Decarbonising the Road Freight Sector

Ireland

Ireland

FTA Ireland in partnership with...

Analytiqa · inver · sse · Gas Networks Ireland · AIR PRODUCTS · Alternative Fuels Working Group

Decarbonising the Road Freight Sector - Ireland

Foreword

At this crucial intersection of industry, innovation, and environmental responsibility, I believe this document can stand as a catalyst for change, illuminating the path towards a greener, more efficient future.

In my capacity as Chair of the Forest Industry Transport Group and lead for Coillte's Sustainable Transport Programme, my mission is clear: to drive a sustainable evolution within the supply chain, reducing carbon emissions in the challenging heavy-duty vehicle (HDV) sector. "Heavy Duty Vehicles" are the lifeblood of our economy, encompassing trucks, machinery, and specialised equipment essential for transportation and operations on and off road across sectors like forestry, agriculture, mining, quarrying, and construction.

Transformation thrives on collaboration. As Council Chair for FTA Ireland, I embark on a journey to decarbonise logistics through my work with the Department of Transport's Road Freight Forum involving stakeholders from government departments, supply chain and logistics sectors, and educational institutions. Among these stakeholders, we must not overlook the pivotal role played by small and medium enterprises (SMEs), indispensable to both the public and private sector. Their challenges demand recognition and support from larger stakeholders to assist them in navigating the path to decarbonisation. As we chart our course, it's imperative that no one is left behind.

This report will serve to provide the ingredients for a roadmap, by presenting four alternative fuel options along with information on decarbonising properties and the costs asscoatied with these these fuels. The timelines for change are well mapped out in the report as well. It must be practical, achievable, and firmly grounded in reality.

While deadlines are essential, they must be tempered with practicality and the necessity of maintaining financial viability as we transition to renewable alternatives that supersede conventional methods of powering our economy. Transformation must not be rushed at the expense of industry sustainability. Considerations of cost loom large, requiring a delicate balance that propels us forward without jeopardising businesses.Alternative avenues for powering our economy, such as hydrogen, biomethane, and biofuels in conjunction with electrification, beckon us towards a cleaner horizon. However, each alternative fuel requires support from a tailored ecosystem suited to its specific needs.

Beyond the realm of spreadsheets and policy documents lies a legacy of action. As Chair of Hydrogen Mobility Ireland, I envision a future where hydrogen, harvested from our land and sea-based wind resources, propels our mobility forward and delivers energy security that exceeds what is currently provided by legacy fuels. Ireland, with its picturesque landscape and abundant natural resources, can serve as a model and a testament to the achievements possible through collaboration, determination, and foresight.

Let us forge ahead to deliver a sustainable transformation within Ireland's supply chain, securing a brighter tomorrow for all.

Des Phelan
Chairperson - FTA Ireland

Introduction

FTA Ireland are delighted to introduce the first 'decarbonising freight distribution in Ireland' report that will provide plenty of food for thought for owners and operators of commercial Heavy Duty Vehicles and policy makers as we grapple with understanding the challenges decarbonisation poses from a cost and timeline perspective.

Whilst there are many challenges to reducing emissions, progress is being made and there are many examples of leaders in the industry who have moved to alternative fuelled commercial freight distribution such as CNG fuelled (now 100% Biomethane) and the first fully electric articulated trucks have been introduced in Ireland in 2023. The Freight Transport Associations' Alternative Fuel Working Group is presenting compelling evidence of a strong ambition to decarbonise within the industry. Nonetheless, significant challenges persist. Consideration must be given to understanding the cost associated with transitioning to newer fuelling technologies, the availability of the technologies, the lifespan of the new technologies and most importantly the infrastructure available to support the effective transition to newer fuelling technologies. One could reasonably infer that for the introduction of new technologies to be viable, they must align with business interests, demonstrate sustainability by offering long-term solutions, and, critically, remain affordable.

This report endeavours to unravel the multifaceted challenges faced by commercial fleet operators in Ireland, as well as offering valuable insights to policymakers and key stakeholders.

Enhancing operational efficiencies and implementing streamlined processes can not only contribute to a healthier environment by reducing fuel consumption but also prove beneficial to the bottom line. Since 2012, the FTA Ireland TruckSafe Standard available at Bronze Silver, Gold and Green has consistently put a spotlight on environmental management practices that encourage documented fuel management and operational efficiency plans that deliver year on year in improvement to Litres used per 100km driven. This report aims to analyse the current European and National Legislation/Regulations governing commercial fleet operations, with a focus on reducing emissions. It seeks to provide valuable insights, guidance, and future oriented options to facilitate the decarbonisation of commercial fleets, empowering operators to make informed decisions for a sustainable future and be a catalyst for policy makers to develop a coordinated approach to supporting the freight distribution and logistics sector decarbonise. The transformative change requires considered legislation and well-presented guidance and information in a timely manner that serves the best interests of the Irish economy, preserve competitiveness of essential services and delivers for the environment.

The report can be used as a reference for commercial fleet operators to reaffirm that change is necessary, highlighting the options available to them. Our partners Gas Networks Ireland, Inver Energy, SSE Airtricity, and Air Products offer up the position and the service provided by key players that support decarbonisation of commercial transport in Ireland. All highlight the necessity to focus on infrastructure development and the importance of the state working in tandem with industry to support these projects as well as outline challenges they are currently facing to meet very ambitious deadlines. All demonstrate that industry are committed to a coordinated approach to decarbonise and this should be mirrored with policy makers as we strive to develop a transition strategy that support options that are affordable and cognisant that not one solution fits all.

The Operator

Mirroring the well documented narrative that decarbonising Heavy Duty Vehicle fleets will be complex and require a multi-faceted approach, this report reasserts that there is much to consider for commercial fleet operators in understanding their growing obligations to decarbonise, specific timelines in doing so and that they will have to develop solutions that make sense for their business. The overarching message from this report for fleet operators is to prioritise decarbonisation within your business and to develop an understanding of the changes that must be made to future proof your competitiveness.

The integrity of Supply chains is sacrosanct to our global reputation. Irelands supply chains have demonstrated over the last number of years significant resilience and an innovative spirit that has seen off Brexit and Covid. Key to the success of all supply chains is developing robust relationships where each link in the supply chain works in tandem to deliver efficiencies and excellent service. This must now be extended to work collaboratively in understanding the challenges of decarbonisation particularly for the freight distribution sector. This sector is multifaceted that needs clearer definition for the purpose of pursuing solutions that support a sustainable transition to alternative fuels. Commercial Fleet operators come in many guises such as (not an exhaustive list) those that operate across all industries including, haulage, manufacturing, retail, warehouse and distribution, construction, private and public passenger transport operations, security, telecommunications etc.

Commercial fleets comprise of Light Goods Vehicles (vehicle category N1); Heavy Goods Vehicles (vehicle categories N2 & N3) and Passenger Vehicles (Vehicle Categories M1, M2 & M3). The average fleet size in the haulage sector is 5.9 trucks per fleet and the biggest commercial fleets are in local authorities or semi-state bodies.

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Because of the variety of type of commercial fleets, the weights carried and the size of vehicle, distances travelled, urban versus motorway, national versus international driving, consideration must be given to understanding the cost associated with transitioning to newer fuelling technologies, the availability of the technologies.

Policy Makers

The report will assist key stakeholders in understanding the complex challenges for commercial fleets operators in Ireland and should act as a catalyst for further research and collaboration that can deliver a viable roadmap to decarbonisation. It is important that the freight distribution and logistics sector is not vilified for its use of fossil fuel. There are significant challenges for decarbonisation of the Heavy Goods Vehicle Fleet and the reliance on fossil fuels is well documented. Commercial fleet operators must be protected from the spiralling price of fuel in the coming years, to protect the viability of essential services for the Irish economy.

It is reasonable to assume that for new technologies to be introduced they must make business sense, be sustainable (in the sense that they are not short-term solutions) and most importantly affordable. To encourage quicker uptake in new technologies the narrative must shift to focus on affordability and benefits of the transition to zero emissions. The infrastructure investment that enables greater use of alternatively fuelled vehicles requires significant capital expenditure and collaboration between the private sector and Government. Developing trust and transparency that is matched by a clear policy pathway for change is critical to this. Industry needs certainty to make the investments necessary for this transformational change. For Fleet operators, the focus must centre on the 'total cost of ownership' (TCO), that takes account of the costs of truck acquisition, average fuel prices, maintenance, and other items such as average road tolls, taxes, and levies. For each actor in the transition landscape, change must make business sense for the investment required, and more importantly it must give a healthy return on that investment. The cost of the new technologies, the lifespan of the new technologies and the infrastructure available to support the effective transition to newer fuelling technologies requires public private partnerships that has the investment support underwritten by the Government.

The Haulage strategy published in 2022 outlines 39 actions to be progressed up to 2031, with 14 of these actions (35%) dedicated to sustainability and decarbonisation. The Climate Action Plan 2023 references the freight forum as the body responsible for advancing the road haulage strategy and achieving emissions reduction. Therefore, it is imperative that this group's work is progressive and supported by all stakeholders to ensure its success.

The forum should adopt a transparent and collective approach that represents the interests of the Irish freight distribution and logistics sector, while also supporting a national strategy for decarbonising road freight distribution. It is essential that industry decarbonisation issues, such as modal shift requirements, planning issues, refuelling infrastructure, and the availability of righthand drive vehicles, are effectively represented by all stakeholders. This ensures that Ireland's unique circumstances are conveyed to Europe to support a 'just transition' that benefits all in the freight distribution and logistics sector. Given Ireland's limited Ten-T Network, urban-centric population, and geographical constraints, it is challenging to implement general EU sustainable transport policies such as increased use of inland waterways and rail freight. Therefore, an approach of incremental decarbonisation is advisable to facilitate a cultural shift towards understanding the necessary changes and how they can be implemented.

There are other necessary changes to support more ambitious investment in Light Commercial Vehicles, including an overhaul of vehicle registration tax (VRT). Currently, electric vehicles incur higher tax burdens due to battery weight, resulting in significantly higher VRT charges compared to diesel equivalents. This acts as a deterrent to investing in environmentally friendly low-emission vehicles. Additionally, there needs to be a review of Benefit in Kind (BIK) to avoid penalising employers who provide commercial electric vehicles (vans) to their employees and require them to charge these vehicles at home.

We hope that this report will spark further research and foster collaborative efforts, ultimately paving the way for a dynamic roadmap towards decarbonisation in the commercial fleet sector.

A coordinated approach to decarbonising the road freight distribution sector will work best and this is ably represented by all partners in this project who demonstrate that working together can deliver clarity and insight into the available options available to fleet operators. Thanks to Inver, SSE, Air Products and Gas Networks Ireland. Thanks also to Analytiqa who have pulled the report together and to Conor Molloy (Authentic Energy Management) for his insight and guidance along the way.

Aidan Flynn
CEO - FTA Ireland

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Key take-aways

To change behaviour, (which can be either good or bad) requires repetition of messaging, clear instruction and buy in. It takes much more work to change behaviour for the better than it does to experience negative change. The scale of change requires a positively disposed mindset. It also requires a clear strategy and vision that is not at threat to changing government policy.

DECARBONISING THE ROAD FREIGHT SECTOR

- **More than one solution** –There is a requirement for a myriad of solutions and technologies to decarbonise the road freight sector, depending on distance requirements, payload, time available, economics, infrastructure available, local/national/international routes.
- **Investment and support for infrastructure** projects that support the transitions to zero emission fuels must be a priority. Lack of support is creating uncertainty, delaying growth and jeopardising the ultimate objective of meeting net zero in 2050.
- **Imported renewable energy** can be used to complement domestically produced renewable energy, kick-start the Irish hydrogen market and bring climate targets back in reach.
- **Ireland as an island** is reliant on the importation of energy.

  There is a need to create a resilient alternative energy import supply chain. Imported energy has increased from 69.0% in 2018 to 83.4% in 2022.

  Ports must be equipped with sufficient storage capacity and facilities to support the introduction of bigger volumes of alternative fuels such as Biomethane and Hydrogen
- **Alternative Fuels are available now**. All partners in this project (Inver, Gas Networks, SSE and Air Products) are keen to engage with and help fleets to make the move to alternatively fuelled vehicles.
- **Incremental change** now is better than waiting for a perfect solution later. Interim non-technological solutions and complementary measures will need to be implemented in the short to medium-term to meet targets.

  Eco Driver Training can save on average 3.2litres per 100km (average of 3,723 litres per day) resulting in cost saving of €5,000 per year or 10 Tonnes of CO_2 savings [see page 53 for more details].
- **Security of energy supply** is critical for commercial fleet operators and the availability of wattage to support quick recharging will be essential to support industry transition to electrification.
- **Remove planning barriers** to support introduction of alternative fuel infrastructure that is not cost prohibitive.
- **It is essential that the common set of rules** and emissions calculation principles for transport operations (GLEC Framework, ISO14083) is based on the 'well-to-wheel' concept.
- **Fleet Operators' focus** must centre on the 'total cost of ownership' (TCO), that takes account of the costs of truck acquisition, average fuel prices, maintenance, and other items such as average road tolls, taxes, and levies.
- **Key to transition** is education and effect communication that brings everyone on the journey. Small to medium (SME) businesses need to be able to afford change and understand the journey required in order to plan and finance this change.

ROLE OF THE 'STATE' - POLICY MAKERS

Ambition of industry is there to decarbonise – this ambition must be matched by State support and leadership.

- **Government must support** the private sector with deployment of sufficient alternative fuelling infrastructure and electric charging facilities (either independently or cooperatively). Building confidence in available alternative fuels infrastructure is essential in supporting the freight distribution and logistics sector to decarbonise.
- **Developing trust and transparency** that is matched by a clear policy pathway for change is critical to this. Industry needs certainty to make the investments necessary for this transformational change.
- **More positive commentary and support** from Government for all alternative fuelling solutions is needed. Do not support a narrative that highlights the reduction of vehicles from our roads and pillory commercial fleet operators, who are essential to the Irish economy.
- **Pragmatic solutions** that take account of real-world challenges such as fuel security, cost of fuel, access to fuel and residual value of vehicles that support an effective transition to alternative clean fuels is critical to encouraging industry to make the change to alternative fuels.
- **Initiatives such as the Zero emission** HDV grant must be dynamic to present a viable incentive for industry to invest in Alternatively Fuelled Heavy-Duty Vehicles. However, much broader support is required to meet the price differential gaps in vehicles and there should be more focus on supporting infrastructure projects as well.

  Limiting grant funding for CNG/BioCNG vehicles, for example, based on tailpipe emissions, makes little or no sense when NORA recognises BioCNG as a fully renewable transport fuel.
- **If we are serious about decarbonising** the road freight sector, new tax supports must be introduced to encourage commercial fleet operators to purchase alternatively fuelled vehicles, CNG/Biomethane, Hydrogen and Electric.
- **Fuel taxation must be modernised** to protect fleet operators' competitiveness and business viability as the transition to alternative fuels diminishes the demand for diesel fuels over the coming years.
  1. Review the tax categorisation of HVO, the cost of which is 20% higher than diesel fuel but delivers 90% reduction in emissions. The Government must clarify their position on HVO and the role for this fuel in the decarbonisation journey.
  2. The Diesel Rebate Scheme (DRS) must be reviewed as a means to encourage the transition to alternative fuels
  3. BioCNG incentives should be considered to ensure the price of BioCNG remains cost competitive with Diesel
- **Provide a Tax Rebate** (credit) for all commercial fleets that have evidence-based fuel management programmes in place i.e., they are able to demonstrate reduction in fuel burn. Programmes such as the annual audit TruckSafe at Silver & (Green) level record Kilometres driven and Litres of fuel used per vehicles feed the information into a programme audited by the SEAI.
- **Introduce a scrappage scheme** for the aging truck and trailer fleet. (In 2022 61.7% of the truck fleet in Ireland was 6 years or older)

A COORDINATED APPROACH TO DECARBONISATION

- **Truck manufacturers** need to be more proactive, engage with industry, government representatives, hauliers, to drive advancements in technologies and provide choice to hauliers and fleet operators.
- **All major truck manufacturers** need to be involved in developing and offering alternative solutions to this marketplace, having only a small number of manufacturers (2) offering CNG versions of their products will not deliver efficiencies and competitiveness in the market that is essential to fleet operators in their purchasing activities.
- **A whole of government strategy** (key departments) is necessary to support the change necessary. Introduction of new energy supplies and refuelling infrastructure requires engagement and alignment between many government departments and agencies on a national and local government level.
- **Develop a 'national decarbonisation road freight strategy'** through collaboration and engagement with key stakeholders. This level of collaboration and transparency is essential if Ireland is to come close to meeting the transport decarbonisation targets. The strategy must take account of Ireland's unique status as an island and one that is currently reliant of the importation of energy and fuel.

  Ireland as an island nation has a different trajectory to change than mainland Europe for many obvious reasons, not least because of our island status and lack of historical investment in alternative fuels. Our position must be highlighted in the national decarbonisation strategy and should impress upon the EU the supports and timelines for change applicable to Ireland due to our unique circumstances.
- **Government and other State stakeholders** including local authorities must develop stronger collaborative engagement with industry to develop a road map to transition to alternative fuelled vehicles and remove barriers to new fuelling infrastructure.

  A bespoke eco-system is needed for each of the alternative fuels required.

The success or otherwise of ambitious targets to decarbonise are wholly reliant on the leadership of the incumbent Government. The national policy is taking the lead from the European regulatory framework. The extent of legislation, regulations and advice that is being published to enshrine the policy position is somewhat overwhelming. Clear and unambiguous messaging that details the availability of national / European funding that supports transition as well as definitive sectorial guidance and information is essential to support the demands of the ambition.

Alternative Fuels - Challenges to Transition

1. Fuel

- What is a viable alternative fuel
- What alternative fuels suit my business
- Competing fuels
- Better communication of types of available alternative fuels
- Security of supply
- **Cost of alternative fuel.**

2. Barriers

- **Political [Political ambition not aligned with industry requirements]**
  1. Government strategy does not adequately consider the unique needs of Irelands' decarbonisation challenge versus the UK and Continental Europe
  2. Pace of change by Government not aligned with industry ambition.
  3. No joined up thinking
- **Infrastructure**
  1. A bespoke eco-system is needed for each of the alternative fuels required. Government need to engage industry on delivering this eco-system.
  2. Cost of infrastructure impacting cost of fuel/energy to the consumer.
- **Technological**
  1. Availability of supply of rolling stock
  2. Reliance on the UK market – Brexit does not help
- **Social**
  1. Operators discriminated against because of reliance on fossil fuel
  2. Build public empathy to essential service providers

3. Operator Business Case

- **Cost of vehicles (availability & residual values)**
- **Cost, availability and clarity of government support for sustainable fuels**
- **Cost of alternative fueled vehicles**
- **Access anxiety**
- **Training & Support**
  1. SME's need training and support to develop their sustainable logistics roadmaps, then review them with a government authority such as SEAI / Enterprise Ireland to establish their financial feasibility and grant funding needs.

4. Legislation Regulations

- EU / National – too much in short timeframe
- Unrealistic political timescale for change
- Planning / CRU regulator / Grid access to build charging centers
- Lack of understanding of processes involved in delivering infrastructure to support decarbonising transport
- Lack of sufficient incentives to support change
- Vehicle replacement plan
- Total cost of ownership

Ireland’s Freight Distribution

in numbers …

- **42,782 HDVs (3.5 tonnes) were taxed in Ireland in 2023**
  - 23,615 vehicles licensed for haulage
  - 19, 167 on own accounts
- **99% of Irish Heavy-Duty Vehicles (HDV) are currently Diesel**
- **165 million Tonnes was carried by road freight in 2022**
- **99% of inland freight is moved by road in Ireland**
- **Rail freight is <1% of total Tonnes per km**
- **35 Electric HGVs are ‘on the road’**
- **128 Gas HGVs are ‘on the road’** (01)
- **Ten - T Network (Ireland)**
  - 500km core network
  - 1,700 km comprehensive network

01 https://stats.beepbeep.ie/heavy-commercial-vehicles
* NB: above stats are for the 2022 - 2024 period

FTA Ireland

Chapter 1

The road to decarbonisation

2050

- EU: Green Deal: Europe climate-neutral by 2050
- EU: Doubling rail freight traffic, new heavy-duty vehicles to be zero-emission
- IR: Achieving net-zero emissions by 2050

2040

- EU: Targets for truck manufacturers: 90% emissions reduction from 2040. compared to 2019 levels
- IR: 100.0% of sales of new Medium- and Heavy-duty vehicles (trucks and buses) to be zero emission by 2030

2035

- EU: Targets for truck manufacturers: 65% emission reductions from 2035. compared to 2019 levels
- 3500 kW Recharging stations every 100 km

2030

- EU: 'Fit for 55' Greenhouse gas emissions cut by at least 55.0% by 2030
- EU: Trans-European Transport Network (TEN-T) to be completed
- EU: Ireland to reduce its Green House Gas emissions by 30.0% by 2030
- EU: Publicly accessible charging pools for HDVs of 3,600 kW at 60 km intervals and of 1,500 kW at 100 km intervals
- EU: Targets for truck manufacturers: 45% emissions reductions from 2030
- IR: CAP 24 target for commercial electric vehicles of 150,000 by 2030.
- IR: 30.0% of sales of new Medium and Heavy-duty vehicles to be zero emission, 100% by 2040
- IR: Achieve a 20.0% biodiesel blend
- IR: 80% of electricity requirements will come from renewable sources

2025

- National EV Charging Infrastructure Strategy in January 2023, and the draft National En-Route EV Charging Plan, sets a vision for the deployment of public charging infrastructure, which envisages a 300% increase in charging capacity by 2025

DEPLOYMENT OF ALTERNATIVE FUEL INFRASTRUCTURE

FUEL TYPE	DEADLINE	ON THE CORE NETWORK	ON THE TOTAL NETWORK	IN EACH SSTPA	IN EACH URBAN NODE
HGV Electric Refuelling Station (Art 4)	31 December 2025	At least 1400 kW of recharging points every 60km			
	31 December 2030	At least 3500 kW of recharging points every 60km	At least 1400 kW every 100 km	At least 1 station per SSTPA with at least 100kW	Aggregated power output of at least 1200 kW
	01 December 2035		At least 3500 kW every 100km		
Hydrogen (Art 6)	31 December 2030	Stations with a minimum capacity of 2 t/ day and equipped with at least a 700 bar dispenser every 150km. Liquid hydrogen every 450km.			At least 1 station in each urban node (if possible, located in multimodal hubs)

2024 - EU Freight is currently responsible for over 30.0% of transport CO_2 emissions

THE ROAD TO DECARBONISATION

The objective of this Chapter is to provide a high-level overview of the alternative fuels that will support the transition pathway and future of a low-emission, decarbonised road transport sector in Ireland. It will be for manufacturers to decide which vehicle technologies they use to achieve these targets. A majority of truck operators will be subject to a continued reliance on diesel fuel. Therefore, biofuels will play an important transitionary role – the renewable transport fuel obligation scheme will see the renewable fuel blend in diesel increase to 49% by 2030.

The EU Regulation on CO2 emission standards for heavy-duty vehicles has recently been revised and sets new binding reduction targets for heavy duty vehicle manufacturers. The stronger targets, compared to 2019 levels, will be phased as follows:

- **45.0% emissions reductions from 2030**
- **65.0% emission reductions from 2035**
- **90.0% emissions reduction from 2040**

Transitional measures, such as the use of renewable transport fuels, will be needed to reduce emissions in existing vehicles while the widespread take up of battery and hydrogen fuel cell electric trucks begins towards the end of this decade. The FTA Ireland Manager's Guide to Distribution Costs 2023 report highlights increased levels of interest in battery electric vehicles, whilst a 'solid' share is exploring the use of natural gas vehicles.

What is clear and evidenced in this report is that there are many options to support decarbonisation of the Heavy Duty Vehicle Fleets in Ireland at this moment in time. This chapter will help inform and identify the current options currently available.

FUEL COMPARISONS

Alternative Fuel Options to Support Transitional Phase

Biofuels

Biodiesel is a renewable, biodegradable fuel manufactured domestically from vegetable oils, animal fats, or recycled restaurant grease. Biofuels are currently the most important type of alternative fuels, accounting for 4.4% in EU transport. Total biofuel consumption was 17.0 Mtoe in 2018. They can contribute to a substantial reduction in overall CO2 emissions, if they are produced sustainably and do not cause indirect land use change. They could provide clean power to all modes of transport. However, supply constraints and sustainability considerations may limit their use. Biofuels can be produced from a wide range of feedstock through technologies in constant evolution and used directly or blended with conventional fossil fuels. They include bioethanol, biomethanol and higher bioalcohols, biodiesel (fatty-acid methyl ester, FAME), pure vegetable oils, hydrotreated vegetable oils, dimethyl ether (DME), and organic compounds.

First generation biofuels are based on food crops and animal fats. The majority of biofuels consumed in Ireland are second generation, waste derived biofuels. They include biodiesel and bioethanol. To mitigate against impacts of some biofuels, the Commission has proposed to limit the number of first-generation biofuels that can be counted towards the Renewable Energy Directive targets to 5.0% and increased the incentives for advanced biofuels such as those made from lignocellulosic biomass, residues, waste, and other non-food biomass, including algae and microorganisms. in 2023, 50.61% of renewable energy in transport was derived from Used Cooking Oil **(01)**.

Blends with conventional fossil fuels are compatible with the existing fuel infrastructure, and most vehicles and vessels are compatible with the blends currently available (E10 – petrol with up to 10.0% bioethanol and diesel with up to 7.0% FAME biodiesel content). Higher blends may require minor adaptations of power trains, and corresponding fuel standards need to be developed. High-level petrol-ethanol blend containing 85.0% ethanol (E85) is used in only a few Member States in flexible fuel vehicles (FFVs) that can also use lower blends.

Consumer acceptance of biofuels has been hampered by the lack of coordinated action across Member States when introducing new fuel blends, the lack of common technical specifications, and the lack of information on the compatibility of new fuels with vehicles. Some biofuels such as hydro-treated vegetable oils can be blended at any ratio with conventional fuels and are fully compatible with existing refuelling infrastructure and road vehicles, vessels, locomotives, and planes for up to 50.0% blends. Biofuels in the transport sector are consumed in France, Germany, Sweden, Spain, Italy, and the UK, with a large gap between their consumption and that of the rest of the Member States. For aviation, advanced biofuels are the only low-CO2 option for substituting kerosene. The compatibility of bio-kerosene with today's planes has been proven. Cost, however, must become competitive. The 'Flightpath 2050' initiative aims at 75.0% reduction in CO2 emissions and 90.0% reduction in nitrogen oxide (NOx) emissions

01 https://www.nora.ie/_files/ugd/e450e1_258f05a4d1394f659c01ca1d17021948.pdf

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Ammonia **(02)**

Ammonia is a molecule with the chemical formula NH3 that occurs as a gas at room temperature and normal pressure. It can also be stored as a liquid at low temperatures (below -33°C) and/or when compressed. In this case, it is called liquid ammonia.

The use of ammonia as a fuel is not recent. It has been used since the beginning of the 19th century as a fuel in motorised vehicles, in locomotives (England) or in tramways (New Orleans, US). More recently, ammonia has come back to the forefront to decarbonise various specific sectors, the maritime transport sector as a replacement for certain heavy fuels (e.g. heavy fuel oil (HFO)), known for their greenhouse gas emissions. Ammonia emits less greenhouse gases than liquid petroleum gas (LPG) or compressed natural gas (CNG). However, its overall environmental impact (from production to use) must be assessed on a case-by-case basis. Various initiatives to demonstrate the potential of ammonia in the maritime sector are being set up following the Maritime EU Directive for shipping decarbonisation.

The efficiency of ammonia in internal combustion engines is improved when it is blended with other fuels. Ammonia has a low flame speed and high resistance to self-ignition. Doping ammonia with other fossil fuels (especially diesel) is the most technically efficient option, reducing CO2 and NOx emissions if the NH3 content of the blend does not exceed 60.0% by weight. Gasoline/NH3 or ethanol/NH3 blends also offer high power output under stable conditions, although conditioned by NOx emissions during the combustion phases.

