree or disagree that weight limits should increase by up to a maximum of 1 tonne for certain alternatively fuelled HGVs on both international and domestic journeys (without exceeding 44 tonnes)? Please explain your answer.

No response.

Question 13
Do you agree or disagree that weight limit increases should only offset any additional weight due to the alternatively fuelled or zero emissions technology? Please explain your answer.

No response.

(Ends.)