Liquefied petroleum gas (LPG)

LPG is a by-product of the hydrocarbon fuel chain. Its use in transport increases resource efficiency. LPG is an immediately available low-carbon alternative. Indeed, it emits 35.0% less CO2 than coal and 12.0% less than oil. It also emits almost no black carbon, the second biggest contributor to global warming. LPG offers significant environmental advantages, particularly in terms of indoor and outdoor air quality. It is characterised by low particle emissions, low nitrogen oxide (NOx) emissions and low sulfur content. Currently, it is derived from crude oil and natural gas, and in the future also from biomass. Currently, gas (natural gas as well as LPG) is being flared and vented in huge quantity.

LPG infrastructure is well established, with some 32,000 dispensing sites in the EU but with a very uneven distribution across the Member States. Its advantage of producing low pollutant emissions, however, has been diminishing as the EURO standards have progressed to lower general emission limits. There remains, however, a clear advantage in lower particulate emissions. LPG might still expand its market share but will remain a niche market. Automotive LPG, also known as autogas, is Europe's most widely used alternative fuel, with little need for investment in infrastructure. With over 15,000,000 vehicles already running on autogas, serviced by a filling station network of over 46,000 sites, Autogas offers Europe's drivers an alternative to conventional fuels.

Liquefied natural gas (LNG)

Natural gas in liquefied form (LNG) with high energy density offers a cost-efficient alternative to diesel for waterborne activities (transport, offshore services, and fisheries), trucks and rail, with lower pollutant and CO2 emissions and higher energy efficiency. LNG is particularly suited to long-distance road freight transport for which alternatives to diesel are extremely limited. Trucks might be able to meet the more stringent pollutant emission limits of future EURO VI standards cost efficiently. LNG is also an attractive fuel option for vessels to meet the new limits for sulfur content in marine fuels decreasing from 1.0% to 0.1% from 1 January 2015 in Sulphur Emission Control Areas (SECAs) in the Baltic Sea, North Sea and English Channel as set by the International Maritime Organisation (IMO). These obligations will be relevant for about half of the 10,000 ships currently engaged in intra-EU shipping. LNG is also an attractive economic alternative for shipping outside SECAs, where sulfur limits will decrease from 3.5% to 0.5% from 1 January 2020, and globally.

Lack of fuelling infrastructure and common technical specifications on refuelling equipment and safety regulations for bunkering hamper market uptake. LNG in shipping, on the other hand, could be economically viable, with current EU prices lower than for heavy fuel oil and low sulfur marine gasoil, and prospects of increasing use in future. LNG development into a global commodity can improve security of energy supply in general by boosting the use of natural gas as fuel for transport. LNG use in transport can also increase the value of gas that would be otherwise flared.

Compressed natural gas (CNG)

Natural gas vehicle technology is mature as regards the broad market, with close to 1.3 million vehicles on the road in Europe and around 3,000 filling stations. Additional refuelling stations could easily be supplied from the existing dense natural gas distribution network in Europe.

02 https://alternative-fuels-observatory.ec.europa.eu/general-information/alternative-fuels

CNG vehicles have low pollutant emissions and have therefore rapidly gained ground in urban fleets of buses, utility trucks and taxis. Optimised gas-only vehicles can have higher energy efficiency. Biomethane, which is a direct replacement for natural gas, can be used in CNG vehicles to fully decarbonise journeys. Fully functioning Renewable Gas Certification Schemes are in operation all over Europe, including Ireland, to enable fleet operators to procure biomethane and Gaurantees of Origin (GOOs) where supply of fully renewable gas is available, either directly from the gas infrastructure or transported to areas of demand off-grid. Biomethane in transport is certified as carbon neutral resulting in low-effort decarbonisation of fleets.An economically viable market development could be expected by private initiatives as CNG vehicles are competitive with conventional vehicles in price and performance, and natural gas is cheaper than petrol and diesel. Government intervention is required to facilitate the roll-out of additional CNG stations in all EU jurisdictions, including Ireland, to allow for EU-wide mobility for CNG vehicles

Gas-to-liquid (GTL)

Natural gas can also be transformed to a liquid fuel by first decomposing it to a 'synthetic gas', consisting of hydrogen and carbon monoxide, and then by refining to a synthetic fuel with the same technical characteristics as conventional fuels, fully compatible with existing combustion engines and fuel infrastructure. Synthetic fuels can also be produced from waste feedstock. They improve the security of supply and reduce pollutant emissions of present vehicles. Moreover, they promote advanced engine technologies of higher energy efficiency. Excessive cost, however, presently limits market take-up.

Electricity

Electricity is considered an alternative fuel under the European alternative fuels strategy and the new regulation on the deployment of alternative fuels infrastructure. Electricity can be produced from three main sources: (1) fossil carbon, (2) nuclear and (3) renewable. In the EU in 2019, 39.0% of the electricity consumed came from power stations burning fossil fuels and 35.0% from renewable energy sources, while 26.0% came from nuclear power plants. Among the renewable energy sources, the highest share of electricity consumed came from wind turbines (13.0%), hydropower plants (12.0%), biofuels (6.0%) and solar power (4.0%).

Electric vehicles (EVs), using a highly efficient electric motor for propulsion, can be supplied by electricity from the grid, coming increasingly from low-CO_2 energy sources. Flexible recharging of vehicle batteries, at times of little demand or ample supply, supports the integration of renewable energy into the power system. EVs emit no pollutants and no noise and are therefore particularly suited for urban areas. Plug-in Electric Vehicles (PEVs) are the common terminology for plug-in hybrid electric vehicles (PHEV) and 100.0% electric vehicles (Battery Electric Vehicles – BEVs). These vehicles are capable of drawing electricity from off-board electrical power sources and storing the energy in batteries. Hybrid configurations, combining internal combustion engines and electric motors, can save oil and reduce CO_2 emissions by improving the overall energy efficiency of propulsion (up to 20.0%) but are, without external recharging possibilities, not an alternative fuel technology. The technology of EVs is maturing, and their deployment is picking up. By 2030, the European Commission wants to place at least 30.0 million zero-emission cars and 80,000 clean-energy lorries on Europe's roads. The key issues are excessive cost, low-energy density and heavy weight of batteries. These limit the driving range of vehicles. Normal recharging takes several hours. Fast, inductive recharging, or battery swapping can alleviate the problem. Improvements in battery technology are essential for the market take-up of EVs. Electric two-wheelers share all the assets of EVs and can support their broad market penetration. Lack of recharging points, with a common plug, is a major obstacle to market uptake. They would need to be located at home, at the workplace and in public spaces. At present, most of the Member States are catching up with the number of publicly accessible recharging points and announced policies to develop an adequate network of recharging facilities. EVs can also be used for electricity storage and grid stabilisation and, to allow for a flexible electricity pricing system based on demand/supply, controlled interaction with the electricity network will be needed.

Hydrogen

Hydrogen (H_2) is a promising alternative fuel option for transport, where electrification is more difficult. In the first phase, early adoption of hydrogen can occur in captive uses, such as local city buses, commercial fleets (e.g. taxis) or specific parts of the rail network, where electrification is not feasible. Hydrogen refuelling stations can be supplied by hydrogen tankers delivering hydrogen to storage tanks on site just as diesel is delivered to forecourts today but their deployment needs a clear analysis of fleet demand and different requirements for light and heavy-duty fuel cell electric vehicles (FCEV). Hydrogen fuel cells are important technology alternatives for heavy-duty road vehicles, alongside electrification, including coaches, special purpose vehicles, and long-haul road freight given their high CO_2 emissions. The 2025 and 2030 targets set out in the CO_2 Emission Standards Regulation are an important driver to create a lead market for hydrogen solutions, once fuel cell technology is sufficiently mature and cost-effective. Projects of the Horizon 2020 Fuel Cells and Hydrogen Joint Undertaking (FCH-JU) are aiming to accelerate Europe's technological lead. The key limiting factor for the use of hydrogen in industrial applications and transport is the higher costs, including additional investments into hydrogen-based equipment, storage, and bunkering facilities. Furthermore, the potential impact of supply chain risks and market uncertainty is amplified by the tight margins for final industrial products due to international competition. Demand-side support policies will therefore be needed.

The Commission will consider assorted options for incentives at EU level, including the possibility of minimum shares or quotas of renewable hydrogen or its derivatives in specific end-use sectors (for instance certain industries such as the chemical sector, or transport applications), allowing demand to be driven in a targeted way. In this context, the concept of virtual blending could be explored. Ireland aims to build an indigenous, renewables-fed electrolyser market in order to scale up renewable hydrogen production and help the country on a path to ultimately reducing imported energy.In order to do this, however, there will need to be a catalyst in the form of renewable imports that can build a realistic offtaker market rapidly so that investment in renewable hydrogen can commence at the scale Ireland requires. This did not happen in the UK, for example, which is a reason for the very slow development of electrolyser investment and renewable hydrogen supply there.Imported renewables to 'kick-start' a market in renewable hydrogen production are therefore an essential market-building tool, and ultimately a strategy to deliver the energy security the Irish Government wants. Beyond this market-building role, imports can be kept at a limited scale to provide diversification of supply and support intermittency, which again increases energy security.

OPERATING COSTS AND EMISSIONS

FTA Ireland has set out a general approach to evaluating alternative fuels for heavy duty vehicles

Put fuel performance (combustion) and energy efficiency first - Have you done all that is practicable to save fuel already? The cheapest alternative fuel is the fuel you don't use.

Compare costs per kWh in motive power / useful work - The internal combustion engine is at best 40.0% efficient and in real-world conditions only 20.0% i.e. for every €1.00 of fuel you put in, you may only get 20c of motive power to wheels. An electric motor is 90.0% efficient i.e. 60.0%-70.0% of your money gets to the wheels. Anything you can do to electrify your vehicles' power train will help reduce fuel use, as the electric motor is 90.0%-95.0% efficient and produces 100.0% of torque from rest.

Sceptical? Remember when we switched from fan belts to electric fans: This produced a measurable fuel saving and the industry has been electrifying ancillaries ever since.

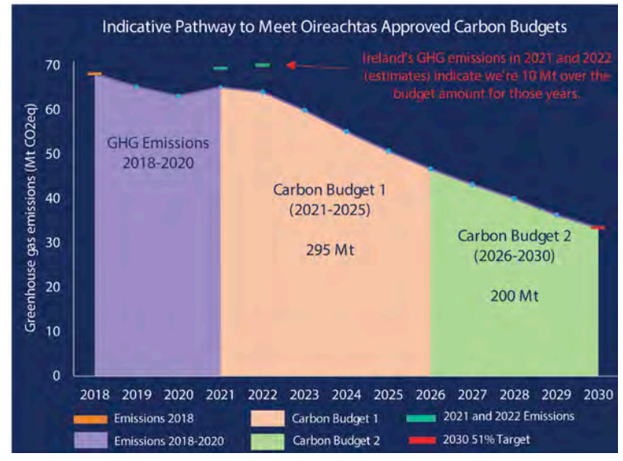
Check availability - Will the fuel you choose be available where and when you want it? Will it's tax break last long enough for you to recoup your investment.

IRELAND EXCEEDED ITS BUDGETS

Across Ireland, decreased emissions in 2022 compared to 2021 were observed in the largest sectors except for transport and waste. These two sectors showed increases in emissions (+6.0% and +6.6% respectively). Greenhouse gas emissions by sector in 2022 are as follows: **(01)**

Waste	1.45 %
Energy Industries	16.63 %
Residential	9.55 %
Manufacturing Combustion	7.10 %
Commercial Services	1.26 %
Public Services	1.08 %
Transport	19.39 %
Industrial Processes	3.78 %
F-gases	1.22 %
Agriculture	38.54 %

GHG emissions for 2021 and 2022 indicate Ireland is 10 Mt over budget for the first two years of the carbon budget. **(02)**



01 https://www.epa.ie/our-services/monitoring--assessment/climate-change/ghg/latest-emissions-data/
02 https://www.energyireland.ie/accelerating-the-energy-transition/

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Roadmap to decarbonisation

OPERATING COSTS AND EMISSIONS

Intended for discussion and learning only
Consult suppliers fpr specific prices, efficiencies and emissions
Prices sourced from: https://www.seai.ie/technologies/electric-vehicles/fuel-cost-comparison/ April 2024
Grey / Italic values not Irish as specifics not yet available

		ENGINE EFFICIENCY	COST				GREEN		CLEAN		
			UNIT PRICE (2023)	€ PRICE / kWh	COST PER kWh	TAXES (01) EXCISE + CARBON PER kWh	Kg CO_2E PER kWh AFTER LOSSES		REDUCED NOx AND PM's	*AVAILABILITY*	*ISSUES*
		How much fuel is converted to power		Litres & kg converted to kWh for comparison	Price / kWh ÷ Energy Efficiency		Well to wheel (WTW) from GLEC Framework 2019				
Electric	**Electricity (kWh)** subject to change e.g. +25% from 01/10/2022 (Lithium-ion battery, night rate - SEAI Commercial Cost Comparison 01/04/2024	90%	€ 0.1398	€ 0.1398	0.155	€ 0.001	0.361	(02)	✓	✓	Grid connections
	Green Hydrogen from renewables (UK using curtailed wind & solar electricity, compressed at 700 bar)	52%	*TBC	*€ 0.140*	*0.490*	*TBC	*TBC		✓	X	Burns with an invisible flame
Liquid fuels for diesel engines	**Diesel DERV** (EN590) **Euro VI** ('6' w AdBlue) 4-6% FAME Biofuel in Ireland, 1kWh is 1/10 of a litre of Diesel i.e. 1L=10.169 kWh	40%	€ 1,349	€ 0.133	0.330	€ 0.051	0.934		✓	✓	
	B100 or 100% HVO Priced at Diesel +40% (on average) 9.53 kWh/L Hydrotreated Vegetable Oil Biodiesel from wastes	38%	€ 1,749	€ 0.176	0.460	€ 0.042	0.009	(03)	✓	✓	Can be blended to burn cleaner than diesel
	Diesel DERV (EN590) **Euro III-V** 4-6% FAME Biodiesl by volume in Ireland	38%	€ 1,349	€ 0.133	0.350	€ 0.051	0.983		X	✓	Air quality
Gas fuels for dedicated gas engines	**Compressed Natural Gas** (CNG) 100% gas engine HPDI 12.433 kWh NCV/kg	32%		€ 0.141	0.44	€ 0.010	0.772	(04)	✓	*Limited*	Limited availability, 8 stations in operation, 4 more under construction. Highly regulated. Biomethane currently in use for the transport sector
	BioCNG / Renewable Natural Gas (RNG) 100% gas engine HPDI 12.433 kWh NCV/kg - **Priced with 40% premium**	32%		€ 0.198	0.62	€ 0.000	0.123		✓	*Limited*	
	Liquefied Natural Gas (LNG) 100% LNG, no mix with diesel (04) 12.433 kWh NCV/kg	32%		€ 0.166	0.52	€ 0.010	0.910		✓	*Limited*	Can be stored on-site, suppliers are self regulated (under licence)
	BioLNG 100% LNG, no mix with diesel 12.433 kWh NCV/kg	32%	*TBC	*TBC	*TBC		0.261		✓	*Limited*	

SOURCE: FTA IRELAND

01 https://www.revenue.ie/en/companies-and-charities/excise-and-licences/excise-duty-rates/mineral-oil-tax.aspx
02 Electricity CO2e per kWh varies by year (provisional from SEAI for 2019. NB this value can go up as well as down)
03 NESTE RTFO value
04 CNG & LNG offer a pathway to hydrogen fuel cells - potentially the best option where payload matters (will be known by 2025).
*TBC: data awaiting clarification due to complexity

PROS AND CONS OF ALTERNATIVE FUELS

Hydrogenated Vegetable Oil (HVO)

HVO Pros:

Biofuels have played a significant role in reducing transport emissions and will remain a core transitional measure for the medium-term reduction of greenhouse gas emissions.

HVO reduces carbon emissions by up to 90.0%.

Hydrogenated Vegetable Oil (HVO) can be blended in significantly higher proportions with fossil diesel than the more commonly used biodiesel, FAME (fatty acid methyl esters).

Fuels and are fully compatible with existing refuelling infrastructure and road vehicles.

HVO Cons:

Demand for this fuel is high and supply is very limited.

As a consequence of high demand and limited supply, the cost of the fuel is therefore high.

Gas (CNG / LPG)

GAS Pros:

Compressed natural gas (CNG) vehicles have low pollutant emissions

Reductions of more than 20.0% CO_2 emissions can be achieved by switching from diesel to compressed natural gas (CNG). Reductions of up to 100.0% CO_2 emissions can be achieved from switching to renewable bioCNG. The use of bioCNG in any application is considered to be a fully carbon-neutral alternative to diesel.

Optimised gas-only vehicles can have higher energy efficiency.

CNG vehicles are competitive with conventional vehicles in price and performance.

Natural gas is cheaper than petrol and diesel. Switching from diesel to CNG or bioCNG can save fleet operators up to 30.0% in fuel costs.

Biomethane can be used with or as a substitute for natural gas in any application which uses natural gas including transport.

Biomethane can be imported or produced indigenously from the anaerobic digestion of organic material.

Government is committed to developing a new investment framework for the growth of sustainable forms gas and as a transport fuel in the transport sector.

CNG refuelling times are similar to diesel, making it convenient for commercial fleets and drivers accustomed to quick refuelling stops. CNG vehicles can refuel rapidly, reducing downtime and increasing productivity.

Good CNG refuelling network across Europe and growing network in Ireland.

Gas Cons:

Limited availability (8 Public fast-fill stations planned, 4 open and 4 to be completed and open by end 2024. Additional 4 Private fast-fill stations in operation with several private slow-fill stations in operation and development). Biomethane already available in quantity with more becoming available from 2025 onwards (multiple projects in development)

Establishing a network of CNG refuelling stations is essential for widespread adoption, requiring collaboration between Government, private sector stakeholders, and energy providers. Public intervention is necessary to avoid fragmented EU level markets and to enable EU-wide mobility for CNG vehicles.

Electricity

Electricity Pros:

Electric vehicles emit no pollutants. Electrification of the vehicle fleet offers a pathway to zero tailpipe emissions, with several co-benefits such as improved air quality, reduced noise pollution and less fossil fuel dependence.

Vehicles can be supplied by electricity from the grid, coming increasingly from low-CO_2 energy sources.

Flexible recharging of vehicle batteries, at times of little demand or ample supply, supports the integration of renewable energy into the power system.

Regenerative braking systems that help to conserve energy, reducing the overall energy consumption of the vehicle.

(Electricity Cons on page 24...)

Decarbonising the Road Freight Sector - Ireland

PROS AND CONS BY FUEL TYPE

FUEL TYPE	B7	B100	HVO 100	BIO CNG / LNG	ELECTRICITY	HYDROGEN
Capital costs	No capital cost	No capital cost	No capital cost,	Capital cost for vehicle	Capital cost for vehicle	Capital cost for vehicle
Fuel costs	Base	Premium over diesel	Premium over B100	Fuel Premium over CNG, CNG less expensive	Cheaper fuel	More expensive
Infrastructure	None	None	None	Very expensive Infrastructure	Very expensive Infrastructure	Very expensive Infrastructure
Carbon Tax	Yes (Diesel Duty)	Yes (Diesel Duty)	Yes (Diesel Duty)	No / Yes (Diesel Duty)	Yes (Diesel Duty)	Yes (Diesel Duty)
Vehicle Grant Duty	No	No	No	Yes	Yes	Yes
Tax Treatment				Yes	Yes	Yes
Tax Relief	No	No	No	No	Yes	No
Vehicle availability and compatability	All EN590 diesel vehicles	Most HGVs - no modification required. Restricted to commercial fleets	Warrantied by leading manufacturers Blend up to 50% to remain with EN 590	Dedicated CNG Vehicles Required	EV, PHEV, mainly limited to smaller vehicle market Better choice but expensive	Compressed H2, Fuel Cell Vehicle – very limited availability
Fuel availability	Available on demand	Available on demand, now in use in Ireland	Available on demand, now Introduced to the market	Limited by infrastructure 4 Fast Fills constructed, more coming. Potential for agri gas production	Available but limited charging network	Certified green available on demand. Large scale green hydrogen available from 2027
Refuelling infrastructure	National retail and wholesale Network	Depot Based - nationwide Can be stored locally	Depot Based - nationwide Can be stored locally Available in retail forecourts	Limited network availability. No LNG infrastructure for transport	Developing charging infrastructure - different capacity / voltage. Rapid Chargers required. Network capacity restrictive	Refuelling network non existent. 5 years minimum to develop minimal network
Cost	Baseline	Premium over diesel Little to no Capex No vehicles premium	Premium over biodiesel Little to no Capex No vehicles premium	Premium over diesel. Capex for refuelling HGV's infrastructure 10-25k additional per vehicle	Energy is cheaper than diesel when adjusted for efficiency Capex for charging Infrastructure and vehicles required. Cost of electric HGVs is currently higher than diesel equivalents.	Presently sold as an industrial gas Expensive. Large capex required for vehicles and infrastructure

SOURCE: FTA IRELAND

Electricity Cons:

High upfront costs of vehicle purchase.

Time it takes to recharge - impacts on working time and availability to work – this is a significant consideration as driving hours are regulated. Businesses cannot afford to have drivers idle whilst waiting for their vehicles to charge mid shift.

Lack of recharging points, is a major obstacle to market uptake.

The key issues are low-energy density and heavy weight of batteries. These, currently, limit the capacity and driving range of vehicles.

Full electrification will remain a challenge for heavy vehicles in the near term.

Electricity supplied to road and rail transport does not currently qualify for credit under the Biofuels Obligation Scheme. While electricity suppliers can apply for carbon savings for electricity supplied to road transport under Article 7a of the Fuel Quality Directive, there is a need to look at how electricity for transport can be integrated into the overall reporting system for renewables in transport.

Lack of available mechanisms (hedging) to counter fluctuations in fuel prices. where the energy demand is relatively small. Funding for infrastructure is considered insufficient, as the complexity of projects and the cost will far exceed what is currently available to deliver the projects within the stated timelines.

Hydrogen

Hydrogen Pros:

Hydrogen refuelling stations can be supplied by hydorgen tankers delivering hydrogen to storage tanks on site just as diesel is delivered to forecourts today..

Quick to refuel with the same range as Diesel trucks with no compromising on the payload

The focus of the Government of Ireland is on green hydrogen and with one of the most energy productive coasts in Europe, Ireland has a real opportunity.

For freight transport operators looking at the case for converting their fleets to hydrogen, there is funding and support available.

Hydrogen Cons:

The key limiting factor for the use of hydrogen in industrial applications and transport is currently the lack of government policy to create demand which in turn encourages investment. This is true for all zero emission vehicles.

There are many companies starting to develop hydrogen businesses, but there are only a handful of companies worldwide with a proven track record to deliver hydrogen safely and at a large scale.

The sector faces challenges sourcing the renewable energy needed now to produce green hydrogen. This can be resolved by importing renewable hydrogen or renewable ammonia to produce hydrogen locally. Ireland as an island nation, reliant on importing over 70% of energy needs, must ensure a strong and resilient hydrogen import supply chain.

The potential impact of supply chain risk and market uncertainty is amplified by the tight margins for final industrial products due to international competition.

Demand-side support policies will be needed. The Commission will consider assorted options for incentives at EU level.

TOTAL COST OF OWNERSHIP

A 2023 study by the ***International Council on Clean Transportation*** [01] - *see chart on page 25* - compares the total cost of ownership (TCO) for various European truck classes and technologies compared to diesel. The TCO encompasses the costs of truck acquisition, European-average fuel prices, maintenance, and European-average road tolls, taxes, and levies.

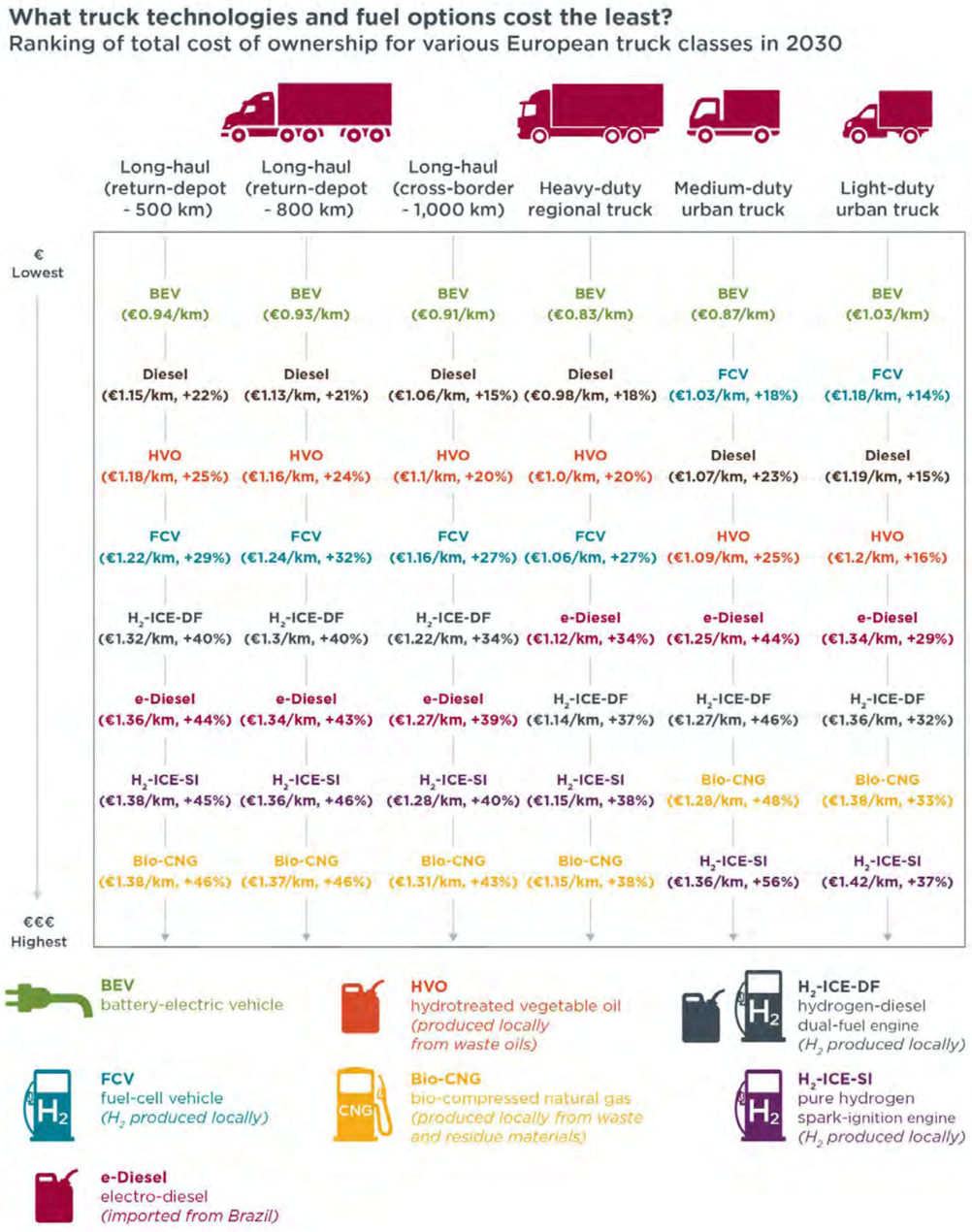
The analysis covers the most common truck types in the region, ranging from long-haul to urban delivery vehicles. It investigates seven truck decarbonisation pathways for combustion or and electric powertrain technologies with different fuel options.

01 https://theicct.org/publication/total-cost-ownership-trucks-europe-nov23/

Decarbonising the Road Freight Sector - Ireland

WHAT TRUCK TECHNOLOGIES AND FUEL OPTIONS COST THE LEAST?

Ranking of total cost of ownership for various *European* truck classes in 2030



COST OF VEHICLES

Truck prices will always vary considerably by vehicle specification, so the following prices are only intended to provide guide estimates. These average purchase prices are based upon data gratefully provided by truck manufacturers contributing the FTA Ireland's Manager's Guide to Distribution Costs 2023 report.

It is clear that current prices for electric trucks are significantly higher than their diesel counterparts and whilst they do not account for the total cost of ownership over a vehicles lifetime, they do present a perceived obstacle to investment.

Operationally, the FTA Ireland's Manager's Guide to Distribution Costs 2023 report identifies the cost savings that fleet operators are making from the use of alternative-fuelled vehicles.

For those using alternative energies, across all fuel types, the average cost saving was 4.2%, up from 2.9% last year and closer in line with the savings levels recorded in 2021.

ZEHDV Scheme

The *Zero-Emission Heavy Duty Vehicle Purchase Grant Scheme* (ZEHDV) was opened in February 2024. The Scheme awards grants to assist companies and enterprises who wish to buy zero-emission heavy duty vehicles (ZEHDV) which are supported by the Scheme instead of buying the diesel equivalent.

The Zero-Emission Heavy Duty Vehicle (ZEHDV) Purchase Grant Scheme is funded by the Department of Transport and administered by Transport Infrastructure Ireland.

Grant amounts are calculated as a percentage of the difference in price between an ZEHDV and its diesel equivalent.

Grant levels awarded to applicants depend on:

- The power-train or fuel-type of the vehicle that the applicant intends to buy;
- The size of the enterprise or company applying for the grant; and
- Whether applicants have already received grants under the Scheme.

More information can be found at:

https://www.tii.ie/roads-tolling/tolling-information/zero-emission-heavy-duty/

Industry ambition must be matched by the State's support and investment in infrastructure. The Zero-Emission Heavy Duty Vehicle (ZEHDV) Purchase Grant Scheme should be continually reviewed to ensure that it is 'fit for purpose' and considered an incentive to purchase zero emission vehicles. There are other changes necessary to support transitional change, including scrappage schemes for the aging truck and trailer fleet, delivery of key haualge strategy projects such as ECO driver training and Longer Trailer Trail as well as more ambitious investment in Light Commercial Vehicles (LCVs) including an overhaul of the vehicle registration tax (VRT).

Zero Emission Vehicles Ireland (ZEVI) has been established as a dedicated Government Office charged with supporting consumers, the public sector and businesses to continue to make the switch to zero emission vehicles.

Currently electric LCVs are inviting higher tax burdens due to the weight of the battery and incurring significantly higher VRT charges than the diesel equivalent due to the pricing differential of the vehicles, which acts as a deterrent to invest in environmentally friendly low emission vehicles. A consequence of the sector's exposure to the rising fuel cost trajectory envisioned under carbon tax increases that will reduce the 'competitive advantage' held by fossil-fuelled vehicles over sustainable alternatives. It is essential that fuel taxation is modernised to protect fleet operators competitiveness and business viability as the transition to alternative fuels diminishes the demand for diesel fuels over the coming years. The Department of Transport notes that taxation and infrastructure charging are important to maintain and develop the trans-European road network. Time-based charging (including the Eurovignette) should, according to EU rules, be phased out, with a new system of varying charges introduced to encourage the deployment of heavy duty vehicles with lower CO_2 emissions.

Road charging may be used to tackle congestion and the negative environmental and health impacts of air pollution and noise. Charges may also reflect the cost of infrastructure, external costs and congestion. Research into the role and placement of logistics hubs and consolidation centres will inform the potential for greater integration with low-carbon alternatives for 'last-mile' delivery and support the realisation of enhanced logistic efficiencies.

Cost of Fuel

FTA Ireland proposes a cost mapping exercise should be undertaken and published that takes account of the investment required to bring Ireland's charging infrastructure network up to required levels and then details of what companies should expect to pay per kw/h to recharge their vehicles at public charge sites.

For FTA Ireland members, engaged in the TruckSafe Standard, they are already documenting their fuel management and journey to net-zero. So, the message is clear to those looking to procure goods and services from audited organisations that meet Environmental, Social and Governance practices, use the services of certified FTA Ireland TruckSafe Standard members

Organisations that operate van fleets are trying to get buy-in to transition to alternative fuels such as electric by installing charging points in employees' homes. The installation of the charging point in homes is having unintended consequences of Benefit in Kind tax implications for the employees. If this is not reviewed the current momentum being built (particularly for local authorities but not exclusively for them) will be compromised

FTA Ireland believes Government can take a more proactive role to support fleet operators:

- Biogas incentives should be considered to ensure the price of Green Gas is competitive against Diesel.

- Provide a Tax Rebate (credit) for all commercial fleets that have evidence-based fuel management programmes in place i.e., they are able to demonstrate reduction in fuel burn. Programmes such as the annual audit TruckSafe at Silver & (Green) level record Kilometres driven and Litres of fuel used per vehicles feed the information into a programme audited by the SEAI.

- The Diesel Rebate Scheme (DRS) has not been fully exploited by Government to date; FTAI urge the Government to use it as a means of incentivising purchases of Euro VI vehicles at a minimum. EURO VI vehicles consume less fuel, a significant cost to operators, and emit less CO_2 per Km, furthermore they emit minute amounts of NOx due to their effective control equipment.

- The DRS should be expanded to include all commercial vehicle operators (currently it is only open to the haulage and PSV sectors) – it should be expanded to include the Own Account Sector.

- All fuels should be included in the DRS e.g., CNG is not. Only post the invasion of Ukraine gas prices spiralled, the price of CNG is significantly lower than diesel per kWh and BioCNG, due to the tax benefits (MOT) it is also competitive compared with diesel.

The Department of Transport's "Ireland's Road Haulage Strategy 2022–2031" report acknowledges that it will take time for Battery Electric Vehicles to become widely available and affordable across Europe. Irelands' peripheral status, as well as the requirement for right hand drive vehicles, could lead to a slower uptake in Ireland.

In terms of hydrogen the costs of renewable hydrogen production are primarily driven by two key factors, the cost of renewable electricity and the capital costs of electrolysers. For hydrogen to become a fuel, production needs to be built at scale and take place where renewable energy costs are signficantly low. NEOM Green Hydrogen Company's $8bn investment that will produce 600 tons of hydrogen per day for Northwest Europe is a real life example for this. Other major producers are looking to follow simliar production pathways. With renewables costs also continuing to fall, renewable hydrogen costs are expected to fall dramatically over the coming decades.

Procurement

The *FTAI Manager's Guide to Distribution Costs 2023* report highlights uncertainty amongst fleet operators considering their timescales for investment in alternatively fuelled vehicles. The report highlights that just under one-half (44.7%) of commercial vehicle operators in Ireland pass responsibility for the acquisition of vehicles to a leasing company, whilst almost one-third (32.8%, up from 25.0% last year) issue RFQs, or tenders, based on price. Almost one-quarter of operators are issuing RFQs, or tenders, based on the anticipated life cycle costs of their vehicles. This is most certainly an area that requires further attention by fleet operators as they investigate alternative solutions in the years to come. Green procurement should focus on fuel management plans and evidence of those plans, age of the fleet and the documented Environmental. Societal & Governance (ESG) plans of organisations. Clear guidance and information on (Transport Service) green procurement requirements should be published by government to help all understand, plan and evaluate the requirements.

Green Public Procurement (GPP) is "a process whereby public authorities seek to procure goods, services and works with a reduced environmental impact throughout their life cycle when compared to goods, services and works with the same primary function that would otherwise be procured." While GPP is a voluntary instrument Members States are able to determine the extent to which policies or criteria are applied, it plays a key role in the EU's efforts to boosting a resource-efficient economy. The basic concept of GPP relies on having clear, verifiable, justifiable, and ambitious environmental criteria for products and services, based on a life-cycle approach and scientific evidence base *For more information see: https://green-business.ec.europa.eu/green-public-procurement_en.*

The Clean Vehicles Directive, highlighted in the Current Legislation Chapter of this report, promotes clean mobility solutions in public procurement tenders and sets national targets for their public procurement.

Decarbonising the Road Freight Sector - Ireland

DEPENDENCIES

Supply / Sourcing

Given the additional impetus to decarbonising, interim non-technological solutions and complementary measures will need to be implemented in the short to medium-term to meet the required emissions abatement targets. Biofuel blending, where renewable fuels are mixed into liquid fossil fuels, will play a large role as a transitional measure as will ensuring mandatory Biofuel blending in CNG where all CNG must include a mimimun percentage of BioCNG in the mix.

Improving logistical efficiency through reducing congestion and overall demand, and via more sustainable practices, such as eco-driving, mode shift and better integrated delivery services will all be key to reducing emissions and fuel costs. The increase in biofuels is currently one of the main pillars of land transport decarbonisation under the Climate Action Plan. Since 2010, increasing volumes of biofuels have been introduced to the Irish conventional fuel mix through a blending obligation on fuel suppliers. The obligation ensures that a certain percentage of the motor fuel placed on the market comes from renewable sources, for example bioethanol and biodiesel. In 2021, approximately 246.0 million litres of biofuel, was placed on the market.

Biofuels will remain a core transitional measure for medium-term reduction of greenhouse gas emissions in road transport. This is particularly so for hard to abate sectors such as heavy duty vehicles, where alternative transport energy and technology are at early and varying stages of development. At present, the main means of producing sustainable liquid biofuels is through the use of tallow and used cooking oil, which is the main feed stock for Hydrogenated Vegetable Oil (HVO).

While HVO and other sustainable biofuels are used in the ongoing decarbonisation of the road transport fleet, they are also in demand across other transport sub-sectors, for example in the manufacture of Sustainable Aviation Fuels (SAFs) and in other sectors, for example in industry and home heating. As a drop-in biofuel that can be used to replace conventional diesel in fossil-fuel combustion processes, HVO in particular is in high demand as a globally traded commodity on the open energy market. One of the key challenges for increasing the supply of biofuels, including HVO, is ensuring sustainability and availability. Studies project an estimated consumption of biodiesel, including HVO, of between 570-730m litres under a 20.0% biodiesel (B20) by 2030 blending scenario.

There is potential for indigenous production to scale up to between 435m and 735m litres of biodiesel/HVO in 2030 **(01),** but with low recoverable feedstock supplies (there is the potential for 70 million litres of biodiesel from indigenous feedstock) reliance on imported feedstocks (used cooking oil and tallow) will continue to be high. Therefore, while it is currently possible for a transport operator to rely upon 100 percent HVO, there are affordability and availability issues including competition from other sectors for the same renewable fuels, as well as fluctuations in global feedstock prices and demand.Supply of used cooking oil is limited and additional demand for it will impact on its cost and may heighten the risk of fuel fraud in global supply chains. To combat this the EU is introducing more rigorous verification requirements including an EU database for all biofuel supply. In this regard, the Department of Transport is engaged with the European Commission on an ongoing basis, including through the working group on sustainability, set up under the Renewable Energy Directive.

By 2030 it is envisaged that the movement in Ireland to electrically-fuelled cars and commuter rail will be well underway, with natural gas and biofuels developing as major alternatives in the freight and bus sectors. In the coming years, as hydrogen use in Europe increases, an emerging market in Ireland is also expected to emerge.

The National Biomethane Strategy, launched at the end of May 2024, sets out the necessary policy and regulatory measures, and provides a roadmap, to developing a biomethane industry of scale in Ireland. The Strategy sets out twenty-five actions to be delivered in the coming years to enable the development of the sector. Ireland is recognised as having one of the largest potentials for biomethane production in Europe per capita, due to Ireland's substantial agricultural sector. Government is committed to supporting delivery of up to 5.7TWh of indigenously produced biomethane by 2030. This will have benefits for the production and supply of biomethane available for road transport. To maximise these benefits, the Department incentivises the supply of biomethane through multiplier renewable transport fuel certificates that can be awarded for supply into the transport sector, subject to legislation.

It is worth noting that as the transition to alternative fuels accelerates, initiated through grants and subsidies, traditional fossil fuels will become more expensive, creating business viability problems for those that have no option but to use traditional fuels. It is imperative that consideration and support are provided on an ongoing basis that does not compromise Ireland's supply chain competitiveness.

According to Ireland's National Hydrogen Strategy, the country will prioritise the scale up and production of renewable hydrogen. Prior to 2030, hydrogen will be produced from grid connected electrolysis from surplus renewables.

01 Ireland's Road Haulage Strategy 2022–2031, published by the Department of Transport

The EV Infrastructure Strategy 2022-2025 allocates €100.0 million in the period to 2025 to support investment in EV charging infrastructure.

This will initially be needed to meet EU targets in specific end-use sectors including industry, transport and power. A 2.0 GW target of offshore wind, for the production of renewable hydrogen, to be in development by 2030, will help to provide greater certainty for investors and create the volumes needed to scale up the sector.

Indicative projections estimate that Ireland's domestic hydrogen energy demand needs could equate to between 4.6 and 39 TWh by 2050. When including non-domestic energy needs such as International Aviation and Shipping, these values could rise to between 19.8 to 74.6 TWh. This wide range demonstrates the significant uncertainties which exist due to the nascent nature of the market.

Infrastructure

In 2017 the Department of Transport published the "National Policy Framework Alternative Fuels Infrastructure for Transport In Ireland 2017 To 2030"

This National Policy Framework on Alternative Fuels Infrastructure for Transport represents the first step in communicating a longer term national vision for decarbonising transport by 2050, the cornerstone of which is the ambition that by 2030 all new cars and vans sold in Ireland will be zero-emissions capable.

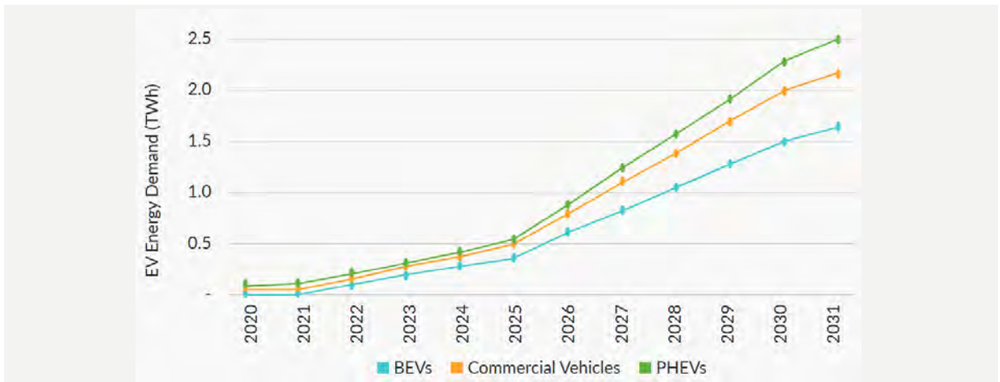
As range anxiety is reduced, the time for charging vehicles becomes more of a focus point. Rapid charging requires strong grid connections. Co-Operative charging infrastructure projects should be supported. To do this, clear guidance on the CRU requirements is needed, planning conditions, access to the energy from the ESB and many other issues have to be taken into account.

The Government and other State stakeholders including local authorities must develop stronger collaborative engagement with industry that supports a road map to transition to alternative fuelled vehicles. Setting ambitious targets for decarbonisation must take account of the unique challenges posed by the cost of infrastructure investment to support a nationwide alternative fuelled fleet. Other significant challenges include the cost of alternatively fuelled vehicles and the increased cost of the energy to supply those vehicles, which is at this moment in time unaffordable for most organisations.

The infrastructure for deployment of these alternative fuel technologies in Ireland is in early development. Placing a renewable fuel obligation on suppliers of these fuels may act as a barrier to further development at this juncture notwithstanding the importance of incentivising renewable fuels such as bioCNG, bioLNG, bioLPG and green hydrogen. Looking specifically at electric vehicles, ZEVI published its Electric Vehicle Charging Infrastructure Strategy 2022-2025. It notes that, in addition to catering for Irish vehicles, charging infrastructure must also cater for the international haulage business which will be dependent on public charging infrastructure in Ireland.

It is hoped that a skeleton infrastructure will be installed by 2025, with this to be rapidly increased by 2030 and 2035. It is estimated that by end of 2025, at least eight charging pools, dedicated to infrastructure for heavy duty vehicles (including buses), will be installed across the TEN-T Network (motorway network). Each motorway charging pool will consist of an aggregate charging capacity of 1400 kW with at least one 350 kW charger.In addition to this, by 2025, a dedicated heavy duty vehicle charging pool of at least 600 kW will be present at each of Dublin, Cork, and Shannon airports. In order to enable the delivery of this infrastructure.

EV Energy Demand - Median Scenario (01)



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Decarbonising the Road Freight Sector - Ireland

Zero Emission Vehicles Ireland (ZEVI) will work with private sector providers, as well as Transport Infrastructure Ireland (TII), ESBN, and local authorities to develop a National EV Charging Network Plan (En-Route Charging) for HGVs. The key risks and dependencies are particularly pertinent in relation to this category of charge point infrastructure.

The National EV Charging Network Plan (En-Route Charging) for HGVs will consider what mitigation measures can be put in place as well as considering how the supply of enabling services can be delivered. As well as this, ZEVI will engage with haulage industry stakeholders, DAA, and Cork and Shannon airports to deliver this goal.

As electric vehicle uptake increases, EV charging is expected to have a significant impact on the local (low and medium voltage) electricity grid. EirGrid's All-Island Generation Capacity Statement 2022-2031 provides an EV energy-demand forecast up to 2031. It accounts for the number of vehicles, vehicle efficiency, and average distance per vehicle. Electricity demand due to EV charging is expected to grow considerably in the next decade, particularly between 2025 and 2031. According to the EIRgrid capacity supply report there is a challenging outlook for Ireland with capacity deficits identified during the 10 years to 2031. Deficits in electric supply will increase due to the deteriorating availability of power plants, resulting in their unavailability ahead of intended retirement dates.

ZEVI: Electric Vehicle Charging Infrastructure Strategy 2022-2025

Delivery of the EV Charging Infrastructure Strategy (particularly the AFIR infrastructure targets) will be highly challenging and require transformation of existing systems and processes.

It is recognised that there are associated risks that will need to be managed and mitigated by ZEVI and key stakeholders to enable the delivery of the strategy.

ZEVI EV Charging Infrastructure LDV En-Route Grant Scheme

ZEVI launched the EV Charging Infrastructure LDV En-Route Grant Scheme. Led by Transport Infrastructure Ireland (TII) and funded by Zero Emission Vehicles Ireland (ZEVI), this scheme aims to accelerate the delivery of Electric Vehicle (EV) charging infrastructure across Ireland's national road network.

In line with EU regulations, this initial scheme mainly targets the motorway network, driving the installation of high- power charging pools with 1200kW power output, with at least four 150kW recharging points in each recharging pool. Future schemes will continue to target other parts of the road network, further supporting Ireland's climate targets and the country's EV growth trajectory.

Skills and Training

At the end of 2021, the Department of Enterprise, Trade and Employment released a report entitled "Skills for Zero Carbon"

From a skills perspective, the report details how the transition to a zero-carbon economy will lead to changes in sectors and occupations, the phasing out of existing roles, but also demands for new skills and competencies, as well as employment opportunities, in the new Zero Carbon economy. Consistent demand will be created across engineering, environmental, science and humanities and legal/professional roles, as well as in construction, retrofit, transport and logistics and electric vehicle maintenance. The study highlights that the existing motor mechanic workforce will meanwhile need to be transitioned to work on electric vehicles as EV uptake increases. Specifically around electric vehicles, the report recommends:

- Engage the existing pool of motor mechanics and encourage and support their upskilling to work on Electric Vehicles, in particular through digital skills training, to improve the attractiveness of the sector overall, retain the existing labour force and attract new entrants.
- Progress the incorporation of Electric Vehicle material into relevant Apprenticeship Syllabuses to secure longer term Electric Vehicle maintenance skills supply.
- Provide and promote mandatory Electric Vehicle Safety Training to the existing mechanic labour force.
- Explore the introduction of recognised certifications as a requirement to work on Electric Vehicles and to foster consumer demand.

Chapter 2

The view from the road

Against a backdrop of uncertainty about the pathway to a decarbonised road transport sector in Ireland, we sought the views of two key stakeholders, truck manufacturers and vehicle operators.

KEY MESSAGES - TRUCK MANUFACTURERS

- *"The biggest hurdle off all (to decarbonisation), is the* ***infrastructure****. We feel that if Ireland had a capable and fully functioning alternative fuel grid (Gas/Biofuel/Electric), we would have a far higher share of alternatively fuelled vehicles."*
- *"There appears to be* ***no joined up thinking*** *at a government level as to what Ireland's future will look like (across all areas). No current or previous Governments are willing to make long term decisions."*
- *"For hauliers, the* ***cost of new technologies*** *and the lack of infrastructure are core. The desire of hauliers and cost are very closely related. Larger fleets aside, many hauliers have* ***no real desire*** *to upgrade to greener technologies."*
- *"If we are to* ***accelerate change****, we also need to spread the word to wider audiences, to ensure people are aware of and understand the issues for decarbonising freight transport, to help shape public opinion that will drive government policy."*
- *"Cost can be looked at, in two ways: Overall, alternatively fuelled vehicles may have an initial higher purchase price but when we look at the* ***total life cost of the vehicle****, it tends to be much lower in comparison to fossil fuel powered vehicles."*
- *"We anticipate many of these vehicles will be contract hire vehicles which* ***negates the risk*** *for the end user in the residual value position. We suspect that this fear will dissipate over time and that an end user purchase model will be the norm."*
- *"Electric, hydrogen and gas* ***share a lot of the same issues*** *on range capabilities and fuel sources/infrastructure that is lagging behind dramatically. Vehicles are expected to develop dramatically, which will* ***accelerate the obsolescence*** *of existing vehicles."*
- *"Advice to hauliers? Set* ***small goals*** *and leave yourself the ability to scale up. Don't just look at initial purchase price, look at* ***total cost*** *of ownership."*

KEY MESSAGES - FLEET OPERATORS

- *"The principal obstacles to decarbonising fleet operations include the* ***high upfront cost****, a lack of comprehensive charging or refuelling* ***infrastructure*** *and current* ***range limitations****, which can impact operational efficiency."*
- *"We have gas powered vehicles, but there is* ***no incentive*** *to build our own fuel station."*
- *"It's crucial to* ***foster a collaborative ecosystem*** *involving Government bodies, industry players, and technology providers to accelerate the transition."*
- *"We need clear,* ***actionable policies*** *from the Government that include financial incentives for early adopters of green technology, investments in charging and refuelling infrastructure, and guidance on sustainable fuel options. Transparent timelines for regulatory changes and standards would also aid in planning long-term investments."*
- *"It would be great to see truck manufacturers get involved,* ***offering charging solutions alongside their trucks****, charging out at minor cost-plus rates."*
- *"Fleet operators* ***require detailed information*** *from truck manufacturers on the lifecycle emissions of vehicles, encompassing both manufacturing and operational emissions. Insights into the expected development timeline for new technologies, vehicle performance data under various operational conditions, and the total cost of ownership."*
- *"Small hauliers* ***cannot afford to take chances*** *on decarbonisation. Some may be holding onto older trucks waiting on a steer from Government or manufacturers to pick their next truck. Start small, fix the easy stuff first."*
- *"Consider investing in newer, more fuel-efficient vehicles, or retrofitting existing vehicles where feasible.* ***Stay informed about Government incentives*** *and trial small-scale transitions."*
- *"****Start talking****. Talk to the truck manufacturers and talk to your customers. Be open-minded and concentrate on your total cost of ownership over a seven-year period. What do your customers want? Will they go on the journey with you? Try to work in partnership with them. Can you tie your customer contracts in, to mitigate risks?"*

OVERVIEW

The very characteristics that make supply chains such a vital 'cog' in the economy, the demands on performance, productivity and cost effectiveness, also make it such a complex environment to simply consider as 'one' sector.

That said, across all fleet operators, a 'core' set of questions are at the heart of their concerns, these are as follows:

For daily operations:

- How quickly can I fuel up my vehicle?
- How can I schedule for this 'downtime'?
- Where can I fuel up?
- How much will it cost me to fuel up?

For the longer term:

- Which fuel type is appropriate for my operations?
- What will it cost to be environmentally friendly?
- How do I scale up my alternatively fuelled fleet? Will trucks be available when I need to buy them?
- Winning new business requires 5-year foresight to match the contract demands from customers. What products and solutions will truck manufacturers be offering then?
- What training and skills do I need to ensure my employees have?

The operator that transports timber for the construction sector, for example, has very different fleet demands to the haulier delivering food to our supermarkets, or the couriers meeting next day, or increasingly same-day delivery demands for online purchases. The multinational supply chain operator has very different scale and resources at their disposal to the vast majority of fleet operators running small fleets.

THE TRUCK MANUFACTURER'S VIEW

We put the following questions to leading Truck manufacturers in Ireland, affording them anonymity in their responses.

What do truck manufacturers see as the major obstacles / hurdles – irrespective of fuel types – to decarbonising truck fleet operations in Ireland?

RESPONDENT 1

"There are many obstacles to decarbonising truck fleet operations in Ireland. The main ones being:

- infrastructure
- cost
- the desire of hauliers to embrace change
- Government policies

The biggest hurdle of all, is the infrastructure. We feel that if Ireland had a capable and fully functioning alternative fuel grid (Gas/Biofuel/Electric), we would have a far higher share of alternatively fuelled vehicles.

The percentage split between alternatively fuelled vehicles is 97.0% ICE to 3.0% alternatively fuelled vehicles (2023 full year).

The infrastructure appears to be struggling with the current demands being placed on it. A quick chat to any electric car owner will tell you all about the challenges faced with operating a BEV vehicle in Ireland.

To operate an electric HGV, whilst using the National grid only, would be almost impossible.

The charging demands of a HGV BEV are far greater than that of an electric car. Obviously there are numerous factors to take into consideration with these figures (topography, distance, speed etc.) but it shows the demands that will be placed on our national grid if we had 100 Bev's operating in Ireland.

There are similar issues faced with gas infrastructure. Whilst there are more gas-powered vehicles operating in Ireland, in comparison to BEV'S, the grid still faces numerous challenges."

RESPONDENT 2

"Yes, I agree. infrastructure for electric trucks is a huge obstacle. Currently companies using electric trucks have to be self-sufficient with their own charging point installed on site, therefore only certain operations and distances are possible.

In most cases companies can only manage 40kw charging output. To increase to 200kw would take a lot of investment and access to the required electrical power connection is not a guarantee, via the ESB Network.

As of Q1 2024, there is not one Truck Fast Charger positioned in our road network throughout this country and that's without mentioning how poor the infrastructure is for electric car charging.

Also, the mind set needs to change. We see that the general perception and feedback is usually negative when talking about electric vehicles, so this has to be converted to positivity."

RESPONDENT 3

"Infrastructure remains the biggest challenge, and while first adopters are back to base operations with onsite charging facilities, the technical solutions to bring power to customers' depots may be expensive. For commercial vehicles, when it comes to on road charging, the infrastructure does not exist in Ireland today.

The EU's Alternative Fuel Instructure Regulation sets ambitious targets for trucks by ensuring that there will be enough public charging for heavy duty vehicles on the road network by 2030, however target infrastructure is still in draft in the National EV Charging Infrastructure Strategy, with challenges including site location, electricity grid connections, power capacity and cost – it's a complex, lengthy process. Good progress is being made, but more clarity is still needed on where and by when the infrastructure will be ready.

There are a number of early adopter companies looking to open dedicated HGV EV charging stations in key locations near motorways, one of these being Macquarie. However, these companies are experiencing difficulties with power availability in key locations.

Affordability of trucks is a further obstacle, and we welcome the Zero Emission Heavy Duty Vehicle Purchase Grant Scheme. By focusing on mitigating the upfront cost differential between ZEVs and their diesel equivalent, its potential impact in making zero emission vehicles more accessible and economically viable is significant.

We anticipate many of these vehicles will be contract hire vehicles which negates the risk for the end user in the residual value position. We suspect that this fear will dissipate over time and that an end user purchase model will be the norm. It is imperative then that the grants are available to the contract hire companies so they can pass on the saving to the end users, and this should be formulated in Government policy. Alternatively, the grant should be available to the end user for a long-term contract hire.

Additionally, we need to push decarbonisation further up the priority list for more customers. With all the pressures on operators, including driver shortages, interest rates, inflation, many will be considering whether the switch to ZEVs is the right move for their business right now. Together, we need to help them see decarbonising their fleet as an opportunity, not a challenge.

Obviously, an additional carbon tax on fossil fuels will mean an increase in the cost of diesel and one would hope that the availability of green electricity from solar and wind energy projects should mean cheaper electricity. This will serve to accelerate the differential in running costs between diesel and electrical, where long term the "fuel" for an electric vehicle will be substantially cheaper than its diesel counterparts. Any incentives/taxes the government can apply to accelerate this economic advantage will also accelerate the number of electric vehicles on our roads. This could be achieved also using the road tax model by increasing the motor tax on diesel vehicles. The real momentum will only be achieved if the operating costs of the electric vehicle is equal to or less than that of its diesel counterpart.

Finally, the big issue in the short term is "Are customers willing to pay more to have their goods delivered in environmentally friendly vehicles?" and I would say the answer is widely no and until we reach that parity this will mean that sales will be restricted to companies who wish to make an impact by doing the right thing, or buying one or two vehicles for the purposes of greenwashing."

What is it that truck manufacturers need to know – from Government – to drive forwards your own strategies in the next 5 years?

RESPONDENT 1

"The number of fuelling locations and lack of "clean" gas is way below par, and can barely support the existing gas trucks. Operationally, we have had many negative comments about trying to use the public gas infrastructure, and driver down-time is in excess of that for diesel trucks.

We are told that gas infrastructure in Continental Europe and the UK is much ahead of Ireland's infrastructure.

We feel this is fully down to Ireland's Government polices and the authority responsible for creating and maintaining Ireland's national gas grid.

There appears to be no joined up thinking at a government level as to what Ireland's future will look like (across all areas). No current or previous Governments are willing to make long term decisions on items such as upgrading Ireland's national grid or increasing grants for alternatively fuelled vehicles.

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Many comment that the emergence of far right (Non-Green) Governments across Europe is going to be a factor in future decarbonisation policies. The upcoming EU elections could have a major impact on the speed of transition, particularly taking the voice of powerful farming groups and others into account."

RESPONDENT 2

"Government funding has to be put in place to fix the infrastructure issues. The Government Grant System, especially for HGVs, needs to remain in place and a long-term strategy has to be put in place and rubber stamped.

Grants have been reduced for 2024 and the one application we made in 2023 was, to be honest, far from seamless."

RESPONDENT 3

"We need information about the roll out of public charging infrastructure for HGVs. Being realistic, we would need 15 -20 HGV EV Charging Stations mid-way between all our major cities/towns and in all our major cities.

When that infrastructure is there, it will then be possible to charge large kilowatt output vehicles in transit such as Tractor Units.

We need information on carbon tax; what impact will this have on diesel prices over the next 5 years? Are the Government going to use road tax as a measure between polluting and non-polluting vehicles?"

Some stakeholders perceive that it is the truck manufacturers that are driving / will drive the adoption and preference for trucks of particular fuel types. Is that correct?

RESPONDENT 1

"The desire of hauliers and cost are very closely related. Larger fleets aside, many hauliers have no real desire to upgrade to greener technologies.

We already see the unpopularity of relatively simple "green systems", such as Ad blue technology and DPF filters. There is great resistance to maintaining these as vehicles get older, and there is a burgeoning industry involved in switching these off as soon as vehicles exit warranty.

For hauliers, the cost of new technologies and the lack of infrastructure are core. In most cases it is our "customer's customer" who are pressurising our customers to change, but of course, they may have to accept a higher cost to have this change implemented."

RESPONDENT 3

"It's a big cultural shift for many operators, pushing them out of their comfort zone, learning to speak the new language of electric mobility, for example measuring consumption in terms of kWh per 100km rather than miles per gallon, and we're all becoming more fluent as time goes on.

If we are to accelerate change, we also need to spread the word to wider audiences, to ensure people are aware of and understand the issues for decarbonising freight transport, to help shape public opinion that will drive government policy.

Consumers are becoming more sustainably minded, making more sustainable choices, and demanding more sustainable solutions from businesses, including transport. We need to get them – and keep them – on our side.

The transition to alternative fuels and electric vehicles in HGVs will have to be a combination of push and pull.

Push from the vehicle manufacturers; push from the customers wishing to have their products delivered more sustainably;

Push in terms of reduced EV pricing over time from manufacturers;

Push in terms of widening the number of modes of transport covered by alternative fuels such as hydrogen, bio-gas and EV.

And pull from the Government in terms of taxation measures, grants, in terms of charging infrastructure, and grants for charging infrastructure, road tax incentives, rebates for electricity use consumed in commercial vehicles, road toll incentives, and awareness campaigns of the need for both consumers and transport operators to play their part in the decarbonisation of goods vehicle transport.

A combination of all these things working in tandem will see the migration of the market in a timely manner."

What are the constraints in getting alternatively fuelled vehicles into the Irish market? (is it fuel availability, truck manufacturers strategies, scale economies, infrastructure concerns....)

RESPONDENT 1

"Introducing alternatively fuelled trucks into Irish Market faces several challenges such as

- Cost considerations: The initial purchase of alternatively fuelled vehicles can be substantially higher than ICE equivalents. The availability of grants and incentives to offset the cost of initial purchase may also be a factor
- Infrastructure concerns: Inadequate charging facilities or gas refuelling stations. And even when they are in place, the constraints and delays of refuelling at them
- Regulatory environment: Laws and regulations regarding emissions standards, vehicle taxes and incentives will all play a factor in the emergence of alternatively fuelled vehicles within Ireland
- Maturity technology: Products and software are constantly updating but on a whole we are at the very early stages of mass production of alternatively fuelled vehicles. Hauliers will either embrace the new technology or treat it with a hands-off approach. There is definitely a fear of the unknown when it comes to this new technology, and this affects both the buyers and the sellers. We already see on the BEV car market that dealers are unable to sell used BEV's, and in the truck market, we tend to have long-term relationships with our customers, so we will advise them of the residual value uncertainties and dangers at the outset."

RESPONDENT 2

"HVO fuel is an easy win for reducing emissions with a CO2 90.0% plus reduction, however the cost is higher than standard diesel.

When diesel prices increased to an all-time high in 2023, the HVO Price was close enough on comparision and we had one operator that switched over completely to HVO. They had to switch back when diesel prices came back down.

There is also a school of thought that if HVO was affordable and everyone started using it there may be implications with food supplies."

RESPONDENT 3

"There needs to be recognition for Bio CNG as a clean fuel. Ireland has large agricultural outputs from bio-digesters which in turn are generating large volumes of bio CNG which can power commercial transport in Ireland and this needs to be treated largely the same as electric vehicles from an incentive point of view. Likewise, provision will have to be made in future legislation for Green Hydrogen powered vehicles.

The factors that influence the market are parity of pricing with diesel, adequate charging infrastructure and overcoming range anxiety. Electric Vehicles will work perfectly well now, provided they can be charged at a single point of charging each evening. To bring this forward we need to progress to in transit charging as outlined above."

What factors influence the development of the market for alternatively fuelled trucks in Ireland? Do you consider the Ireland / UK market to be a single 'market' for alternatively fuelled trucks? Is Ireland dependent upon developing demand in the UK? Would cutting edge developments be affordable in the Irish market even if other countries lag behind? Should Irish fleet operators look to developments in the UK rather than Europe?

RESPONDENT 1

"In terms of the relationship between the Irish and UK markets, since Brexit the only thing that has really stayed the same is their geographical position, the whole relationship has changed considerably.

The UK are their own distinct market with their own unique identity. There is definite crossover in some areas and there are many companies that operate both within Ireland and the UK. But from our perspective we are completely different markets with separate policies and identity.

That's not to say that decisions made in one market can't influence or sway policy makers in another. Historically Ireland did follow the UK (derogations, frameworks etc.) but we tend to have gone away from this and are following a much more European approach.

In terms of hauliers, they would be aware of what their UK counterparts are investing in and working towards and we would encourage hauliers to look at developments in all markets to help them make the best decision for their operation."

RESPONDENT 3

"Ireland and the UK shouldn't be considered as a single market for alternatively fuelled trucks largely because UK is now outside of the EU and not subject to regulation and legislation from Europe, which Ireland is.

The largest RHD market will always be the UK. Therefore, the demand in the UK will always influence demand in the likes of Ireland, Northern Ireland and Malta being the other RHD markets in this continent.

Irish fleet operators who operate internationally are now increasingly operating LHD vehicles, and operating directly from Irish Ferry Ports that serve Europe directly, therefore developments in Europe are more applicable to them than those of the UK. The developments in hydrogen powered vehicles will be more interesting for this market given the distances travelled. Vehicles that are operating domestically in Ireland and in the UK will be interested in developments in the UK."

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Affordability (costs) and availability (lead times for delivery) of alternatively fuelled vehicles.... These are the two key concerns that stakeholders want truck manufacturers to address and provide further insight on. How do you see these two issues developing and evolving over the next five years ?

RESPONDENT 1

"In our case there are no real major differences in terms of lead times between the different vehicle technologies. That being said, the fear is understandable amongst hauliers given that we have only recently come out of the semi-conductor crisis.

I think a wider point would be the lead time of technical training, tools, parts and software. The actual purchase of the vehicle could be regarded as the easiest part of the equation. The maintenance of vehicle uptime is a much bigger challenge.

Cost can be looked at, in two ways: Initial purchase cost or whole life cost. Overall, alternatively fuelled vehicles may have an initial higher purchase price but when we look at the total life cost of the vehicle, it tends to be much lower in comparison to fossil fuel powered vehicles.

The two biggest factors in this would be cost of fuel and maintenance, with the big unknown being the useful life of the vehicle (especially BEV), the bespoke nature of the specifications (even CNG), and a most uncertain RV (Residual value)."

RESPONDENT 2

"Again, I would agree. Lead times for mainstream Electric Trucks are currently not an issue. Tractor units and distribution trucks can be supplied with the same delivery times as conventional diesel trucks.

In terms of cost, electric truck chassis prices have reduced in the last year, driven in some respects by the pressure on the manufacturers to reach EU targets.

Also, I would say that prices started high because manufacturers are, in some ways, dealing with an unknown entity – that is how well will the vehicles perform in the real world? What is the warranty cost going to be? What is the service cost going to be? What is the residual value going to be? etc."

RESPONDENT 3

"Lead times for alternatively fuelled vehicles currently are not an issue (circa 3-4 months) and are similar to diesel powered vehicles, so we don't see this as a concern. Regarding affordability, as volumes grow in Europe of HGV EVs and more manufacturers are engaged in this space this will put pressure down on pricing, lead to economies of scale and ultimately lead to the narrowing of the gap between diesel and electric vehicles."

Where is the European truck manufacturing industry at with the development of trucks of each fuel type (gas, electric and hydrogen) in terms of product development, range capabilities etc, and how is this expected to develop over the next 5 years? Where do you see the market going over that period?

RESPONDENT 1

"All truck manufacturers in Europe, have an alternative to diesel. The alternatives include electric, hydrogen or gas. The demand for these alternatives has come from: increasing governmental regulations, demands from transport purchasers and a more informed society.

The three aforementioned fuel sources share a lot of the same issues:

- Range Capabilities - All these fuel alternatives have lower range than their diesel comparisons
- Fuel sources/infrastructure – As highlighted, the infrastructure is lagging behind dramatically
- Expected development – Over the next five years these alternatively fuel sourced vehicles are expected to develop dramatically in terms of range capabilities and software upgrades, all of which will accelerate the obsolescence of existing vehicles.

Looking forward into the future, even as far as 2040/2050, we believe that the transport sector will be almost unrecognisable.

The European truck market is headed more and more towards a zero-emission future, whether that is via electric or hydrogen fuel cells or something not yet discovered.

Either way, stringent emission regulations and Government policies are shaping dramatically what the future truck industry will look like. In the grand scheme of things, we see ICE technology with us for at least the next ten years and beyond."

RESPONDENT 2

"Yes, truck manufacturers have no option other than to develop low emission vehicles. Clearly there is not the full product portfolio available, as this will take time to develop all the different truck operating segments.The EU target for truck manufacturers is to reduce CO2 output by 15.0% in 2025 and the target for 2030 has been increased from 30.0% to 45.0%, so quite a challenge for all truck manufacturers.

Decarbonising the Road Freight Sector - Ireland

If they don't reach the target then EU fines will be imposed, which as one person pointed out, 'we may be able to pay the fine one year but not for a second successive year' therefore the targets have to be achieved.

From our point of view electric and hydrogen powered trucks are seen as the future replacement to diesel trucks. Hydrogen trucks exist and will be seen as the long-haul choice. There is a lot of development work and testing to do on this side.

The end of 2024 will see the launch of vehicles with capabilities which would not have been possible even two years ago, so battery technology is improving all the time.

Already training is ongoing for electric vehicles and technicians are not allowed to work on vehicles unless certified to do so."

RESPONDENT 3

"Our preparations for decarbonisation started in 2018 with the launch of our first electric van. Since then, our network of technicians has been trained to reflect the growth of our portfolio of products and with our extension of the range with articulated EV units we will continue to grow the number of fully qualified sites to support our customers across the whole country.

As a vehicle importer, we can only answer this from our importer perspective, and we would expect our manufacturer will largely deal with this question. However, at this point in time we have CNG up to 26T, HVO across the whole range, Electric Vehicles from 14 tonne and 42 tonne and we understand Hydrogen is well on its way in terms of product development.

With regards to maintenance skills and equipment, we have already invested largely for CNG and Electric Vehicles in terms of training, charging infrastructure, tooling etc. at dealer sites as well as the necessary parts and equipment. And when Hydrogen comes along, we will do likewise."

What advice / knowledge would you pass on to the country's many hundreds of small truck fleet operators - that know they need to decarbonise their fleet, but are unsure how to go about it and where to start ?

RESPONDENT 1

"Take stock of where you currently are and explore if there are small changes you can make within your existing fleet.

We aren't saying jump straight into the world of BEV's or Natural gas trucks, but upgrading older vehicles to more efficient Euro 6 plus technologies would be a great way to start. And for those with Euro 6 fleets, are they all operating to at least Euro 6 standards? Set small goals and leave yourself the ability to scale up. Beginning with manageable and cost-effective solutions such as biofuels would be another great initiative.

Don't just look at initial purchase price, look at total cost of ownership. The initial purchase price maybe higher, but over the life of the vehicle consider the savings on fuel and maintenance. For BEV's and Gas you will have to consider a longer replacement cycle.

Look at your grid capacity and location and see if EVs are even a valid possibility. Work with a reputable truck manufacturer to explore the possibilities. We have the tools to help you analyse this and will work with you in the interests of a long-term relationship.

There are great possibilities with HVO and Biofuels, but the standards need to be clear and actively policed. Some fuels may have consequences for engines long-term and we would see more issues arising as the levels increase."

RESPONDENT 2

"Yes, take small steps on your journey to find a suitable alternative.

Ask for advice from an E-Consultant or ESB to be sure your premises can support charging. Try a demo unit. Manufactures are starting to offer demo trucks with a mobile charger capable of 40 kw output, so generally overnight charging, as long as the appropriate three phase plug is available on site."

RESPONDENT 3

"Plan for the future. Making the switch to electric trucks can be daunting and the process does need to be properly understood and planned to ensure a seamless and stress-free transition. That's why we are urging operators to start planning now for the future – bearing in mind that electrical vehicles will impact many other aspects of your business, compared to purchasing diesel vehicles. It will be up to the vehicle distributors to make the transition easier for small fleet operators by:

1. helping them to assess the suitability of their work for electric vehicles;
2. helping them in the journey in relation to charging infrastructure, including the purchase and installation of same;
3. providing vehicles that de-risk the move to electric vehicles using contract hire models, and selling vehicles with full maintenance packages, and providing buy backs where necessary; thus eliminating the risk of used vehicle values;

4. giving long (up to 10 years) battery guarantees, and enabling finance to be provided over longer years to accommodate the extra cost of electric vehicles.

Our obligation will be to provide demonstrator vehicles to smaller operators to show them that electric vehicles will work in their operation. Where customers need first-hand experience of the technology our wide-ranging electric vehicle demonstrator fleet is available for customer trial across various applications.

We are also working in partnership with a number of bodybuilders to ensure the change to building on an electric chassis is as seamless as possible and we have contract hire options available through our Financial Services unit. Additionally, for peace of mind, some models are offered with a battery promise of up to 10 years (minimum 3 years warranty, extendable to 5 years); and some models are offered with an 8-year warranty, or 100,000 miles (whichever comes first).

Finally, once the vehicle is built and delivered, we offer training and fleet monitoring through our telematics system with regular follow up.”

THE FLEET OPERATOR’S VIEW

Similarly, we put the following questions to leading fleet operators across Ireland. We are very grateful to the following for their contributions:

- **Mick McConnell**
  Managing Director, Road Truck Services
- **Robin Murphy**
  Operations Manager, Elsatrans
- **Denise Ryan**
  Operations & Transport Manager, Polar Ice
- **Mark Crowe**
  Head of Transport, BWG Foods

What do you see as the major obstacles and hurdles – irrespective of fuel types – to decarbonising your fleet operations?

MICK McCONNELL

“Fuel/Charging Networks and cost. We have gas powered vehicles, but there is no incentive to build our own fuel station. We have investigated the possibility of electric, even going so far as completing route analysis with Volvo, however the technology does not seem to be there yet to complete a shift and the cost is a factor,

The investment cannot be recouped, we are still trying. Smaller operators cannot afford to take chances on alternative fuels and will continue to use modern diesel engines. These operators are the backbone of our industry and look after small business across Ireland. We just need information and support.”

ROBIN MURPHY

“The principal obstacles to decarbonising fleet operations include the high upfront cost of transitioning to low or zero-emission vehicles, a lack of comprehensive charging or refuelling infrastructure for alternative fuel vehicles, and the current range limitations of electric vehicles, which can impact operational efficiency.

Additionally, the variability in availability and cost of sustainable fuels across regions presents a challenge. It’s crucial to foster a collaborative ecosystem involving Government bodies, industry players, and technology providers to accelerate the transition to sustainable transport.

Sharing best practices, pooling resources for infrastructure development, and establishing standards for emissions reporting and reduction can drive collective progress. Moreover, public awareness and acceptance of the need for sustainable transport solutions are essential for this transition.

Elsatrans is committed to playing a proactive role in the decarbonisation of the transport sector and welcomes further dialogue on how we can collectively achieve these goals.”

DENISE RYAN

“We see four main challenges, time, finance, risk and performance.

Time – the investments made will have to run their course and new CAPEX won’t be released for new/alternative vehicles until existing fleet has reached the end of its useful life.

CAPEX – There are return on investment calculations for all investments, and our experience even with solar PV, is getting the returns to justify the spend.

Proven – This is relatively new territory and there’s a hesitancy to jump straight in – we can’t afford to get it wrong.

Range – Low range on LGV vehicles ”

MARK CROWE

“BWG currently operate three electric HGV and 30 Bio-gas trucks, so we have built up a great deal of experience. The main challenge is infrastructure, or the lack of it, especially on the motorways. There are no heavy-duty public stations and only six CNG stations in Ireland in operation. The Government are working with fuel suppliers, but a more innovative approach is needed.”

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What information and action do you need from Government for Ireland’s road transport sector to be able to effectively develop a strategy towards decarbonisation over the next five years?

MICK McCONNELL

“When will there be a roll out of charging or fuelling stations for HGVs? Can heavy goods operators have financial support to assist us in a road to net zero. We need active guidance and communication from Government.”

ROBIN MURPHY

“For Ireland’s road transport sector to effectively develop a decarbonisation strategy, we need clear, actionable policies from the Government that include financial incentives for early adopters of green technology, investments in charging and refuelling infrastructure, and guidance on sustainable fuel options. Transparent timelines for regulatory changes and standards would also aid in planning long-term investments.”

DENISE RYAN

“There are three main areas where we require great clarity and more information. First of all, ‘WIFM – What’s in it for me”– for the Company, the Staff, our Stakeholders and all others.

Secondly, tax related information would be useful to support good tax planning and help us assess any incentives. Thirdly, funding. Will there be specific funds, grants, supports, reliefs etc? If the Government support a rebate on the use of HVO, we would like this rebate scheme to be available to own account operators also.”

MARK CROWE

“Support heavy duty charging points which sell electric at a competitive rate. High speed for cars is .70 cent per KW when depot charging is circa .25. Allowing fuel operators to put a high rate will discourage adoption for electric HGVs. Commercial operations are just not viable at high charging rates. It would be great to see truck manufacturers get involved, offering charging solutions alongside their trucks, charging out at minor cost-plus rates.

In our view, there is simply not enough HVO around, and there are questions over sourcing. Demand from the airline industry might also account for an increasing share and shortages may see prices rise.

Electric is more suited to short distance and urban distribution, it is not practical for heavy long distance which can be covered by Bio-CNG. Support for CNG Biomethane seems to have stopped and should be revisited.”

What insight do you fleet operators need from truck manufacturers to be able to develop and execute a decarbonisation strategy for your fleet?

MICK McCONNELL

“What can manufacturers make that will work? Is it Hybrid, Is it electric? Once you load an electric HGV it changes the range, using lights and a heater changes this also, using a tail lift also reduces the range.

Could additional batteries for components be charged from an alternator to work a tail lift without draining a battery for example? We need a workable vehicle that can transport goods and it isn’t electric at the moment, so give us insight into what will work in the short term and publish it.”

ROBIN MURPHY

“Fleet operators require detailed information from truck manufacturers on the lifecycle emissions of vehicles, encompassing both manufacturing and operational emissions. Insights into the expected development timeline for new technologies, vehicle performance data under various operational conditions, and the total cost of ownership for electric and alternative fuel vehicles are critical for planning and executing a decarbonisation strategy.”

DENISE RYAN

“While the insight we want from Government is more strategic and financial, from truck manufacturers we need greater operational information. This is technical details – running costs, performance commitments, local centres of excellent for repairs, servicing, stock spares, training programmes for these centres and how they will attract new talent.”

MARK CROWE

“Truck manufacturers are usually quite good with communicating the latest products. They should consider more collaboration in creating heavy duty charging points to support the products and look at offering the full package of truck and supply of power.”

What advice or knowledge would you pass on to the country’s many hundreds of small truck fleet operators, that know they need to decarbonise their fleet, but are unsure how to go about it and where to start?

MICK McCONNELL

“Small hauliers cannot afford to take chances on decarbonisation. Some may be holding onto older trucks waiting on a steer from Government or manufacturers to pick their next truck.

Start small, fix the easy stuff first, know where every litre of fuel is, get the tyres right, fix the wind kit, keep it serviced, use smaller vehicles when loads permit but make the changes. Use tracking to reduce kilometres, This is a great way to reduce carbon emissions.”

ROBIN MURPHY

“For small truck fleet operators looking to decarbonise, our advice is to start with a comprehensive review of your operations to identify areas where emissions can be reduced, such as through route optimisation and driver training on fuel-efficient driving. Consider investing in newer, more fuel-efficient vehicles, or retrofitting existing vehicles where feasible. Stay informed about Government incentives and trial small-scale transitions to electric or alternative fuel vehicles to gain firsthand experience.”

DENISE RYAN

“Polar Ice are an SME and currently have six delivery vehicles and three company cars in our fleet as at Q2, 2024. Our four HGV’s and two LGV’s are all diesel powered engines which currently run on HVO.

We gained knowledge from being involved in the FTA Ireland’s Alternative Fuel’s Group meetings where we had the opportunity to speak with other companies who shared their story and ask relevant questions of the FTA and their members. This was a massive support and guidance for Polar Ice.

For HVO to work for us, we needed the space for refuelling onsite and the security for this, then the capital investment for a 10,000lt storage tank and a fuel management system. It wasn’t easy to find all the information and many Fuel Management System Companies were slow to come back or even respond at all. It took a lot of commitment to get this up and running.

In March 2023, we began using HVO in our diesel-powered engines and we are very happy with the use of this fuel. There have been no issues with supply, our systems or our fleet. We now also have one electric and two hybrid company cars in our fleet.”

MARK CROWE

“Start talking. Talk to the truck manufacturers and talk to your customers. Be open-minded and concentrate on your total cost of ownership. We engage a lot with the truck manufacturers, and I have to say, they are all very helpful.

Start discussions with them, with the total cost of ownership over a seven-year period, in line with a lifetime warranty on batteries. Tie this into a repair and maintenance contract, to give you reassurance.

At the same time, you need to have discussions with your customers. What do they want? Will they go on the journey with you? Try to work in partnership with them. Can you tie your customer contracts in, to mitigate risks, perhaps on a cost-plus basis? Put the proposals to your customers. Bringing them along with you will give you confidence.

Be conscious that your larger customers will have their own reporting pressures coming down the line, and also make sure you are aware of developments in low emission zones and understand how they will impact your operations. Of course, technology and capabilities will move on and improve, but I don’t see today’s electric vehicles becoming obsolete as such. On the other side, what will today’s diesel vehicles be worth in five or six years’ time?

Operationally, I would suggest investigating charging capabilities on your site. At 43 kWh, a truck would take around 10 hours to charge, which is viable.”

Chapter 3

The transition to alternative fuels

The objective of this Chapter is to provide context to the pathway to decarbonising Ireland's road transport operations. It provides insight into the current 'state of play' on the infrastructure required, whilst providing an understanding of the role of road transport in Ireland's economy and the characteristics of the vehicles that facilitate our daily lives.

KEY MESSAGES

PLAYING CATCH-UP ON INFRASTRUCTURE

- ***Government must support the private sector** with deployment of more alternative fuel facilities (either independently or cooperatively)*
- ***Security of supply is critical** for commercial fleet operators and the availability of alternative fuels will be essential in supporting the industry to fully transition to alternative fuels.*

IRELAND'S FLEET OF GOODS VEHICLES

- *Logistics and transport solutions are rarely, if at all, served by 'one size fits all' solutions. What works for one industry sector, or stage of a supply chain, will not in another. The fleet is incredibly diverse in its weight, shape and size, **supporting supply chains in every sector**, across agriculture, industry, manufacturing and retail is critical.*
- *The fleet is **powered almost exclusively (over 99.0%) by diesel**, though this is starting to change, albeit gradually.*
- *The fleet is operated by companies of all sizes – but is **dominated by SMEs**. Around 70.0% of licensed hauliers operating nationally have at most three HGVs and 49.0% have only one HGV.*

EMISSIONS

- *The European Union's 'Greenhouse gas (GHG) emissions of all world countries' report highlights that of 210 countries and territories, **Ireland ranks 27th in terms of GHG emissions** per capita, and is one of Europe's lowest ranked countries.*
- ***The path and pace for decarbonising HGVs remains uncertain**, with internal combustion engine (ICE) vehicles expected to make up a substantial majority of the on-road fleet in 2030 and beyond*
- ***Future targets are challenging**: 91% growth in freight demand to 2050 vs at least 80% reduction in GHG/CO2e and net zero to 2050 (balance is removed not just offset)*
- *CAP 24 outlines how renewable transport **fuels, including biofuels, will continue as a core transitional measure** for the medium-term reduction of greenhouse gas emissions in transport*

CAP 24 OUTLINES THE 'STATE OF PLAY/TRENDS' IN THE TRANSPORT SECTOR

- ***2022 saw a 6% increase in emissions** over 2021 levels, as the economy and transport demand continued to rebound following the lifting of public health restrictions associated with the Global Covid-19 pandemic and return to typical levels of transport activity*
- ***41.9% of the first sectoral carbon budget was expended in the period 2021-2022**. While this level could be consistent with the sector being compliant with its carbon budget to 2025, a consistent decrease from the level of 2022 emissions is required in each year from 2023 to 2025 if we are to achieve this*
- *At the midway point of the first carbon budget, **the Environmental Protection Agency's (EPA) provisional emissions inventory for 2022 and its long-term projections reflect the continuing challenge** and scale of the system and behavioural transformation required in transport to meet emissions abatement targets.*

The Department of Transport set out Ireland's Road Haulage Strategy 2022–2031, stating its view that, following uncertainty as to the likely technological pathway for decarbonising HGVs (e.g., whether compressed natural gas or biomethane (bioCNG), electric, hydrogen, or other bio-/advanced fuel-types represent the best alternative), it sees electric trucks emerging as the preferred technology. This, however, may not be the correct strategy for the freight distribution and logistics sector, as there will be different solutions based on operational requirements.

The strategy highlights that the path and pace of this transition remains less clear, with ICE vehicles expected to make up a substantial majority of the on-road fleet in 2030 and beyond.

Transitional measures, such as the use of renewable transport fuels, will be needed to reduce emissions in existing vehicles while the widespread take up of electric trucks begins towards the end of this decade.

The Government has ambitious targets of having 180,000 Electric Vehicles (EVs) on Ireland's roads by 2025 and 936,000 by 2030. SIMI reported that 22,789 new electric cars were registered in 2023, up from 15,678 in 2022. However, the targets set by Government to 2030 would require on average more than 100,000 new EV sales per year to meet the 2030 targets. Setting unrealistic targets without the considered engagament of all stakeholders both private and public sector can prove to be counter productive.

Setting goals is fundamental to any successful business strategy. However, when ambition overshadows realism, the fallout can impact on the integrity of the project, increase cynicism and create barriers to change. The current demand for EV's does require investment in charging infrastructure. Given the increased range for electric vehicles, comparable now with petrol (400km +) investment in service station facilities is vital. The support required for heavy-duty vehicles is different and difficult given the cost of electric vehicles in this category, and availability of these vehicles.

A critical element in supporting the transition will be the provision of charging infrastructure for heavy-duty vehicles. The Alternative Fuels Infrastructure Regulation (AFIR) targets dedicated publicly accessible charging pools for heavy-duty vehicles of 3,600 kW at 60 km intervals on the core TEN-T network and of 1,500 kW at 100 km intervals across the comprehensive TEN-T network by 2030. The high energy demand for heavy-duty vehicles will require different solutions that are cognisant of these challenges, where the state supports the private sector with deployment of charging facilities (either independently or cooperatively) at hubs closer to distribution hubs.

The total distance covered by road freight transport (HGV & LGV) in 2022 was 1.7 billion kilometres same as in 2021. The commodity group that contributed most to vehicle kilometres was Foodstuffs.

The security of supply is critical for commercial fleet operators and the availability of power to support quick recharging will be essential to support industry transition to electrification. Current barriers are the cost of public recharging and the cost of the vehicles.

COMPARING IRELAND ACROSS EUROPE

Please see the tables in the Data Appendix to cross compare statistics on Ireland to other countries around the world.

THE ROLE OF ROAD FREIGHT

Road Freight Activity

In Ireland almost 99.0% of freight is moved by land transport due to the significantly lower contribution of other modes of transport (In Europe it is approx. 75.0%).

Maximising laden operations reduces emissions and demonstrates freight distribution efficiencies. This should be a key focus for vehicle operators as this is a quick win to assist with decarbonisation. The following tables provide context to Ireland's road transport sector, and an understanding of the movement of goods, produce and raw materials, distances travelled and the use of fuel.

For 2022, the last full year of data prior to publication, the CSO reported in its "Road Freight Transport Survey Quarter 4 and Year 2022" a total of 164.3 million tonnes of goods were transported by road, up 6.0% compared with 154.9 million tonnes in 2021.

Table 07 (in the Data Appendix) indicates greater efficiencies within the supply chain where more laden journeys are contribution to less vehicle movements at a time of growth across a wide variety of goods as detailed in ***Chart: 01***

Fleet Characteristics

A recent report from the Department of Transport, *'National Demand Management Strategy'* noted that 42,782 HDVs (>3.5 tonnes) were taxed in Ireland as at the end of 2023, with 23,615 vehicles licensed haulage and 19,167 on own accounts. As of October 2023, there were 3,813 registered and licensed hauliers in Ireland, of which 36.0% operate only in Ireland. A large proportion of these hauliers have relatively small fleets, with an average fleet size of 5.9 vehicles across the sector. Around 70.0% of licensed hauliers operating nationally having at most three HGVs and 49.0% having only one HGV.

Tables in the Data Appendix illustrate the characteristics (number, weight, age and fuel types of goods vehicles) across Ireland.

The data paints a picture of aging, increasingly older vehicles, dependent almost exclusively on diesel engines, operated across a fragmented operator base.

- Over 10.0% of vehicles were first registered in 2005 or earlier, whilst almost one-half (46.5%) were registered in 2014 or earlier.
- Of the total number of licences awarded to companies operating in the haulage sector in Ireland (excluding own-account operators), 39.0% are allocated to companies operating 0-1 trucks. Almost three-quarters of licences (73.4%) are awarded to companies operating five or less trucks.
- Diesel powers over 99.0% of goods vehicles in Ireland, with petrol accounting for a further 0.2%
- Alternative fuelled vehicles are making ground. Of the new goods vehicles licenced in 2022, 'only' 97.1% were diesel vehicles, with a further 0.5% pet

Fleet licences and sizes

Furthermore, data in the *Data Appendix* analyses licence numbers by fleet size for the haulage sector in Ireland. Data, analysed by fleet size, for own account operators Is not readily available.

The number and share of companies operating in the licensed haulage sector with a fleet size of ten or more vehicles has increased from 10.5% of licences in 2015, to 16.5% in 2023. At the same time, the number and share of companies operating with one, two or three vehicles continues to fall (to 62.0%).

Of those companies in the licensed haulage sector with ten or more vehicle licences, following a number of years that saw an increasing share undertaking international activities, the proportion of those with international licences dropped significantly in 2021, but regained share in 2022, maintaining that level in 2023

EMISSIONS

Transport accounts for approximately 18.0% of Ireland's greenhouse gas (GHG) emissions and diesel-powered Heavy Goods Vehicles (HGVs) and buses produce 38.0% of our road transport emissions, but only account for 4.0% of vehicles on our roads. The road to transition to alternative fuels that produce zero emissions is a difficult one for the Heavy Goods Vehicle Operator fleets due to the limited supply of affordable and available alternatively fuelled vehicles, The cost differential between new fuel and traditional diesel fuel vehicles and the main issue which is the availability of infrastructure to support a sustained transition.

In 2022 air monitoring results from EPA stations across Ireland show that fine particulate matter (PM2.5), mainly from burning solid fuel in our homes, and nitrogen dioxide (NO2) mainly from road traffic, remain the main threats to good air quality.

It is fair to say that there is much work to be done and much scope for improvement.

Ireland ranks 8th out of 14 comparable EU countries in the 2024 Sustainable Progress Index. The report, undertaken by Social Justice Ireland, comprises three dimensions: economy, society and environment. Ireland is ranked 9th out of the 14 countries on the economy. On the social index, Ireland is in the middle of the ranking, in 7th place. Poor air quality has a proven negative impact on people's health. The Environmental Protection Agency **(01)** quotes that there are an estimated 1,300 premature deaths in Ireland per year due to particulate matter in our air.

The report entitled 'Measuring Progress: Sustainable Progress Index 2024' ranks 14 comparable EU countries based on their delivery of the UN's Sustainable Development Goals (SDGs).

Ireland is at the bottom of the ranking on the environment index. Significant challenges exist if Ireland is to meet a commitment to the environment goals set out in Agenda 2030, which is part of the SDG goals. Ireland's score has improved on some environmental SDGs, notably on SDG 11 'Sustainable cities and communities', but poor performance on goals relating to water quality, affordable and clean energy, responsible production and consumption, and climate change are among the key factors driving the result for this dimension.

01 https://www.epa.ie/publications/monitoring--assessment/air/air-quality-in-ireland-2022.php#:~:text=Poor%20air%20quality%20has%20a,particulate%20matter%20in%20our%20air.

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Whilst the use of biodiesels is increasing across Ireland, the scale of the challenge to replace diesel is clear.

The European Union published its report *'Greenhouse Gas (GHG) emissions of all world countries'* in 2023. China, the US, India, the EU27, Russia and Brazil were the six world largest GHG emitters in 2022. Together they account for 50.1% of global population, 61.2% of global Gross Domestic Product, 63.4% of global fossil fuel consumption and 61.6% of global GHG emissions.

Of the 210 countries and territories, Ireland ranked 27th in terms of GHG emissions per capita, and one of Europe's highest ranked countries. ***(See Table 16 in the Data Appendix)***

Generating fuel from renewable sources is vital, but Ireland is behind its European counterparts in this area.

Data from the European Environment Agency demonstrates the challenge ahead. **(01)**

The share of energy consumed in the EU during 2022 generated from renewable sources was 23.0%. This increase, from a level of 21.9% in 2021, was largely driven by a strong growth in solar power. The share is also amplified by a 2022 reduction in non-renewable energy consumption linked to high energy prices, however renewables in Europe are expected to keep growing. Meeting the new target of 42.5% for 2030 will demand more than doubling the rates of renewables deployment seen over the past decade, and requires a deep transformation of the European energy system.

Sweden, Finland and Latvia had the highest share among Member States in 2022. All three countries have strong hydropower industries and wide use of solid biofuels. Ireland and Malta reported the lowest penetration of renewables, representing around 13.0% of their respective total energy consumption. ***(See Table 18 in the Data Appendix)***

Climate Action Plan 2024 and Renewable Fuels for Transport

CAP 24 outlines how renewable transport fuels, including biofuels, will continue as a core transitional measure for the medium-term reduction of greenhouse gas emissions in transport. Modelling analysis of this measure projects a carbon saving of 1.08 MtCO2eq by 2030, equating to 13.7% of transport sector decarbonisation in a central scenario.

The plan notes that the balance of overall emissions abatement through renewable fuels could potentially be greater should the electrification of the vehicle fleet and behavioural change measures fall below the targets set.

The Climate Action Plan biofuels target will continue to be delivered through annual increases in the statutory renewable transport fuel obligation (RTFO) on fuel suppliers requiring a minimum proportion of renewable transport fuel supply.

The policy, implemented through 2024, outlines the measures required to achieve national climate action targets and European requirements for sustainability and GHG reduction in renewable transport fuel supply. While the structure for the sector's decarbonisation pathway set out in CAP23 was naturally skewed to deliver the greatest share of emissions abatement in the second half of this decade, the cumulative emissions over the first two years of the carbon budget programme (22.6 MtCO2eq.) suggests that, at present, the transport sector is currently aligned to the required compliance pathway to 2025, with 41.9% of carbon budget consumed over those first two years.

It is important to note however, that the sector's emissions were artificially depressed in 2021 as a continued legacy of Covid-19 public health restrictions, and transport emissions over both 2021 and 2022 have seen increases in emissions of approx. 6% per annum with the ending of pandemic restrictions and the return to pre-Covid levels of economic activity. Though the overall emissions trend since 2018 is downward and 2022 emissions were 4.5% lower than 2018 levels, the scale of abatement required (5.2% p.a.) over the period 2023-2025 highlights the urgent need to reverse this recent rebound in emissions to avoid jeopardizing the sector's capacity to achieve its abatement pathway in future years.

Energy

Published in March 2024, by the Department of Enterprise, Trade and Employment (DETE), Ireland's Offshore Wind Industrial Strategy, the first strategy of its kind for Ireland, aims to build a successful, vibrant and impactful offshore wind energy industry in Ireland, ensuring that the sector creates as much value as possible throughout Ireland and maximises the economic benefits associated with government ambitions to deliver its 2030, 2040 and 2050 offshore wind targets.

Ireland has a significant reliance on imported energy, a reliance that continues to grow. Imported energy has increased from 69.0% in 2018 to 83.4% in 2022. Of Ireland's total energy demand electricity accounts for 21.9%. A total of 54.9% of Ireland's overall energy demand was satisfied by oil products.

Ireland has set a target that at least 80% of its electricity requirements will come from renewable sources by 2030; a total of 36.8% of Ireland's electricity was generated from renewable sources in 2022. To achieve its target, Ireland will need to treble its installed renewable energy capacity by 2030. The strategy highlights that increased Government targets and ambitions on decarbonising the energy sector will require widespread electrification of our energy systems, and an accelerated roll out of indigenous renewable energy. Combined with the significant population and industrial growth expected to take place in the coming years, as well as new large energy users, Ireland is expected to experience a considerable increase in electricity demand.

In the longer term, EirGrid projections estimate an increase in electricity demand of between 73TWh to 86TWh by 2050, more than doubling current demand levels. Accommodating this growth, while simultaneously enhancing energy security and power generation decarbonisation, will require Ireland to partner and collaborate with domestic and international industry across a range of initiatives, including the rapid deployment of installed renewable energy generation capacity, supported by energy storage capacity and increased cross-border electricity interconnection, as well as the acceleration of green fuels and negative emissions technologies.

Ireland has a CAP 23 goal to decarbonise the natural gas infrastructure by targeting the production of up to 5.7 TWh (approx. 10.0% of total gas in the network) of Biomethane and construction of up to 200 Anaerobic Digestion plants of scale by 2030. maritime area that is approximately ten times, and an exclusive economic zone (EEZ) that is approximately seven times, the size of its landmass, with some of the most powerful wind resources in the world. To fully harness the vast potential for clean, renewable energy from our seas, a suite of policies across Government have been, or are in the process of being developed to ensure ORE projects are delivered in line with the target to deliver 37GW of ORE by 2050.

The strategy identifies key challenges to meeting these targets, not least in building capacity and capability in the Irish Supply Chain:

- Business Support and Strategic Leadership
- Increasing Offshore Wind Start-ups in Ireland
- Increasing Offshore Wind Start-ups in Ireland
- Developing a Skilled Workforce

MAKING A DIFFERENCE NOW

A particularly difficult challenge for the decarbonisation of the transport sector has been in the haulage and heavy goods road freight sector, which together with emissions from light commercial vehicle fleet, constitutes c.38.0% of total transport emissions.Collectively, the commercial goods fleet is heavily reliant on the use of diesel-fuel for their operations. The majority of fleet operators often operate fleets of less than five HGVs, in highly competitive markets. The modelled decarbonisation pathway to achieving 50.0% abatement recognises that, in the interim, the lack of immediate alternatives means a majority of HGV operators will be subject to a continued reliance on diesel fuel.

As the majority of emissions abatement by 2030 will be carried by decarbonisation of the private car fleet and shift to sustainable transport, the overall abatement required of the heavy goods sector will be to deliver a c.10.0% reduction in emissions relative to 2018 levels.

This will be achieved and supported via the DoT's Road Haulage Strategy 2022-2031, which sets out 39 specific actions for the sector.

These measures will not only deliver in terms of emissions abatement through, for example standardising eco-driving training programmes to improve operational efficiency, but also through wider labour, safety, and skills measures to help support the sector.

In recognition of the sector's exposure to the rising fuel cost trajectory envisioned under carbon tax increases that will be required to reduce the 'competitive advantage' held by fossil-fuelled vehicles over sustainable alternatives, the Department of Transport is engaged in further research regarding taxation and renewable fuels used in the sector.

A net-zero decarbonisation pathway for transport must seek to reduce demand, through mechanisms that lessen or avoid the need for unnecessary travel by unsustainable means. Separate considerations must however, be granted for Freight Distribution in recognition that it will require different solutions.

Examples of this in a transport context are detailed on the following page.

Future freight demands

With the Irish population growing to its 2030 projection of 5.2 million in 2022, and the economy booming, the Department of Enterprise, Trade and Employment (DETE) indicate that the projected freight Tonne.km increase by 91.0% to 2050 will be likely exceeded (globally freight volumes are expected to increase 230.0% - International Transport Forum).

The challenges ahead for fleet operators are clear.

- **95% of exports by volume go by road, Ireland's employment and tax base is reliant on freight transport primarily road but also air, rail and even cargo bike**
- **91% growth in freight Tonne/.Km to 2050 vs at least 80% reduction in GHG/CO2e and net zero to 2050 (net zero means balance is removed from atmosphere not just offset)**
- **Solutions are known and tested internationally but many barriers exist locally, not least conflicting signals and supports from Government**

01 https://www.eea.europa.eu/en/analysis/indicators/share-of-energy-consumption-from

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Decarbonising Road Freight

Key considerations...

Reasons to decarbonise

Business case

Corporate responsibility

FOMO (Fear of missing out)

Government policy

Procurement – changing requirements

Growing legislation

Solutions fit business model

Regulatory requirements

Help avert a climate crisis

Tax incentives

Competition

Ageing fleet

Challenges to decarbonisation

Cost of change

Lack of education

Availability - refuelling infrastructure

Skills to maintain and run alternatively fuelled fleets

Lack of confidence in Govt policy

Availability of alternative fuelled commercial vehicles

Competition between alternative fuels

Lack of understanding of National and EU Government direction

Scale of change

Not enough industry grants

Lack of incentives to change

Measuring and Training

There are many reasons why commercial fleet operators should engage in Eco Driver Training.

As well as delivering fuel efficient drivers (result in lower running costs), improved profit margins and reduced emissions this training also supports safer drivers (less injuries and fatalities on our roads), less accidental damage to vehicles, less unproductive downtime for vehicle repair, and the potential for reduced insurance premiums.

FTA Ireland Silver/Gold/Green, ECOfleet programme ensures that L/100km is actively reported and can be used as a leading indicator of deterioration in driver behaviour ahead of incidents occurring, which with proactive management allows for weekly feedback.

Fuel Efficient Drivers = Safer Drivers = Good Risk Management

This training is designed to improve fuel efficiency and you should see an annualised improvement of 7% on average?

There can be bigger improvements but this is dependent on annual refresher training also note that reduced fuel burn is also a reduction on CO_2 emissions.

AVOID

- Vehicle Kilometres - reduction in 20.0% of KM driver
- Fuel Usage- 50.0% reduction in fuel consumed.
- Empty Running
- Longer Trailers = Less journey

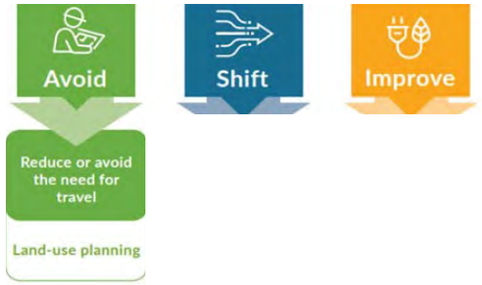
SHIFT

- Sustainable Transport Trips - Roll-out of sustainable demand management measures
- informed by National Demand Strategy
- Consolidate Loads and review average distances travelled with partial or empty loads.
- For consignors, buy services from recognised TruckSafe Green Standard operators.

IMPROVE

- Alternative fuelled vehicles
- Documented and reported Eco_Driver Training reduces fuel burn
- Route Optimisation
- Fuel Management Plan
- Organisation environmental policy with clear goals and objectives

.



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The Use of Alternative Fuels

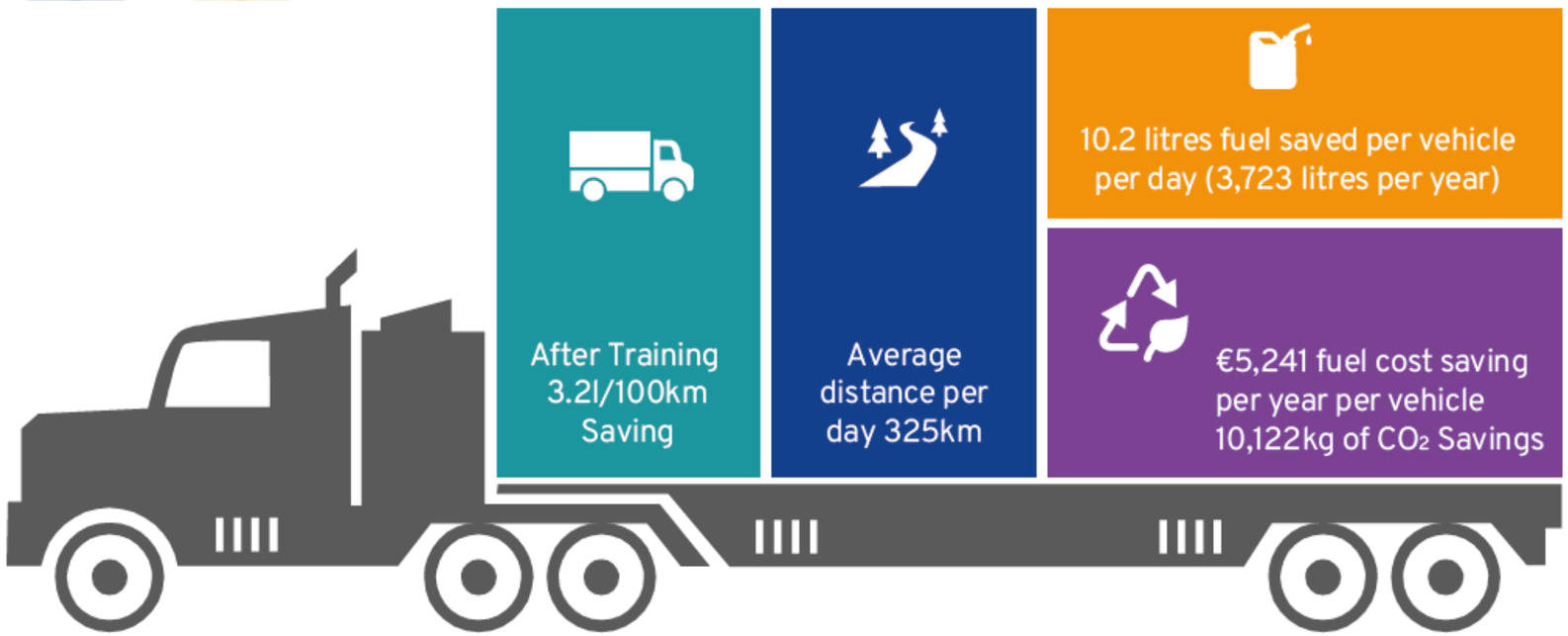
Biofuels, including BioCNG, will remain a core transitional measure for medium-term reduction of greenhouse gas emissions in road transport. Hydrotreated Vegetable Oil (HVO), in particular, is in high demand.One of the key challenges for increasing the supply of biofuels, including HVO, is ensuring sustainability and availability.

The role and importance of such fuels could potentially be greater should the electrification of the vehicle fleet and behavioural change measures fall below targets set.

Compressed Natural Gas (CNG) and renewable bioCNG, delivered through the national gas network, will also be key to driving sustainable supply chains and helping deliver a net-zero commercial transport in Ireland.

The operational and commercial opportunities, and challenges, of using these fuels is discussed in subsequent chapters.

FTA Ireland Silver/Gold/Green, ECOfleet programme ensures that L/100km is actively reported and can be used as a leading indicator of deterioration in driver behaviour ahead of incidents occurring, which with proactive management allows for weekly feedback.



A practical guide to transitioning fleets to alternative fuels

Transitioning to HVO

Inver has been supplying quality fuels across Ireland for over 40 years. From their jointly owned terminal in Foynes, Inver offers nationwide supply to industrial and commercial markets such as transport, construction and agriculture. Inver's renewable fuel offering includes B20 (20% biodiesel) and HVO (Hydrogenated Vegetable Oil) which are both readily available alternatives for commercial vehicles. Both fuels offer an immediate reduction in carbon emissions without significant capital investment.

HVO is readily available, a whole fleet can transition in days.

- Immediate savings with up to 90% GHG reduction.
- HVO does not require technology change or vehicle conversions.
- Inver have dedicated storage for HVO in our Terminal in Foynes.
- HVO supplied by Inver is certified to ensure that the carbon emissions reductions count against Ireland's national targets.
- Inver's fuels meet all National and European standards and have complete traceability from manufacture until delivery.
- HVO can be purchased from forecourts with existing fuel cards, with a seamless operational implementation.
- Transitioning to HVO is cost-effective and convenient.
- HVO is a flexible and reversible solution, a fleet that runs on HVO can also be fuelled with Diesel.

For more information:

www.inverenergy.ie
Tel: +353 (0)21 439 6950
Email: inverinfo@greenergy.com

Making the transition to BioCNG

Gas Networks Ireland operates and maintains Ireland's €2.8bn, 14,725km national gas network, which is considered one of the safest and most modern renewables-ready gas networks in the world.

Please follow the steps below to switch to CNG or BioCNG.

- Visit www.gasnetworks.ie/cng to find out how CNG and bioCNG can provide a cleaner energy for your transport needs.
- Contact Gas Networks Ireland and ask to speak to somebody in our CNG Sales team. Contact can be made in any of the following ways:
    1. Call the Gas Networks Ireland Businesslink team on 1800 411 511
    2. E-Mail Gas Networks at cng@gasnetworks.ie
    3. Complete the online contact form at www.gasnetworks.ie/cng-contact-us
- Gas Networks Ireland will provide you with information on how to start on the CNG/BioCNG journey. We will provide information on truck manufacturers, equipment suppliers, benefits of switching, grants available, gas network connection information (for CNG stations), locations of existing CNG stations and future planned CNG stations. Our team will help you to develop a business case to make the switch to CNG/BioCNG for your fleet of vehicles.
- A customer can then commence a trial with the introduction of a CNG vehicle/s into their fleet, using existing CNG stations to test the concept and suitability to their business needs. Gas Networks Ireland can assist with selection of the best equipment and choice of CNG station for refuelling during this trial. We can also advice on fuel pricing compared with diesel and direct customers to suppliers of natural gas and renewable gas who can provide fuel costs/quotations.
- Once the trial is completed, a business case can then be developed by the fleet operator/haulier to continue investment in this technology to decarbonise their fleet operations and provide an improved selling proposition to customers (carbon-free transport logistics).

Making the transition to Electric vehicles

Providing reliable and efficient Electric Vehicle infrastructure is one of the cornerstones of SSE Energy Solutions' portfolio to help Ireland businesses and local authorities meet their climate change targets. With our extensive experience in the utilities sector, we can provide a wide range of fully funded* solutions across the EV ecosystem and can take you on your electrification journey from initial feasibility studies through to design and installation.

What makes for a successful site with SSE?

1. Grid Capacity
2. Typical lease term of 25 years
3. Site size allowing for minimum of 6 bays

Things to consider when embarking on charging infrastructure:

- Planning is essential.
    1. Re-evaluate your site layout including and ingress and exits.
    2. Plan for the future and understand what your fleet will look like in the coming years.
- Early contact with the DSO will save time in the future. A New connection application should be submitted to ESBN free of charge to understand the total costs associated with any installation.
- If there is insufficient power to site, look into installing onsite generating assets such as solar PV, or consider on-site battery storage in the design – this may be an option to drive down build costs.
- If the company does not own the land, then early conversations should be had with the landowners to explore if EV is something they are willing to support.

We are set up to help you through each step and answer any of the questions you may have in evaluating EV Infrastructure capability, so please get in touch to help us better understand your requirements.

For more information, please get in contact via EVTeam@sse.com and visit: https://www.sseenergysolutions.co.uk/distributed-energy-infrastructure

*conditions permitting

Making the transition to Hydrogen

As the world's largest hydrogen producer, we have over 60 years' experience in safely producing, distributing, storing, and dispensing hydrogen. We own and operate over 100 hydrogen plants and 1100km of hydrogen pipelines globally, and we already have $15 billion committed to renewable and low carbon energy transition projects globally by 2027.

We're also expanding our network of refuelling stations across the EU, with work underway on Rotterdam's first large scale public green hydrogen refuelling station, and a recent agreement in place to build the EU's first commercial scale liquid-hydrogen station in Belgium.

To switch to Hydrogen, take the following steps:

- Consider the size of the initial fleet you want to convert and size of the long term fleet
- Estimate the range of your vehicles and the distance travelled. This will help determine your hydrogen refuelling requirements and infrastructure needs
- Explore funding options explained in this report
- Gather information about hydrogen fleet options from commercial hydrogen fuel cell vehicle manufacturers
- Contact a hydrogen supplier who can advise you on the full hydrogen value chain and evaluate the most suitable mode of supply for your requirements

For more information, contact::

Chloe Tindale
Email: TINDALC@airproducts.com
Tel: +44 (0)7717348077

Chapter 4

Current legislation

This chapter will provide an introduction to the key pieces of legislation shaping the future decarbonisation of road transport operations, both across Europe and in Ireland. The 'further information' section at the end of this report provides links to access further details.

KEY MESSAGES

THE EUROPEAN UNION

- *The **European Green Deal** is the EU's long-term plan to make Europe climate-neutral by 2050 and to cut greenhouse gas emissions by at least 55.0% by 2030, compared to 1990.*
- *The **'Fit for 55'** Package aligns EU legislation with its 2030 climate ambition. It contains a set of legislative proposals to achieve the 55.0% emission reduction target.*
- ***Alternative Fuels Infrastructure Regulation (AFIR)**. aims to ensure that the public has access to a sufficient infrastructure network for recharging or refuelling road vehicles.*
- *The EU's trans-European transport network policy, the **TEN-T policy**, is a key instrument for the development of transport infrastructure across the EU.*
- *As part of the Green Freight Strategy, the **Weights and Dimensions Directive** has been revised to allow additional weight for vehicles using zero-emission technologies.*

IRELAND

- ***The Climate Action and Low Carbon Development (Amendment) Act 2021** commits to achieving a 51.0% reduction in Ireland's overall Green House Gas emissions from 2021 to 2030, and to achieving net-zero emissions no later than 2050.*
- *The **Climate Action Plan 2024 (CAP 24)** provides a roadmap for taking decisive action to halve Ireland's emissions by 2030 and reach net zero by no later than 2050. It is recommended that the target for commercial electric vehicles should be increased to 150,000 by 2030, with consideration of additional incentives to support adoption.*
- *Increasing the amount of **renewable transport fuels** will provide a level of emissions savings from the existing fleet. In 2022, 7.0% of the diesel fuel supplied was from renewable sources and it is the intention to achieve a 20.0% biodiesel blend by 2030.*
- *2023 saw the publication of new policies, including the **National EV Charging Infrastructure Strategy** and The Renewable Fuels for Transport Policy Statement 2023-2025.*
- ***The Avoid-Shift-Improve framework** for transport sustainability was introduced in CAP23 and this approach has been applied again in CAP24.*

Spotlight on Europe

European Green Deal

1. **Rail Freight – focus on more efficient rail freight to optimise use and improve cross border co-ordination - 50% of rail crosses EU borders.**
2. **Road Distribution – weights and dimensions directive changed to allow additional weight for vehicles using zero emission technology.**
3. **Count Emissions EU – develop a new common methodology approach for companies to calculate greenhouse gas emissions.**

Fit for 55

1. **Renewable Energy Directive – set increased targets to produce 40% energy from renewable sources by 2030.**
2. **Alternative fuels infrastructure regulations – requires charging points every 60km for electric charging and every 150km for hydrogen refueling on core Ten T network.**
3. **Energy Taxation Directive – align taxation of energy products with EU energy & climate policy.**

THE EUROPEAN UNION

Freight transport is the backbone of the EU's Single Market – it keeps supermarkets, factories and pharmacies stocked, and enables European companies to sell their products across the continent – and beyond. Some six million people worked in the EU freight sector in 2020.

Freight distribution is also responsible for over 30.0% of transport CO2 emissions. And as the EU economy grows, emissions are likely to rise unless decarbonisation measures are put in place: freight transport is expected to grow by around 25.0% by 2030, and 50.0% by 2050. **(01)**

In order to meet the objectives set at global level by the Paris Agreement, the EU's goal of at least -55% greenhouse gas reductions by 2030 and of climate neutrality by 2050, the European Union (EU) needs to decarbonise the transport sector. A number of legislative and non-legislative instruments are being adopted by the European Union in the area of sustainable transport, and alternative fuels in particular, a selection of the most relevant of which are summarised here.

European Green Deal

The *European Green Deal* is the EU's long-term plan to make Europe climate-neutral by 2050. This target is enshrined in the European Climate Law, as well as the legally binding commitment to reduce greenhouse gas emissions by at least 55.0% by 2030 when compared to 1990 levels.

The goal of being the first climate-neutral continent by 2050 requires ambitious changes in transport. The Green Deal establishes a clear path to achieve a 90.0% reduction in transport-related GHG emissions by 2050, together with more stringent air pollutant emissions standards for combustion engine vehicles and the promotion of clean fuels including aviation and maritime transport.

In July 2023, the Commission proposed measures to make freight transport more efficient and more sustainable, by improving rail infrastructure management, offering stronger incentives for low-emission lorries, and better information on freight transport greenhouse gas emissions.

'Fit for 55': delivering the EU's 2030 Climate Target on the way to climate neutrality

The *'Fit for 55'* Package aims to bring the EU's legislation in line with its 2030 climate ambition. It contains a set of legislative proposals and amendments considered necessary by the Commission to achieve the 55.0% emission reduction target set by the co-legislator for 2030, compared to 1990 levels. It contains a number of proposals aimed at decarbonising the transport sector, including the extension of the Emissions Trading System (ETS) to the maritime sector and the creation of a parallel ETS for road transport, the Regulation on CO_2 emission performance standards for cars and vans and the Alternative Fuel Infrastructure Regulation (AFIR). Other measures, such as the revision of the Renewable Energy Directive (RED), introduce incentives for low-carbon energy in transport.

Greenhouse gas emissions fit into two categories, namely the Emissions Trading System (ETS) and the non-ETS Emissions from electricity generation and large industry in the ETS are subject to EU-wide targets which require that emissions from these sectors must be reduced by 43% by 2030, relative to 2005 levels. Emissions from all other sectors, including agriculture, transport, buildings, and light industry are covered by the EU Effort Sharing Regulation. This established binding annual greenhouse gas emission targets for member states for the period 2021–2030.

Ireland will need to reduce its emissions from these sectors by 30.0% by 2030, relative to 2005 levels.

Road freight will be impacted by a number of the Fit for 55 proposals, including revisions to the Renewable Energy Directive (RED III), CO2 emissions performance standards for heavy duty vehicles, and most notably the *Alternative Fuels Infrastructure Regulation (AFIR).*

AFIR aims to ensure that the public has access to a sufficient infrastructure network for recharging or refuelling road vehicles or ships with alternative fuels. AFIR contains provisions for the construction of recharging points for electric HDVs and refuelling stations for hydrogen HDVs along the Trans-European Transport Network (TEN-T), which it aims to have completed by 2030.

Count Emissions EU: comparing carbon footprints

Additional information on weights and dimensions can be found at: https://transport.ec.europa.eu/transport-modes/road/weights-and-dimensions_en

The Commission is proposing a common methodological approach for companies to calculate their greenhouse gas emissions if they choose to publish this information, or if they are asked to share it for contractual reasons.

The proposed methodology is based on the recently adopted ISO/CEN standard for the quantification and reporting of greenhouse gas emissions arising from the operation of transport chains of passengers and freight.

01 https://transport.ec.europa.eu/news-events/news/green-deal-greening-freight-more-economic-gain-less-environmental-impact-2023-07-11

Reliable data on door-to-door emissions will enable operators to benchmark their services and allow consumers to make informed choices on transport and delivery options. The package also complements the Commission's proposal to update its Trans-European Transport Network (TEN-T) policy through incentives and requirements for infrastructure development, and by better integrating the different modes within a multimodal transport system. Digital technologies are also helping to increase efficiency, including the European Rail Traffic Management System and Digital Automatic Coupling for rail, the Electronic freight transport information Regulation and the European Maritime Single Window environment. 'Greening Freight Transport' is Flagship 4 of the Sustainable and Smart Mobility Strategy.

Regulation (EU) 2021/1153,

establishing the Connecting Europe Facility for the period 2021 – 2027, adapted the alignment of the Corridor. The modification includes:

- **the extension of the Corridor in Ireland westwards to connect the Port of Shannon Foynes;**
- **the addition of maritime links between the three Irish core ports of Dublin, Cork and Shannon Foynes**

The Strategy is a roadmap to decreasing transport emissions by 90% by 2050, as requested by the European Green Deal. Many of the Strategy's milestones describe how freight transport needs to become greener, such as by doubling rail freight traffic by 2050, ensuring new heavy-duty vehicles are zero-emission by the same date, and having zero-emission, ocean-going ships market-ready by 2030.

North Sea - Mediterranean corridor

The North Sea - Mediterranean (NSMED) Core Network Corridor stretches from Dublin, Limerick and Cork in the north-west to Lille, Paris and Strasbourg in the centre, Marseille in the south, and extends north-east to Benelux towards Amsterdam via Luxembourg and Brussels.

It covers five countries, namely Belgium, Ireland, France, Luxembourg and the Netherlands. It includes some of the most significant economic and production centres in Europe, as well as key European ports (Northern Range ports, Marseille, Irish ports). It reaches the German and the Swiss borders, connecting to the Rhine Alpine Corridor with onward links through the Alpine region to Italy. It also connects to the Mediterranean, Atlantic, North Sea – Baltic and Rhine - Danube Corridors opening up to wide European regions. It consists of 5,452 km of railways, 3,233 km of roads and 4,019 km of inland waterways.

The addition of Shannon Foynes also means that all core ports in Ireland are now included. Following 'Brexit', the corridor alignment was modified with the addition of maritime connections from continental Europe to Ireland, thus reinforcing the integration of Ireland within the TEN-T network. In the same spirit, Ireland has also been included in the Atlantic corridor.

The *Fifth Work Plan* was published in November 2022: *https://transport.ec.europa.eu/document/download/29aa251d-0245-4b62-b91e-116774363ef1_en?filename=5th_workplan_nsm.pdf*

Milestones for a smart and sustainable future *(01)*

All transport modes need to become more sustainable, with green alternatives widely available and the right incentives put in place to drive the transition. Concrete milestones will keep the European transport system's journey towards a smart and sustainable future on track:

By 2030

- at least 30 million zero-emission cars will be in operation on European roads
- 100 European cities will be climate neutral.
- high-speed rail traffic will double across Europe
- scheduled collective travel for journeys under 500 km should be carbon neutral
- automated mobility will be deployed at large scale
- zero-emission marine vessels will be market-ready

By 2035

- zero-emission large aircraft will be market-ready

By 2050

- nearly all cars, vans, buses as well as new heavy-duty vehicles will be zero-emission.
- rail freight traffic will double.
- a fully operational, multimodal Trans-European Transport Network (TEN-T) for sustainable and smart transport with high speed connectivity.

01 EU Mobility Strategy - https://transport.ec.europa.eu/transport-themes/mobility-strategy_en

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Decarbonising the Road Freight Sector - Ireland

Trans European Transport Network (TEN-T) Policy

The EU's Trans-European transport network policy, the TEN-T policy, is a key instrument for the development of coherent, efficient, multimodal, and high-quality transport infrastructure across the EU. It comprises railways, inland waterways, short sea shipping routes and roads linking urban nodes, maritime and inland ports, airports and terminals.

Nine core network corridors and two horizontal priorities were created to support the completion of the trans-European transport network. A European Coordinator is appointed for each corridor and horizontal priority who oversees the progress of the corridor or priority and acts as "ambassador" of the TEN-T policy.

Road

For road, the TEN-T guidelines focus on achieving either motorway or express-way standards, as well as the provision of safe and secure parking, and the availability of alternative clean fuels. Only two sections are classified as non-motorway or expressway, one of which is:

- The N69 between Limerick and Foynes, which is a mainly single-carriageway road with open junction. This will be addressed by 2030 through the construction of a new section.

TEN-T requires the development of rest areas on motorways approximately every 100 km with an appropriate level of safety and security. In 2022, the EU adopted a Commission Delegated Act supplementing Regulation (EC) N°561/2006 which sets out the minimum level of service which safe and secure parking areas need to offer to professional drivers and the procedures for their certification. *Netherlands and Belgium are compliant, France is partially compliant and Ireland and Luxembourg are not compliant.* TEN-T requires alternative clean fuels to be made available across the network for road transport, backed up by the Alternative Fuels Infrastructure Directive (AFID), the Green Deal, the SSMS and the Alternative Fuels Infrastructure Regulation (AFIR).

Two of the flagship strategies refer directly to road transport and freight:

- **Flagship 1 – Boosting the uptake of zero-emission vehicles, renewable & low-carbon fuels and related infrastructure**
- **Flagship 4 – Greening freight transport**

Intelligent Transport Systems (ITS) deployment

ITS refers to the use of electronics, information processing and communications technologies to deliver transport improvements. They are relevant to improve safety, interoperability, network management and to reduce traffic congestion and emissions. Across the Corridor there are a few projects deploying ITS. An example are the C ROADS platform pilots, involving Belgium, France and Ireland, that have been and are testing the deployment of Cooperative Intelligent Transport Systems (C-ITS) services.

Plans for the deployment of alternative fuels infrastructure

Several Corridor ports in France, Belgium and the Netherlands have started developing LNG and hydrogen bunkering facilities, with the potential to serve the maritime, inland waterway and road sectors, but these are at different stages of completion. More focus is required on the provision of alternative maritime fuels at ports in Ireland.

Sustainable and Smart Mobility Strategy

In 2020, the European Commission presented its 'Sustainable and Smart Mobility Strategy' together with an Action Plan of 82 initiatives that will guide the next four years. This strategy lays the foundation for how the EU transport system can achieve its green and digital transformation and become more resilient to future crises.

To support the greening of cargo operations in Europe, the existing framework for intermodal transport needs a substantial revamp and must be turned into an effective tool. Options to revise the regulatory framework such as the Combined Transport Directive as well as introducing economic incentives for both operations and infrastructure should be considered. Incentive mechanisms should be based on impartial performance monitoring, according to a European framework to measure transport and logistics emissions.

Multimodal logistics must be part of this transformation, within and beyond urban areas. The growth of e-commerce has significantly changed consumption patterns, but the external costs of millions of deliveries, including the reduction of empty and unnecessary runs, must be factored in. Hence, sustainable urban mobility planning should also include the freight dimension through dedicated sustainable urban logistics plans. These plans will accelerate the deployment of zero-emission solutions already available, including cargo bikes, automated deliveries and drones (unmanned aircraft) and better use of inland waterways into cities. The scarcity of transhipment infrastructure, and of inland multimodal terminals in particular, is pronounced in certain parts of Europe, and should be given the highest priority.

Missing links in multimodal infrastructure should be closed. Moreover, the transport system should work more efficiently overall with improved transhipment technologies. The EU needs the multimodal exchange of data, plus smart traffic management systems in all modes. Ultimately all transport modes for freight must come together via multimodal terminals and the Commission will take initiatives so that EU funding and other policies, including R&I support, be geared better towards addressing these issues, while fully respecting the Union's international obligations. The review of the State aid rules for railways, which already provide for a flexible framework to publicly fund multimodality, will further support that objective.

In recent years, innovative companies have demonstrated that rail freight can operate reliably and be attractive to customers. However, many domestic rules and technical barriers still hinder performance.

Decarbonising the Road Freight Sector - Ireland

The Commission will propose the revision of regulations governing Rail Freight Corridors and the TEN-T core network corridors. Integrating these corridors into 'European transport corridors', focusing on 'quick wins' like train length, loading gauge and improved operational rules, alongside the completion of key missing links and the adaptation of the core network so that it is fully freight capable, will strengthen the infrastructural dimension of our actions to promote intermodal transport. The Commission will propose to improve rules on rail capacity allocation in line with the ongoing project on the timetable redesign, to provide additional, flexible train paths.

Irish considerations as an island on the periphery of mainland Europe has different challenges and connectivity issues. The notion that the EU intermodal policy can work for Ireland is very challenging for many reasons including the population density and population dispersenment, we are a small island with no inland waterways used for freight distribution. Our ambition is as strong to decarbonise transport, however the national interest must be pontificated to ensure Europe supports our transition to decarbonise in a realistic and economically viable manner.

Rail freight needs economies of scale to be viable, at least 300km distance for rail freight and dense populations to justify the mass movement of freight by rail. When we examine Ireland's freight movement, we see that the road network has developed to support speed and certainty of delivery on a national basis. The vast majority of freight/goods moved on the roads in Ireland demand 'just in time' logistics that is 'dispatch for immediate delivery'. The rail freight model requires delivering to depots, unloading and storage at depots and is thus not time sensitive.

Whilst there are opportunities to develop rail freight in Ireland it needs to be done in a realistic and pragmatic manner. One such opportunity could be expanding upon existing services by developing links with and between ports should be prioritised as it can assist the movement of containerised freight for import and exports.

TEN-T support for the Motorways of the Sea has succeeded seeing more cargo transported more sustainably, through short-sea shipping.

Corporate Sustainability Reporting Directive

To meet its GHG reduction targets the EU Parliament has passed into law the CSRD – *Corporate Sustainability Reporting Directive* – for large organisations from 1 January 2024 for those already subject to the *Non Financial Reporting Directive* - NFRD - (reporting in 2025) and from 1 January 2025 for all other large companies (reporting in 2026).

It modernises and strengthens the rules concerning the social and environmental information that companies have to report. A broader set of large companies, as well as listed SMEs, will now be required to report on sustainability. Large organisations are gathering data across their supply chains, so even if CSRD only applies to a company's customers, as a service providers may be asked to supply a lot more information than heretofore.

Green Freight Strategy

The current Weights and Dimensions Directive sets the maximum weight length, width and height for heavy-duty vehicles. The proposal revises these rules to allow additional weight for vehicles using zero-emission technologies, as they tend to increase a vehicle's weight.

This will incentivise the take-up of cleaner vehicles and technologies. Once the technology develops and zero-emission propulsion systems become lighter, thanks also to the use of aerodynamic devices and cabs, cleaner vehicles will benefit from additional loading payload in comparison to conventional lorries. The uptake of more aerodynamic cabins and other energy-saving devices will also be encouraged, not only improving driver comfort and safety, but also increasing the efficiency of zero-emission powertrains – meaning the mechanism that transmits the power from the engine to move the vehicle.

The proposal will also provide clarity on the use in cross-border traffic, in certain conditions, of heavier and longer vehicles, which are allowed today in some Member States. This includes clarifying that Member Stated who allow European Modular Systems (EMS) in their territories, will also be able to use them in international operations among these neighbouring Member States, without a need for a bilateral agreement and without a restriction of crossing only one border. This will mean the same amount of cargo can be carried in fewer trips.

IRELAND

Ireland's 'Clean Vehicles Directive', was published on the 20th June 2019. The Directive promotes clean mobility solutions in public procurement tenders, providing a solid boost to the demand and further deployment of low- and zero-emission vehicles. The Directive defines "clean vehicles" and sets national targets for their public procurement. It applies to different means of public procurement, including purchase, lease, rent and relevant services contracts.

The revised Directive defines a "clean vehicle" as follows:

- Clean light-duty vehicle: any car or van meeting the following emission thresholds:

  - until 31 December 2025: no more than 50g/km CO2 and up to 80% of applicable real driving emission (RDE) limits for NOx and PN;

  - from 1 January 2026: only zero-emission vehicles.

- Clean heavy-duty vehicle: any truck or bus using one of the following alternative fuels: hydrogen, battery electric (including plug-in hybrids), natural gas (both CNG and LNG, including biomethane), liquid biofuels, synthetic and paraffinic fuels, LPG.

Zero-emission heavy-duty vehicles are defined as:

- For light-duty vehicles (cars and vans), the definition is in line with the corresponding provisions under the latest CO2 emission performance standards for cars and vans (Regulation 2019/631). In the first period, until 2025, the focus will be on low-emission vehicles, ***while in the second period, starting in 2026, the focus will be only on zero-emission vehicles.***

Carbon Budgets

The Climate Action and Low Carbon Development (Amendment) Act 2021 establishes a system of carbon budgeting with three five-year economy-wide budgets included in each carbon budget programme. The first carbon budget programme will comprise carbon budgets for the following periods: 2021-2025; 2026-2030 and 2031-2035. Each five-year carbon budget sets a limit on an economy-wide basis to the amount of GHGs that can be emitted in the period.

The economy wide carbon budgets will be supplemented by sectoral emissions ceilings, setting the maximum amount of GHG emissions that are permitted in a given sector of the economy during each five year carbon budget. The Minister for the Environment, Climate and Communications, in consultation with other relevant Ministers, will develop a sectoral emissions ceiling for each relevant sector within each five-year budget, once the overall carbon budget has been adopted. These sectoral emission ceilings will be approved by government.

Climate Action Plan 2024

The Government of Ireland's Climate Action Plan 2024 (CAP 24) refines and updates the measures and actions required to deliver the carbon budgets and sectoral emissions ceilings. The Plan provides a roadmap for taking decisive action to halve Ireland's emissions by 2030 and reach net zero by no later than 2050, as committed to in the Climate Action and Low Carbon Development (Amendment) Act 2021. 2023 saw the publication of new national policies, plans and strategies as well as European initiatives under the Fit for 55 package that will bolster and reinforce Ireland's decarbonisation pathway. These include:

- *National EV Charging Infrastructure Strategy* and associated National En-route EV charging plan;
- The *Renewable Fuels for Transport Policy Statement* 2023-2025;

Within *CAP 24*, in the area of 'Transport' while progress is being made, the Plan acknowledges that there are significant internal and external risks and challenges to delivery, including:

- Inflation and Exchequer Funding:

Delivering the policies, services and infrastructure required to achieve emissions targets requires sustained and significant Exchequer funding across all areas;

- Project Delivery Delays, including Planning:

While progress is being made, institutional processes currently impact the delivery of transport infrastructure/services to provide more sustainable travel alternatives, including in the overall planning system, as well as stakeholder consultation

- Supply Chain Issues:

Although recent supply chain issues - which arose from both the COVID pandemic and war in Ukraine - are less of an issue in 2023 than in recent years, the delivery of new bus and rail fleet, as well as the global EV supply chain, is still subject to some delays.

- Market Capacity and Skills:

Ireland, like many other economies, is experiencing a skills shortage in many areas. Examples range from infrastructure designers, consultants and construction specialists, to operatives and mechanics which impact the speed of infrastructure delivery

- Charging Infrastructure and Renewable Transport Fuels:

There are a range of technical and supply chain risks to the roll-out of EV charging and alternative fuel supply and infrastructure – including high powered charging infrastructure - which must be closely managed in order to ensure achievement of carbon emission reduction targets.

Decarbonising the Road Freight Sector - Ireland

The Plan acknowledges that addressing these risks and challenges requires a range of responses along with a cross-Government partnership approach, involving relevant Departments, Local Authorities, industry, academia, and wider society. It highlights key recommendations of the Climate Change Advisory Council (CCAC) for the transport sector:

- Choices need to be made now on the design and implementation of demand management measures through the development of the National Demand Management Strategy. This should use proven approaches to drive behavioural change such as road pricing (e.g. congestion charging, low-emission zones), parking restraints and fuel pricing.

- It is recommended that the target for commercial electric vehicles should be increased to 150,000 by 2030 from the current target of 95,000 to support decarbonisation of commercial vehicle activity, with consideration of additional incentives to support adoption by businesses.

- A national certification/accreditation system for eco-driving programmes as identified in the Road Haulage Strategy (December 2022) should be established immediately along with a policy for the development of freight consolidation centres. A step up in ambition is also required on the future role of Ireland's rail network in order to significantly increase the proportion of inland freight tonnage moved by rail.

Key actions to deliver abatement in transport for the period 2024-2025 for haulage and logistics:

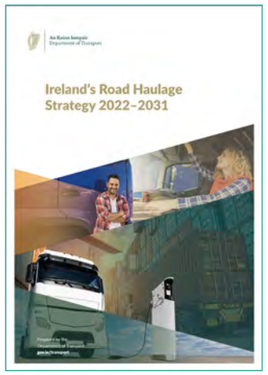
2024

- Advancement of decarbonisationelements of Road Haulage Strategy
- Enhanced rail connectivity to ports – rehabilitation of Shannon-Foynes freight line.
- Establish a national certification/accreditation system for eco-driving courses and consider mechanisms and incentives for operators to adopt and maintain eco-driving practises.

2025

- Advancement of Road Haulage Strategy (RHS) work programme.

Road Haulage Strategy – Decarbonisation Programme



The heavy goods fleet comprises vehicles which are almost exclusively fuelled by diesel. While decarbonisation will remain a significant challenge for the sector over the medium term to 2030 and beyond, CAP24 highlights a growing drawdown of funding supports available under the *Alternative Fuel Heavy Duty Vehicl*e scheme.

Ireland's Road Haulage Strategy (published December 2022) provides a roadmap as to how the Irish Government will support the Road Freight sector to decarbonise and meet the targets set out in the climate action plan. 35.0% of recommendations in the Haulage Strategy relate to decarbonisation.

CAP23 included a new target for the sector following Ireland becoming a signatory in November 2022 to the Global MOU on Zero Emission Medium- and Heavy-Duty vehicles.

This non-binding agreement targets 30.0% of sales of new Medium- and Heavy-duty vehicles (trucks and buses) to be zero emission by 2030, increasing to 100.0% of new sales in 2040.

A critical element in supporting the transition will be the provision of charging infrastructure for heavy-duty vehicles. In order to enable the delivery of this infrastructure. This meets the requirements set out in the recently agreed Alternative Fuels Infrastructure Regulation (AFIR) and targets dedicated publicly accessible charging pools for HDVs of 3,600 kW at 60 km intervals on the core TEN-T network and of 1,500 kW at 100 km intervals across the comprehensive TEN-T network by 2030.

As a transitional measure, increasing the amount of renewable transport fuels (e.g., biodiesel) in the national fuel mix will provide a level of emissions savings from the existing fleet.

In line with meeting EU ambition, the Irish Government has committed to achieving a 51.0% reduction in Ireland's overall Green House Gas emissions from 2021 to 2030, and to achieving net-zero emissions no later than 2050. These legally binding objectives are set out in the Climate Action and Low Carbon Development (Amendment) Act 2021.

Under the Renewable Transport Fuel Obligation, which is administered by the National Oil Reserves Agency (NORA), there is an obligation on suppliers of mineral oil to ensure that a percentage of the motor fuel they place on the market in Ireland is produced from renewable sources.

In 2022, 7.0% of the diesel fuel supplied was from renewable sources and it is the intention to increase the level of renewable fuel usage in transport such that Ireland achieves an equivalent 20.0% biodiesel blend by 2030, a move which will help to significantly reduce emissions from the Road Freight sector.

Additionally, there is a full relief from the carbon component of Mineral Oil Tax for liquid or gaseous fuels that have been produced from biomass. This means that no carbon tax applies to biofuels, such as Hydrogenated Vegetable Oil or biomethane, used in any road vehicle, private or commercial. The carbon tax relief for biofuels is intended to promote a higher level of biofuel usage and supports the Government's commitment to incentivising more environmentally friendly alternatives to fossil fuels. This means that, as annual increases in the carbon tax are implemented, the differential in tax costs between biofuels and fossil fuels will continue to widen, further incentivising the uptake of biofuels.

Eco-Driver training, which trains drivers to operate their vehicles in a safer and more eco-friendly manner, will be important in promoting decarbonisation in the road freight sector. This training, which has been proven to lead to a significant reduction in fuel consumption and related carbon emissions, not only benefits the environment, but it also improves road safety and generates cost savings and improved efficiencies for road freight operators. In line with the objectives of CCAC in relation to establishing a certification / accreditation system for eco-driving, the Department of Transport is currently working towards establishing such a standard for eco-driving courses and will, in addition, analyse what incentives and measures could be introduced to increase the number of drivers undertaking available courses.

Further measures which have the potential to assist in the decarbonisation of the sector include a longer trainer trial (part of the Haulage Strategy) and a study to establish the potential for logistics consolidation hubs and the promotion of digital and operational efficiencies such as load sharing. Improving asset sharing through digitalisation can result in more efficient use of vehicle capacity to reduce the number of kilometres operated with empty/part loads. Research is to be undertaken to examine the policy options to reduce carbon emissions through these efficiencies and assess how they will play a role in Ireland's journey to net zero will be progressed in 2024. It will also assess how state funding can play a role in developing and promoting these new ways of doing business.

To encourage intermodal transport, whereby goods are moved using two or more transport modes but with a standardised cargo unit (like a container trailer or other), lorries, trailers and semitrailers will be allowed to carry extra weight. Extra height will also facilitate the transport of high-cube containers by standard vehicles.

Rail Freight

Irish authorities have plans to deploy Level 1 ETCS on the whole network by 2040. A GSM-R communication system is being rolled out to replace the existing analogue radio network by 2025. The reinstatement of the rail connection from Limerick to Foynes - ongoing, is to be completed by 2030. The all island Rail Strategy was published in July 2023 and aims to inform policy and future strategy for the railways in both jurisdictions on the island of Ireland A new rail strategy for Ireland will enable planning for future investments in Irish rail infrastructure and rolling stock.

This is complementary to the existing Irish Rail Freight Strategy, which includes a plan to develop a network of intermodal freight facilities in collaboration with the freight and logistics industry, starting with strategic terminals to the west of Dublin and at Limerick Junction, extending over time with smaller tactical terminals in Cork, Galway and Sligo. In parallel, measures to alleviate traffic congestion around urban nodes are also ongoing.

There has been a renewed investment programme in Dublin to make significant enhancements to public transport, such as the MetroLink project to connect the airport with the city centre by light rail (planning and design work are almost complete with an expected completion date by 2034) and the ongoing DART+ programme, which is planned to triple the length of the electrified commuter rail network in the Greater Dublin Area.

In Cork, Ireland has been able to use funding from the EU Recovery and Resilience Fund to part-fund network capacity enhancements to Cork's commuter rail system (€185m of expenditure between 2022 and 2026). This is only the first phase of the investments needed to decarbonise and boost the use of rail in the Cork urban area.

Targets

CAP 24 outlines key targets for the transport sector that include:

- 20% reduction in total vehicle kilometres travelled relative to business-as-usual,
- 50% reduction in fuel usage, and significant increases to sustainable transport trips and modal share.

© FTA Ireland 2024

It reiterates that fleet electrification and biofuels will continue to provide the greatest share of emissions abatement in the medium term.

Measures and Actions

The Avoid-Shift-Improve framework for transport sustainability was introduced in CAP23 and this approach has been applied again in CAP24

Following the publication of the National EV Charging Infrastructure Strategy in January 2023, and recent publication of the draft National En-Route EV Charging Plan, the primary focus over coming years will be on expansion in the provision of public charging infrastructure alongside the development of Regional and Local Authority EV Charging Network plans, alongside a gradual move to reduce reliance on vehicle grants in line with international best practice and the continuing mainstreaming of the EV sector within the overall vehicle market.

The vision set for the deployment of public charging infrastructure, which envisages a 300% increase in charging capacity by 2025 and will see fast recharging stations established for cars and vans every 60 km along the main transport corridors, as well as dedicated HGV charging facilities on the TEN-T network and at key urban nodes, will bolster public confidence in transitioning to electric vehicles, and is in line with the European Parliament and Council's recent adoption of the new Alternative Fuels Infrastructure Regulation (AFIR). The Regulation also means that users of electric or hydrogen-fuelled vehicles will be able to pay at recharging or refuelling points with payment cards or contactless devices – without needing a subscription. Operators of recharging or refuelling points will be required to provide consumers

Renewable Fuels for Transport

Renewable transport fuels, including biofuels, will continue as a core transitional measure for the medium-term reduction of greenhouse gas emissions in transport. Modelling analysis of this measure projects a carbon saving of 1.08 MtCO2eq by 2030, equating to 13.7% of transport sector decarbonisation in a central scenario. Here, it is noted that the balance of overall emissions abatement through renewable fuels could potentially be greater should the electrification of the vehicle fleet and behavioural change measures fall below the targets set.

The Climate Action Plan biofuels target will continue to be delivered through annual increases in the statutory renewable transport fuel obligation (RTFO) on fuel suppliers requiring a minimum proportion of renewable transport fuel supply. The trajectory of these annual increase in the RTFO rate for the next two years and indicative rates to 2030 has been set out in the updated Renewable Fuels for Transport Policy Statement 2023-2025 published in June 2023.

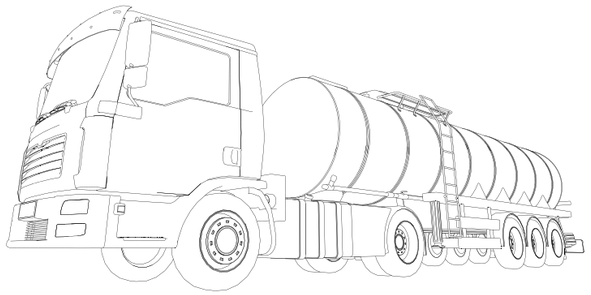
Zero Emissions Vehicles Ireland (ZEVI) has recently set out its draft National En-route EV Charging Network Plan.

Hydrogenated Vegetable Oil (HVO)

OVERVIEW

HVO - Hydrogenated Vegetable Oil

HVO is an advanced diesel alternative that offers immediate reductions in carbon emissions. Manufactured from 100% certified waste derived and sustainable raw materials, HVO can be used as a drop-in alternative to diesel in existing vehicles and heavy-duty equipment without engine modifications.



The benefits of HVO

- HVO reduces carbon emissions by up to 90%
- Excellent cold-weather performance: higher cetane number (up to 90) and lower cold filter plugging point (CFPP) providing better starting performance than regular diesel, clean combustion and less chance of waxing in extreme temperatures
- A wide range of OEM approvals means HVO can be used without modifications
- Reduced need for regular testing: impurities are removed during the production process, eliminating the key factors for fuel degradation and increasing shelf life to around 10 years
- HVO is available from Inver's state-of-the-art terminal in Foynes and selected forecourts for fleet users.

CASE STUDY

Portway's transitions to HVO to reduce emissions

Portway are a leading haulier of liquid fuel products in Ireland, responsible for transporting millions of litres of fuel annually to forecourts across the country. Many of their deliveries originate from the AFSC Terminal in Foynes (Co. Limerick), co-owned by Inver. Overseen by David Irwin, Head of Fuel, Portway operates a fleet of over 100 trucks and trailers, maintaining Silver Standard FTAI Operator status.

Their challenge:

Like all hauliers, Portway are facing the pressing need to reduce their emissions profile, aligning with evolving environmental regulations and customer expectations.

Portway's journey

Following a meeting with a customer, Portway was questioned in relation to the emissions profile of their fleet, which at the time was running on standard B7 diesel, emitting circa 2.6 KG of CO_2e per litre consumed.

By renewing their tractor fleet every five years, Portway was seeing improved engine efficiencies in the newer vehicles, but a solution was needed to lower their emissions further in order to meet Government and European policies targeting a 49% reduction in GHG emissions.

Portway's strategy was to explore viable solutions with their team of logistics, mechanical, financial, and safety specialists.

Together, they evaluated different fuel options against a criteria that included driver acceptance, operational impact, cost efficiency, availability, safety, and environmental efficiency. After exploring their options, HVO stood out as the most viable option demonstrating an optimal balance of performance, price, and risk.

Driver acceptance

As HVO is a drop-in replacement, the drivers' experience is almost identical to that of diesel during refuelling. There is no reduction in power or performance and the driver is able to use their existing vehicle, with no engine modifications needed.

After running a trial with a number of vehicles for two weeks, the feedback from the drivers was that the transition was seamless. Lead driver Simon stated: "I don't see any difference and it is always better to avoid emissions."

HVO

Operational Impact

Readily available from Portway's current refuelling locations, HVO is compatible with the same fuel cards and the transition would have a minimal impact on Portway's operations with no changes to routes, vehicles, or refuelling procedures. Edel King, Portway Operations Manager, noted the importance of maintaining maximum operational capacity: "Drivers and driver hours are limited resources and anything that negatively impacts these affects our business and the business of our customers".

Cost efficiency

In order to determine their strategy for decarbonisation, Portway considered a number of options including changing their fleet. However, this alternative would incur high costs and take longer, owing to the number of vehicles to be replaced, and the infrastructure needed for maintenance, delivery and training.

Availability

Inver's dedicated tanks for HVO at the Foynes Terminal ensure consistent availability. With HVO available at selected Inver forecourts and compatible with existing fuel cards, there were no delays in adoption.

Safety

HVO is a paraffinic diesel, meaning similar to mineral diesel, it has a low ignition risk. The fuel is not stored at pressure. No additional training and PPE are required to store and use HVO.

Environmental Efficiency

With a certified GHG reduction of up to 90%, HVO offers significant environmental benefits. Inver's compliance ensures traceability and credibility of HVO's low-carbon credentials.

Conclusion

After thorough evaluation, Portway concluded that HVO offered an optimal balance of performance, price and risk. "With Inver's support, we seamlessly transitioned to HVO fuel, significantly reducing our carbon emissions immediately, while having minimal impact on our operation", concludes Ross Cunningham, Head of Commercial at Portway. With a call to the Inver team, HVO was registered as an available product on his Inver Fuel Card and he was able to refuel his trucks using HVO at the Inver station in Johnstown, Co. Kilkenny, on the same day.

B20

B20 is a high percentage biofuel that contains an average of 20% biodiesel and 80% diesel and can be used to fuel numerous on-road and off-road diesel engines. B20 fuel meets the EN 14214 specifications and can be used in existing vehicles already on the road, including hard to decarbonise heavy goods vehicles. B20 is increasingly popular with fuel retailers and fleet operators worldwide, representing a good balance of cost, emissions reduction and cold-weather performance.

The benefits of B20

- B20 offers immediate carbon emission savings of up to 13% compared to regular diesel
- Priced relative to the same index as regular diesel
- Can be used in existing vehicles without engine modifications
- Delivers the same performance as regular diesel

ABOUT INVER ENERGY ('INVER')

Inver has been supplying quality fuels across Ireland for over 40 years. From their jointly owned terminal in Foynes, Inver offers nationwide supply to industrial and commercial markets such as transport, construction and agriculture. Inver's renewable fuel offering includes B20 (20% biodiesel) and HVO (Hydrogenated Vegetable Oil) which are both readily available alternatives for commercial vehicles. Both fuels offer an immediate reduction in carbon emissions without significant capital investment.

Learn more about our fuels at:

www.inverenergy.ie

inver

HVO

Adoption journey with inver

Reduce your emissions by up to 90% with Inver's HVO see how simple the transition can be:

EVALUATE LOW CARBON OPTIONS

The fleet manager considers available options for lower-carbon transport fuels.

CHOOSE HVO

Considering all the available information, including the FTAI Low Carbon Transport report, the Transport Manager identifies that HVO is the most suitable fuel for their business, recognising budget and priorities.

The Fleet Manager then confirms with the vehicle manufacturer that HVO 100 is suitable for their fleet.

INITIAL TRIAL

The fleet manager arranges an initial trial, where one of their drivers refuels with HVO at select Inver forecourts using credit card or cash, no notice needed.

CONTACT INVER

Following a successful trial, the fleet manager contacts Inver's Sales Team to activate a Fuel Card account and HVO as a product. HVO can be implemented across the whole fleet in a matter of days

REFUELLING OPERATION

Drivers refuel with HVO at Inver forecourts using the Inver fuel card, just like with diesel. No additional training, PPE or technology change needed.

FUEL MANAGEMENT

For larger fleets, Inver can deliver HVO directly to the depot's storage tank. The fleet manager contacts Inver's Sales Team to set up a Commercial account and place an order with next day delivery.

SEAMLESS TRANSITION

Fleets can transition in around a week, reducing emissions by 90% with little to no operational impacts.

NO DOWN TIME, NO ROUTE CHANGES, NO DELAYS.

Start your decarbonisation journey with HVO today!

Contact our team:

+353 (0) 21 439 6950

inver@inverenergy.ie

www.inverenergy.ie

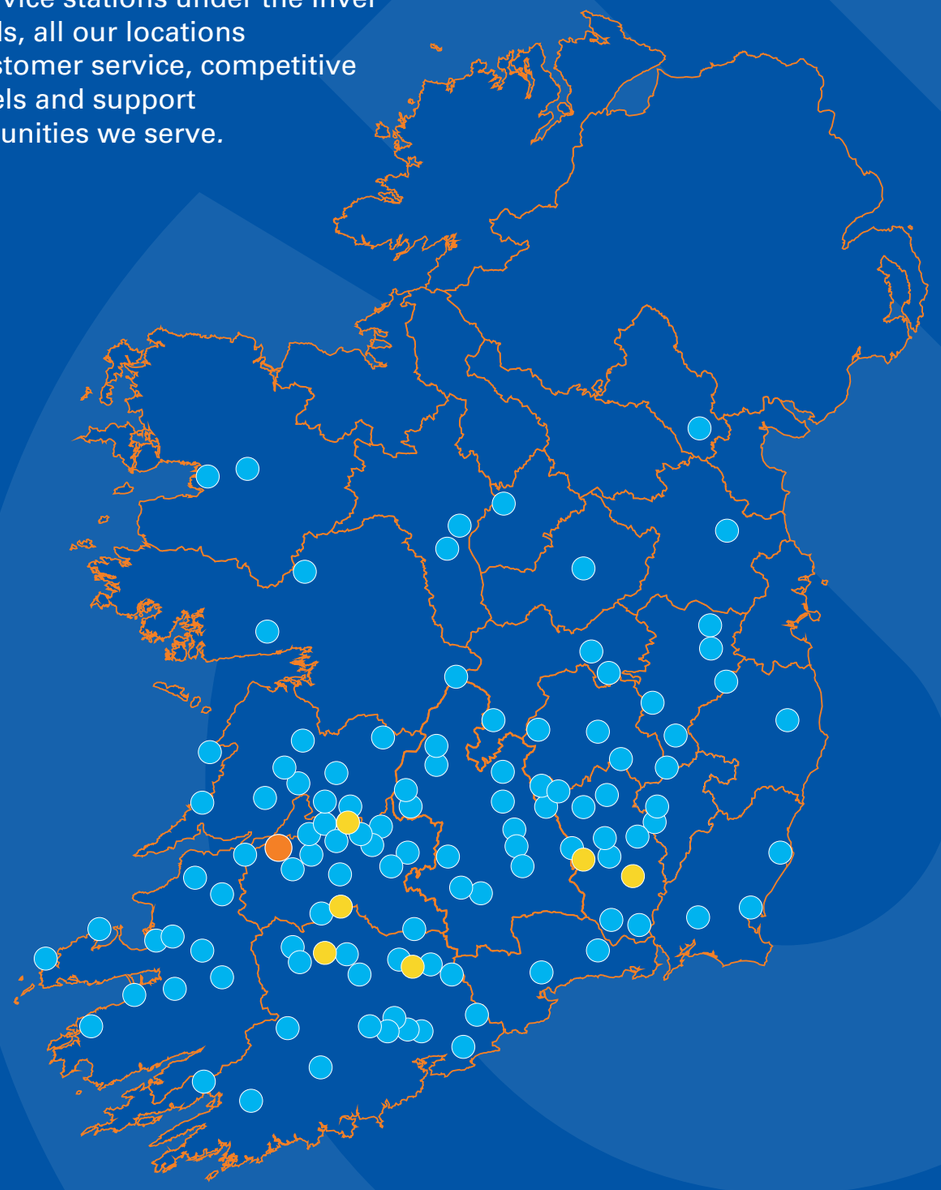
invercommunity

inver

Part of the Greenergy Group

From our jointly owned terminal in Foynes, Inver offers a range of fuel products to industrial, commercial, agricultural, domestic, wholesale and retail customers across Ireland.

With over 100 service stations under the Inver and Amber brands, all our locations offer superior customer service, competitive prices, quality fuels and support to the localcommunities we serve.



- Inver network
- HVO Locations
- Foynes Terminal

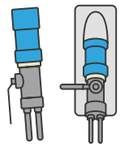
If you are interested in HVO for your fleet in any location, get in touch.

inverinfo@greenergy.com | invercommunity | www.inverenergy.ie | invercommunity

inver HVO

PARTNER PROFILE

Compressed Natural Gas (CNG) & Biomethane



OVERVIEW

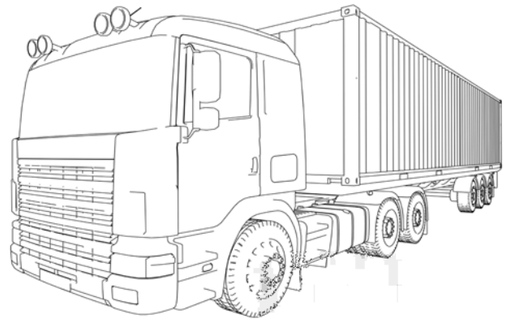
There is increasing demand from the transport sector for more decarbonised customer supply chain solutions. Being able to offer a lower-carbon transport solution is a strong differentiator for any business as it demonstrates a focus on sustainability when tendering for new business. Compressed natural gas (CNG) and renewable bioCNG, reliably delivered through the national gas network, will be key to driving sustainable supply chains and help deliver a net-zero commercial transport in Ireland.

CNG is gas that has been compressed and stored at high pressure to be used as a transport fuel. It is particularly suitable for use in commercial heavy goods vehicles (HGVs) where electric solutions are not currently a viable option. The gas used can be either natural or renewable gas (bioCNG) that meets the network specifications, providing a pathway to more sustainable transport.

BioCNG stands for bio-compressed natural gas (BioCNG). This is a renewable gas that has been produced from organic waste. BioCNG is chemically similar to CNG and so it can be used by current CNG vehicles to deliver a significantly reduced carbon footprint.

ANNUAL CO2 EMISSIONS - BY TRANSPORT MODE (MTCO2)		
01. Private Car	5.746	49.7%
02. Heavy Goods Vehicle (HGV)	2.281	19.7%
03. Unspecified (Road)	1.262	7.6%
04. Light Goods Vehicle (LGV)	0.877	4.8%
05. Fuel Tourism	0.557	2.7%
06. Public Passenger	0.315	2.6%
07. Navigation	0.303	1.3%
08. Rail	0.149	0.3%
09. Gas Pipeline	0.037	0.4%
10. Domestic Aviation	0.041	10.9%
TOTAL	11.568	

There are currently almost 130 CNG HGV vehicles operating across the Republic of Ireland, providing transportation and logistics services to multiple sectors, and this number is growing.



The majority (95%) of these vehicles are now operating on bioCNG (compressed biomethane) This bioCNG is purchased by gas suppliers and sold to the market using the Irish Renewable Gas Certification Scheme administered by Gas Networks Ireland. This transport fuel is certified as a 100% renewable fuel.

A significant challenge

According to the SEAI Energy in Ireland Report, 34.3% of Ireland's energy-related emissions in 2022 came from the transport sector. In the same year, final energy consumption in the transport sector in Ireland was dominated by imported fossil fuels (97.4%). Ireland faces a significant challenge to meet its emission reduction targets, particularly in the transport sector, as it is one of the most difficult sectors to decarbonise.

When considering the percentage share of transport CO2 emissions by sub-sector for transport, it is clear that private cars and Heavy Goods Vehicles (HGV's) are the most significant emitters with 49.7% and 19.7% of the total emissions coming from these transport modes respectively. While there is clear policy and support for the private car sector, with a focus on electrification, the emissions reduction pathway for the road freight sector is not as clear cut. This sector is difficult to decarbonise due to availability of suitable alternative engines, clean technology maturity, high cost of alternative engines, vehicle range issues and the cost of alternative fuels and vehicles.

CNG / BIOMETHANE

With a clear understanding of where the transport emissions are coming from, Ireland now requires a clear road map on how to deliver the required emission reductions.

When considering the percentage share of transport CO2 emissions by sub-sector, private cars and road freight are the most significant emitters with 49.7% and 19.7% of the total emissions coming from these transport modes respectively. While there is definitive policy and support for the private car sector, with a focus on electrification, the emissions reduction pathway, for the road freight sector is not as clear. This sector is difficult to decarbonise due to availability of suitable alternative engines, clean technology maturity, high cost of alternative engines and vehicle range issues.

A multi-faceted approach

There are currently about 390,000 goods vehicles registered in Ireland and 2.25 million private cars. Heavy goods vehicles (HGVs) account for approximately 5% of all vehicles on Ireland's roads and produce almost 20% of total emissions for this sector. Supporting a relatively small number of these HGVs to switch to cleaner alternatives would have a significant reduction in overall emission levels when compared to private car sector numbers. A significant emissions reduction in the transport sector could be achieved in a short timescale by developing a technology shift roadmap and utilising all forms of alternative technologies; there is no "one fit for all" solution for haulage companies as decarbonisation demands a multi-faceted approach. Developing a short, medium and long-term solution pathway will allow these technologies to develop.

Using CNG technology to power trucks and buses offers a real solution today to eliminate emissions from diesel-fuelled HGVs. CNG technology enables the vehicles to operate on natural gas or biomethane, with the fuel stored at high pressures (over 200 bar) and delivered to the engine. Advances in storage technologies are leading the way to reaching ranges comparable to diesel equivalent technologies. CNG vehicles are compatible with both natural gas and biomethane and the technology is particularly suitable for HGVs where electric solutions pose significant challenges (range and cost). This is important considering that road freight account for almost 20% of the CO2 emissions associated with road and rail transport (excluding aviation). CNG is a safe and reliable mature technology with over 1.4 million CNG vehicles in use in Europe2 and close to 30 million worldwide.

An established European technology

There are currently almost 4,200 CNG filling stations operating across Europe with many offering bioCNG. The leading countries offering biomethane as a transport fuel are Denmark and Sweden, supplying shares of 100% and 595% biomethane at their 17 and 205 CNG stations, respectively. They are followed by the Netherlands with 90% (across 185 CNG stations), the United Kingdom with 93% (across 10 CNG stations), and Norway with 63% (across 31 CNG stations). While Germany's 821 CNG stations already delivered 60% biomethane and Italy's 1,392 stations delivered 19% biomethane in 2020.

The European Commission estimates that there will be at least 467 TWh of biogas and biomethane available in 2030, and Gas for Climate estimates 1,020 TWh of biogas and biomethane by 2050. From today's production of 22 TWh of renewable gas, Europe has a potential of 1,200 TWh. Out of this, 117 TWh of renewable gas will be distributed as transport fuel, which represents 40% of the overall fleet consumption in 2030.

Demand for bioCNG refueling stations is growing in Ireland. To develop the market for gas as a transport fuel, real engagement and collaboration is required between all stakeholders in the sector, from HGV fleet operators to forecourt operators, network operators (gas grid), equipment suppliers (truck manufacturers) etc. An important policy requirement could include a support scheme for bioCNG forecourt operators to support the business model for bioCNG infrastructure and reduce investment risk.

KEY CONSIDERATIONS

Savings to be achieved

Switching from diesel to CNG or bioCNG can result in savings as follows:

- Reductions of more than 20% CO2 emissions can be achieved by switching from diesel to compressed natural gas (CNG). This is due to the higher carbon content of diesel compared with natural gas.

- Reductions of up to 100% CO2 emissions can be achieved from switching to renewable bioCNG. The use of bioCNG in any application is considered to be a fully carbon-neutral alternative to diesel.

- Biomethane injected into the Gas Networks Ireland grid can be transported to CNG refilling station and dispensed as bioCNG. Where the biomethane is certified by an EU Voluntary scheme as meeting the sustainability and greenhouse gas (GHG) reduction criteria set out in RED II, it is fully renewable. This renewable gas is a zero-emissions fuel in the transport sector and qualifies for the Road Transport Fuel Obligation (RTFO).

By the end of the 2032, Gas Networks Ireland is expecting annual bioCNG demand to exceed 360 GWh/yr, leading to annual emission savings of more than 73,000 tCO2.

Decarbonising the Road Freight Sector - Ireland

CNG / BIOMETHANE

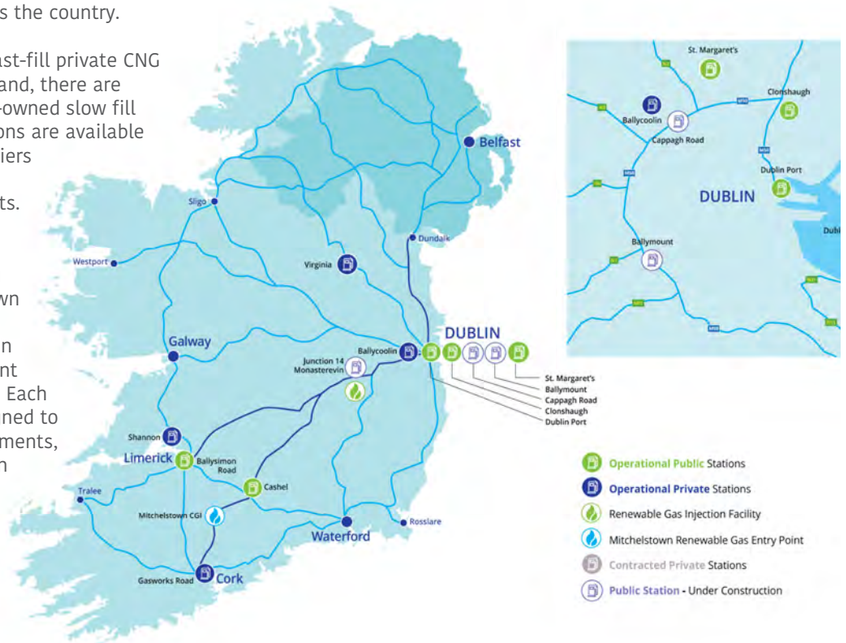
According to the International Energy Agency, the average price of diesel worldwide is around $0.90 per litre, while CNG costs approximately $0.60 per gasoline-gallon equivalent (GGE). This is more than a 33% saving in the cost of fuel when switching from diesel to natural gas. In Ireland, the price of CNG and BioCNG fluctuates depending on the wholesale price of natural gas, but as of March 2024 the differential at some public stations was up to 30%. This cost difference provides businesses with a compelling reason to consider CNG as a viable option.

Ireland's CNG refuelling network

To provide an affordable carbon-neutral alternative fuel to diesel in the Irish market, Gas Networks Ireland has been developing a nationwide CNG fuelling network, co-located in existing forecourts, on major routes and close to urban centres. The combination of bioCNG, together with this extensive national network of refuelling stations connected to the gas network, provides a practical and cost-effective option for decarbonising the road transport sector.

There are currently nine (9) CNG stations in operation in Ireland. This includes five (5) public forecourt fast-fill stations and four private fast-fill stations. The public stations have been developed as part of the Causeway Study which is funded by the Commission for Regulation of Utilities (CRU) and the Connecting Europe Facility (CEF) Transport Fund. The public stations are operated by Circle K in their forecourts in Dublin, Cashel and Limerick. A further four public stations are at various stages of development and will be completed and operating by the end of 2024. See map showing the locations of the current and planned CNG stations across the country.

In addition to the four (4) fast-fill private CNG stations in operation in Ireland, there are also several small privately-owned slow fill stations. Private CNG Stations are available for fleet operators and hauliers who want to avail of their own on-site refuelling depots. Private CNG stations allow those who require more control over their refuelling patterns to do so in their own locations. Ideally, private stations should be located in close proximity to the current gas network infrastructure. Each private station can be designed to individual customer requirements, with specifications based on several factors including, fleet size, volume of gas required and nature of business. Recent policy and regulatory developments clearly show that the potential offered by the gas network and indigenously produced bioCNG to Ireland's transport sector is recognised and understood. The Climate Action Plan 2023 emphasised the role for renewable gases and the rollout of planned CNG refuelling infrastructure such as the Causeway Study project. The gas network can provide even greater support to the transport sector in future but only with further policy, planning and stakeholder support.



KEY BENEFITS

There are many benefits associated with moving from high-carbon diesel fuel for HGVs to CNG or bioCNG. Some of the benefits to fleet operators and the wider environment are listed below:

Cost Savings

Switching from diesel to CNG or bioCNG can save fleet operators up to 30% in fuel costs, a hugely significant savings in a sector that operates on tight margins.

Refuelling Times Comparable to Diesel: CNG refuelling times are like diesel, making it convenient for commercial fleets and drivers accustomed to quick refuelling stops. Unlike electric vehicles (EVs), which may require longer charging times, CNG vehicles can refuel rapidly, reducing downtime and increasing productivity.

CNG / BIOMETHANE

Excellent Range: The range of CNG or bioCNG HGVs depends heavily on the capacity and number of gas storage cylinders installed in the vehicles. On average, ranges of between 600Km and 800Km can be achieved, but this can be increased further to over 1,000Km by the addition of extra storage capacity either under the chassis or behind the cab. This is comparible to diesel vehicles which is an important benefit of switching to CNG for vehicle operators.

Quieter to Drive: CNG engines operate more quietly than diesel engines, resulting in reduced noise pollution in urban areas and along transportation routes. This quieter operation enhances the comfort of drivers and passengers and contributes to a more pleasant urban environment. This is a particular advantage for waste collection operations or hauliers delivering to, for example, hotels and hospitals through the night and into early morning.

Emission Savings: CNG and bioCNG combustion releases lower levels of greenhouse gases (GHGs) such as carbon dioxide (CO2), helping to mitigate climate change impacts and meet emission reduction targets.

Transport Operators: Switching to CNG or bio-CNG can result in lower fuel costs, reduced emissions and reduced maintenance expenses due to cleaner combustion, extending the lifespan of vehicles.

Government and Society: Reduced emissions from CNG and bio-CNG contribute to meeting environmental targets, improving public health, and mitigating climate change impacts.

Agricultural Sector: Biomethane production utilises organic waste materials, providing an additional revenue stream for farmers and waste management facilities while promoting circular economy principles.

Overall, CNG offers a range of benefits over traditional diesel fuel, including comparable refuelling times, good range, quieter operation, and significant emission savings. These advantages make CNG an attractive alternative for commercial fleets, public transportation systems, and individual drivers seeking cleaner, more sustainable transportation options. By promoting the adoption of CNG vehicles and infrastructure, governments, businesses, and communities can work together to improve air quality, reduce greenhouse gas emissions, and create a healthier and more sustainable future

OPERATIONAL CONSIDERATIONS

Infrastructure Development: Establishing a network of CNG refuelling stations is essential for widespread adoption, requiring collaboration between government, private sector stakeholders, and energy providers. With future advances in hydrogen technologies in transport, the gas infrastructure can be transitioned to hydrogen networks into the future, enabling further emissions savings in the transport sector.

Vehicle Fleet Transition: Encouraging the adoption of CNG-compatible vehicles through incentives, subsidies, or regulations can accelerate the transition to cleaner fuels.

Policy Support: Implementing supportive policies such as tax incentives, emissions regulations, and renewable energy targets can facilitate the growth of the CNG and bio-CNG market.

ABOUT GAS NETWORKS

Gas Networks Ireland operates and maintains Ireland's €2.8bn, 14,725km national gas network, which is considered one of the safest and most modern renewables-ready gas networks in the world.

Over 720,000 homes and businesses trust Ireland's gas network to provide efficient and reliable energy to meet their heating, cooking, manufacturing and transport needs. The gas network is the cornerstone of Ireland's energy system, securely supplying more than 30% of Ireland's total energy, including 40% of all heating and almost 50% of the country's electricity generation.

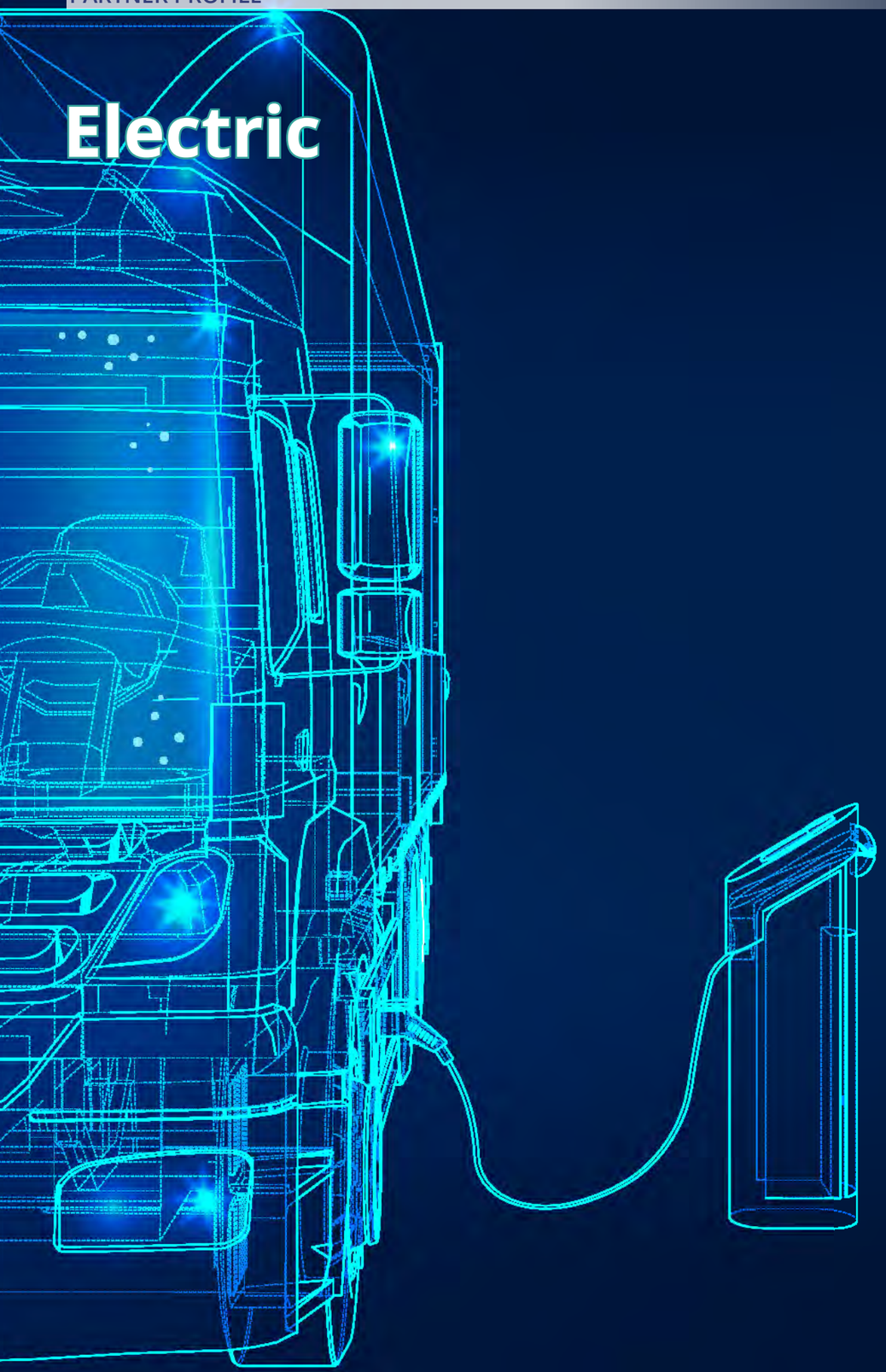
By working to replace natural gas with renewable gases, such as biomethane and green hydrogen, and complementing intermittent renewable electricity, Gas Networks Ireland is supporting Ireland's journey to a cleaner energy future.

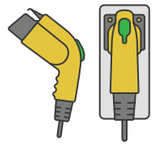
For further information please visit:

www.gasnetworks.ie/biocng

Gas Networks Ireland

Electric



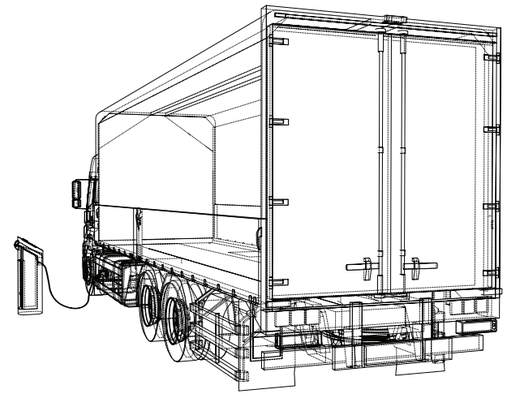


OVERVIEW

According to the statistics from Motorstats [01], the statistics provider for the Irish motor industry, *(See table below)* 22 battery electric HGV's were added to the Irish fleet over the course of January 2022 to March of 2024 (along with 109 buses). Of these HGV's we see something from every weight class of rigid, all the way up to tractor units.

So the first thing to say about electric HGV's is that they are here – today – right now. They are already in use on Irish roads. The owners of these trucks will have paid a pretty penny for them. Roughly two to three times the cost of their diesel equivalents.

However, electric trucks, despite having a higher initial investment, can be a more cost-effective option in the long run owing to their superior efficiency, which is the main factor contributing to lower overall running costs.



HEAVY COMMERCIAL VEHICLES BY MODEL (ELECTRIC)

Rank	Make	Model	2023 Units	2022 Units	% Change	2023 % Share	2022 % Share
1	Wrightbus	Wrightbus	34	0	-	50.75%	0.00%
2	Higer	Buses & Coaches	13	7	85.71%	19.40%	28.00%
3	Volvo	2 Axle Tractor	6	0	-	8.96%	0.00%
4	Volvo	4 Axle Rigid	3	0	-	4.48%	0.00%
5	Volvo	3 Axle Rigid	3	0	-	4.48%	0.00%
6	Alexander	*Unidentified*	2	11	-81.82%	2.99%	44.00%
7	Yutong	Yutong Bus	2	0	-	2.99%	0.00%
8	Dennis Eagle	3 Axle Rigid	2	4	-50.00%	2.99%	16.00%
9	Fuso	2 Axle Rigid 6-7-9 T	1	1	0.00%	1.49%	4.00%
10	Renault	2 Axle Rigid 17 T +	1	0	-	1.49%	0.00%

01 https://stats.beepbeep.ie/heavy-commercial-vehicles)

ELECTRIC

As far back as 2018 the California Air Resource Board undertook a study into this specific point and found that EVs were, at their worst (80km/h), three times more efficient than diesel vehicles; and at their best (crawling) more than nine times more efficient. Naturally, where there is a need for slow movement there is also an idling component, which EV's are simply not subject to at all. **(01)** *(See Graph 01)*

So, while the initial cost of purchasing an electric truck may be more, businesses can save money in the long run, particularly in more intensive use cases where diesel bills are higher.

Other benefits of electric trucks are that they produce greater torque, therefore performing better with heavy loads and on challenging terrain; they suffer from less vibration, potentially improving driver comfort and reducing fatigue; they produce less noise pollution making them more versatile in urban environments and require less maintenance as there are far fewer serviceable parts.

Additionally, electric trucks have regenerative braking systems that help to conserve energy, reducing the overall energy consumption of the vehicle. Whilst drivers spend energy going uphill, a portion of that energy is recuperated on the way back down. Similarly, some energy is captured back into the battery as drivers decelerate, rather than being shed as heat through the brakes. These features increase the overall efficiency of eHGVs, contributing to overall reduced operating costs and greater productivity.

For all the benefits, however, there are still challenges.

One concern which has been widely reported is that of reduced payload capacity owing to the additional weight of a battery in place of a diesel tank. Thankfully, this point is more of a legislative issue than a technical one, and the European Parliament has recently agreed on new rules to accelerate the uptake of zero-emission trucks by granting trucks four extra tonnes to accommodate electric technology.

Another challenge is that the largest trucks in use at present have a range of less than 500 km per charge under their manufacturers' test conditions. There is feedback from the sector to suggest that routes with significant gradients and elevation gain can substantially reduce this number. To their credit, it is understood that the manufacturers' own tools for use in computing achievable range, do realistically reflect these findings. Therefore, confidence in what the trucks can achieve remains, however, without supporting infrastructure, there are routes which cannot yet be completed with a full load. The above being said, local and regional routes are readily accommodated, and reports from industry are largely positive where all charging can be undertaken overnight. This does, however, still leave a requirement for charging provisions to be in place. For a single vehicle, this does not seem to cause any unreasonable difficulties as there is likely to be sufficient power available in a standard three-phase connection to get the job done during the quiet hours, but as more vehicles are added to a fleet the requirement to acquire stronger grid connections may emerge.

KEY CONSIDERATIONS

Everything in the previous section should be leading to a conclusion along the lines of 'ok – so they're great where they work, but how do I know if they'll work for me?' The answer to this question boils down to several factors. Key among these factors are energy efficiency and energy cost.

With diesel trucks, the full tank range can be as much as a few thousand kilometers; so, if sent on a tough route every now and then, you're unlikely to pay much attention to the fact that it will burn more fuel. The difference amounts to a costing consideration, not an operational one. If the vehicle uses double the fuel, then either the cost of the route goes up, or that cost gets socialised across other routes and services. However, if the diesel truck had a smaller tank, then it may not be able to run the route without refilling at some point – and in that case, there would be an operational concern.

This is basically where we're at with EV's. The 'average efficiency (range)' will generally apply only to relatively flat routes at various average speeds using efficient driving practices with a partial load. The consideration required here is what range can be achieved with the load being hauled over the terrain being traversed. Average speed will play a role, as will weather albeit to a smaller degree. Manufacturers regularly provide tools and consultation where these calculations are concerned, but these do still amount to new route planning considerations (load, distance and terrain) and this additional uncertainty can be off-putting.

The good news here is that where fleet managers can operate vehicles at efficiencies which broadly resemble the mainstream manufacturer's claims, (reasonably flat routes and with a balanced mixture of urban and dual-carriageway speeds), then even at presiding open market energy prices (and factoring in the additional CAPEX requirements, maintenance contracts, grant assistance) and assuming parity in residual value as a percentage of purchase cost, e-HGVs compare favourably alongside any of the conventional options operated on sustainable fuels at presiding prices.

01 https://ww2.arb.ca.gov/resources/documents/battery-electric-truck-and-bus-energy-efficiency-compared-conventional-diesel

Decarbonising the Road Freight Sector - Ireland

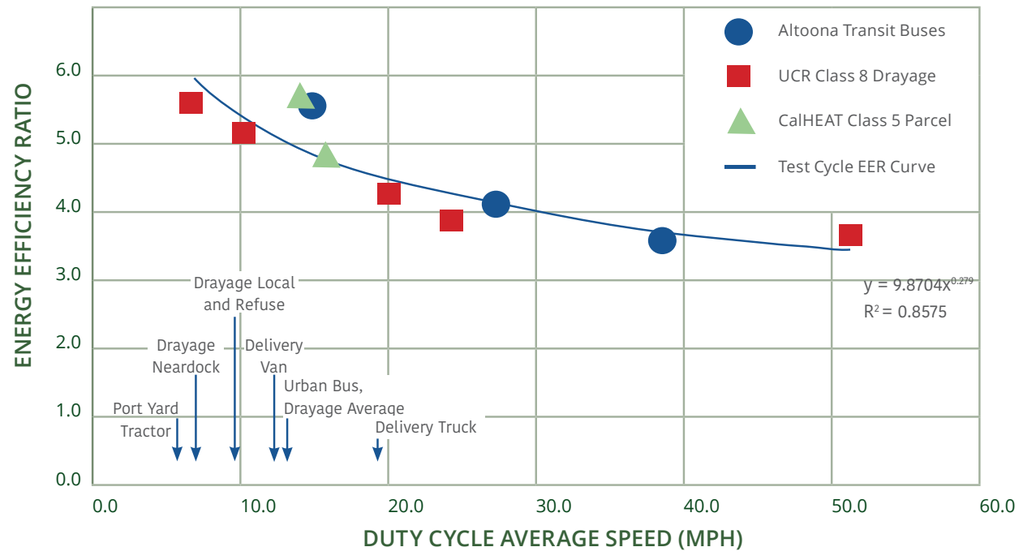
ELECTRIC

With no significant heat cycling in EV's, no significant vibrations, no emissions control systems, limited lubricants and a vastly reduced number of drivetrain components, there is a very reasonable expectation that these vehicles will remain in service without any requirement for rebuilds well past the usual lease or asset disposal cycles.

The above, of course, does assume that the vehicle is able to perform its route on overnight charging alone. Where on-the-road charging is required, then the right technology must be located in the right places, available at the right time. It must also be acknowledged that where the power supply for these stations comes exclusively from the grid, the energy cost will be higher than night-rate depot based charging. Not only because of the daytime use, but where the infrastructure is being provisioned by a Charge Point Operator (CPOs), there will naturally be a markup on that energy price required to recover the investment and operating costs of the infrastructure. This has the effect of, typically, multiplying the cost of energy from these sites (where supply is wholly sourced from the grid) by about two to three times that of night rate depot-based charging.

This cost can be mitigated where there is the ability to install additional energy generation and/or storage at these locations. Solar systems at sufficient scale can reduce energy costs substantially and, although battery storage solutions still need to come down further in price, they have significant potential to help stabilise pricing even further in the future.

CALIFORNIA AIR RESOURCE BOARD, DRIVE EFFICIENCY OF EV VS DIESEL



CHARGING INFRASTRUCTURE

We need to develop high-quality EV charging infrastructure to match the pace and scale of EV sales. A recent study found that Ireland is lagging behind the rest of Europe with its EV infrastructure roll out so there is a requirement to facilitate the adoption taking place across the country.**(02)** And, with a mere 0.014% of Ireland's heavy goods vehicles currently running on electricity, this endeavour represents a crucial milestone in aiding in the decarbonisation of the road freight sector. Estimates suggest that diesel-powered heavy goods vehicles, despite comprising only 7.1% of vehicles on Irish roads, account for a staggering 20% of all road transport emissions within Ireland.

SSE is proactively working to build a network of EV charging hubs across the UK and Ireland. Our first to open in Ireland will be the 10-bay ultra-rapid facility at Lough Sheever Corporate Park in Mullingar, Co. Westmeath, which is designed to accommodate e-HDV's as well as public use. This site will soon be joined by sites at Blanchardstown Business Park, Greenogue Industrial Estate, and Ashbourne Retail Park as we target 30 sites across Ireland in the next 5 years.

This follows the opening of our first ultra-rapid electric vehicle charging hub at Castlebank Street in Glasgow in September of 2022.

02 https://www.completecar.ie/car-news/article/13205/Ireland-one-of-the-worst-performers-in-EV-charging

ELECTRIC

Then, as part of a deal with pan-European investor and asset manager M7 Real Estate, we've opened hubs at Gapton Hall Retail Park in Great Yarmouth and Euro Retail Park in Ipswich. Additional sites are set to go live including two sites in Dundee, one of which, at the city's Myrekirk Roundabout, will feature 24 ultra-rapid charging bays.

SSE is also currently developing a purpose-built electric charging hub for e-HGVs (electric heavy goods vehicles) at the Tyseley Energy Park in Birmingham. The site boasts powerful 360 kW chargers capable of replenishing even the largest of the eHDV batteries in the market at present in under 2 hours.

Our experience in this space is growing rapidly and, throughout the experience of delivering that portfolio, we have taken away great lessons to apply to our infrastructure plans in Ireland. Whilst scale of roll out is essential, the type of sites we are designing themselves need to reflect the needs of the user. Having the collaboration to understand the concerns and pain points is crucial to delivering the not just multiple sites, but the right type of site.

PAYMENT CONSIDERATION

Another major consideration for EV owners is the payment method for charging. While there are pay-per-use solutions, there isn't a standardised method yet. EV and eHGV ownership is in its infancy, and with collaboration between stakeholders across different industry sectors, payment systems/subscriptions will homogenise over time.

SSE charging service subscribers will be able to use our dedicated APP and RFID tags to benefit from fleet specific rates and we are already engaging with EV fleet aggregators and fuel card providers like Paua and Octopus Electroverse to make 'tap and charge' transactions available at all of SSE's Hubs enhancing accessibility and easy of use for both EV drivers and operators.

CONCLUSION

As mentioned at the top of this article, e-HGVs are here already. It isn't a case of getting ahead of the demand to come but playing catch up to support what is here and what will grow. The advantages of adoption are evident but as outlined, there will still come challenges that need to be addressed and supported.

Notwithstanding future challenges, the initial numbers reflected in the Motorstats database for the past two years indicate clearly that e-HDV use is on the rise. As the charging infrastructure catches up with requirements, and becomes more ubiquitous, easier to use and, crucially, more reliable throughout Ireland, the confidence this will bring to the market will only accelerate adoption and we will see far more e-HGVs on Irish roads. .

ABOUT SSE

SSE's Energy Solutions business provides local energy infrastructure solutions to decarbonise organisations, along with clean, renewable energy for customer's businesses. With a whole-system approach, SSE builds flexible networks to deliver the sustainable energy that people need to heat their homes and businesses, drive their cars, and power their lives, by decarbonising transport, heat, and energy systems.

In the UK and Ireland, SSE has increased clean energy investments by 65% to a total of £12.5bn by 2026 and our 'NZAP Plus' programme includes plans for £18bn of investment out to 2027.

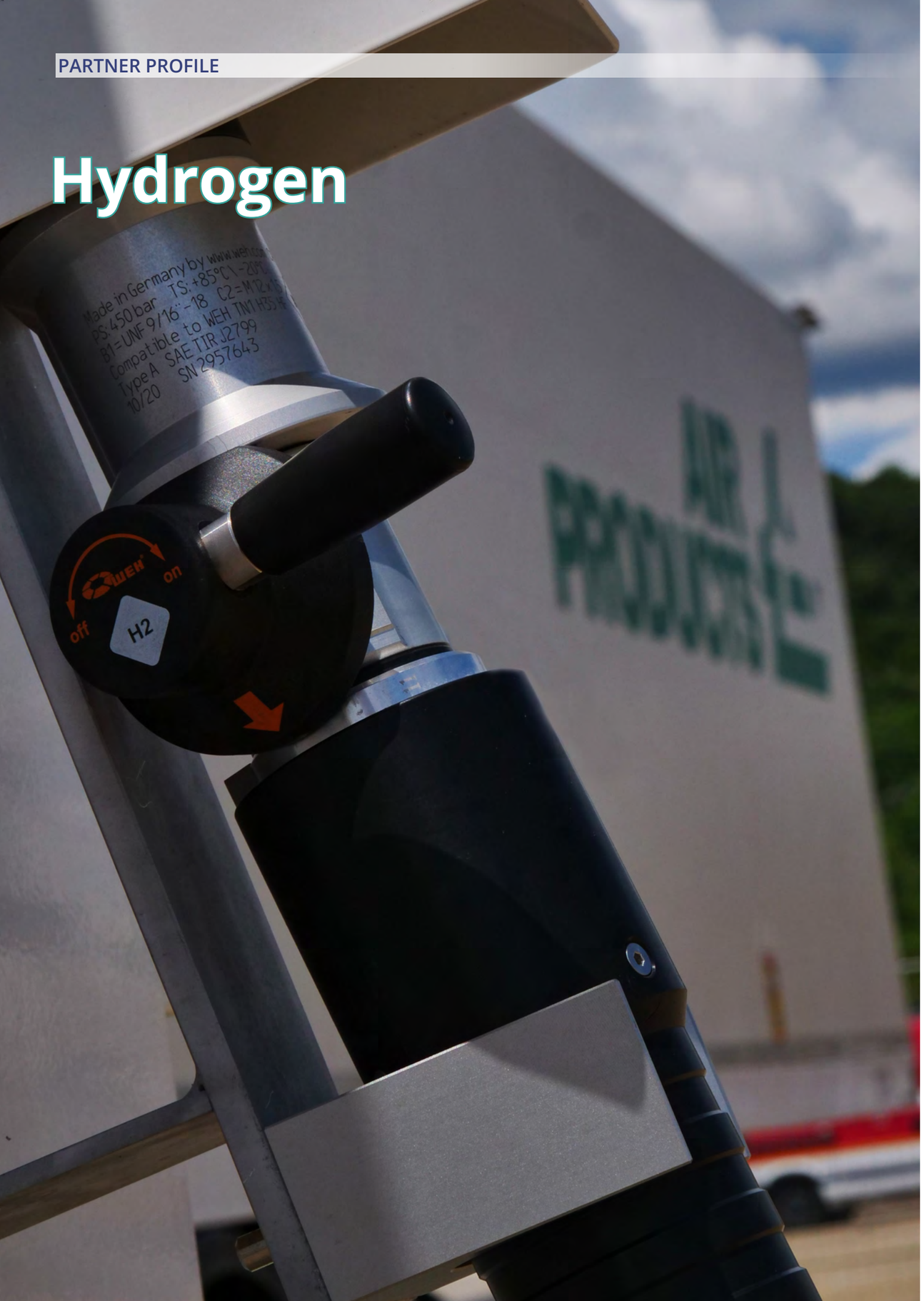
For more information about SSE's decarbonisation projects:

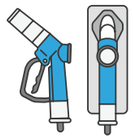
https://www.sseenergysolutions.co.uk/news-and-insights

Our Social Value strategy is designed to create sustainable cities and communities by fostering strong regional relationships, challenging inequality through inclusive recruitment, and inspiring low-carbon career education. You can read more about our Social Values here:

https://www.sse.com/sustainability/social/

Hydrogen





OVERVIEW

AN OPPORTUNITY FOR IRELAND

With transport accounting for around one-fifth of global CO_2 emissions, there can be no denying the scale of the challenge ahead. Together, we must decarbonise the transport sector across Ireland and beyond, and we need to act today to secure a cleaner future. The question for many freight transport operators and logistics companies, however, is what fuel presents the best solution, commercially and environmentally?

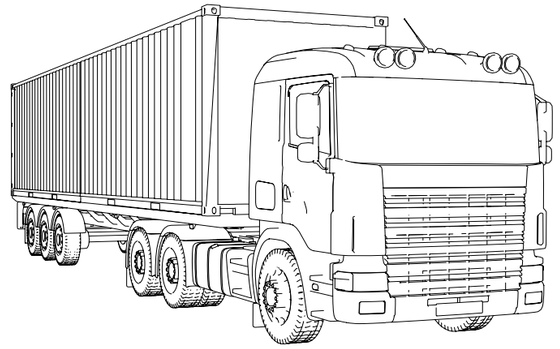
The reality is that there is no one size fits all approach. The right solution for each transport operator will depend on the type and size of its fleet, available space, and access to infrastructure. What's clear however is that the Government of Ireland, and other administrations across the EU, are bound to a 14.5% GHG reduction target (through renewables) in transport by 2030, of which, at least 5.5% are advanced biofuels and Renewable Fuels of Non-Biological Origin (RFNBOs).

As part of the National Hydrogen Strategy, published last summer, Eamon Ryan TD, Minister for the Environment, Climate, and Communications and Transport, makes a clear statement: "Hydrogen technology offers incredible opportunities for Ireland." The strategy also leaves no doubt that heavy duty transport applications, where there are binding EU targets for 2030, are anticipated to be the first end use sectors to develop.

So, how do we translate ambition into action?

To bring forward low carbon hydrogen fuel at scale requires reliable supply, accessible infrastructure, and investment from companies with a proven track record of project execution and delivery. There are many companies starting to develop hydrogen businesses, but there are only a handful of companies worldwide with a proven track record to deliver hydrogen safely and at a large scale.

Leveraging our own global experience, we are working closely with policy makers and partners to ensure a reliable supply of low carbon hydrogen, produced both by carbon capture and storage, and from renewable energy sources. The direction of travel is clear, and we're increasingly seeing enquiries from a range of freight and transport operators, whether those operating trucks, vans, ships or planes, interested in understanding what they need to do now, to prepare for a more sustainable future fleet.



RELIABLE HYDROGEN SUPPLY ACROSS IRELAND

One of the most important aspects of market development is security of supply. It is only reasonable that freight transport operators want to be confident of a reliable supply of hydrogen fuel before they invest in adapting their fleet.

But where will this come from?

It's clear that the focus of the Government of Ireland is on green hydrogen – in other words, hydrogen produced from renewable energy, and - with one of the most energy productive coasts in Europe, Ireland has a real opportunity in this regard.

The National Hydrogen Strategy underlines the scale of this opportunity, stating that Ireland's considerable offshore wind resource means that it has the potential to produce significantly more renewable hydrogen than needed to meet its own needs. This opens up the opportunity for Ireland to become a net exporter of renewable energy and green hydrogen in the long-term.

This is some way off however given that Ireland currently imports 77% of all its energy supply. The question therefore remains - while Ireland builds its domestic energy production capacity, where will it source the renewable energy needed now to produce green hydrogen to serve customers such as fleet operators? The immediate solution is to embrace all available production pathways – and that includes the import of hydrogen as well as renewable energy in the form of green ammonia. This is very much in line

HYDROGEN

with RePowerEU, the European Commission's plan to reduce the European Union's dependence on Russian fossil fuels by diversifying gas supplies and speeding up the roll out of renewable gases.

Indeed, there is a target in place to not only achieve 10 million tonnes of domestic renewable hydrogen production by 2030, but also 10 million tonnes of imports. Looking at the role imported renewable ammonia can play, it provides stored renewable energy that is readily dispatchable to produce green hydrogen during periods of local renewable electricity intermittency.

Above all, it plays a vital role in creating security of supply while local hydrogen storage and associated infrastructure is built up, enabling a kick start to the hydrogen economy.

To supply renewable ammonia globally, Air Products has started the construction of a large green energy project in Neom. Our joint venture project in Saudi Arabia with NEOM and ACWA Power is based on four gigawatts of renewable electricity capacity, from solar and wind sources. The energy generated will be in the form of renewable ammonia that will be transported to renewable energy facilities around the world.

Our three proposed European facilities in Immingham, UK, Hamburg, Germany, and Rotterdam, The Netherlands, are examples of how this ammonia could be received and used for onshore hydrogen production to provide large, reliable quantities, that can ensure a secure baseload to specific geographies.

The ambition is that these renewable energy facilities will store the renewable ammonia which will be used as feedstock to produce green hydrogen. Air Products' existing industrial gases supply chain from the UK to Ireland could be expanded to cover renewable hydrogen if market conditions are favourable.

Whether hydrogen from imported ammonia, imported hydrogen or hydrogen produced from local electrolysis – all pathways play a role in ensuring reliable supply is available to freight transport operators who are looking to invest in hydrogen fuel cell vehicles.

GETTING THE RIGHT INFRASTRUCTURE IN PLACE

Of course, ensuring a reliable supply of hydrogen is only part of the solution. There must also be the infrastructure in place to get that hydrogen to the freight transport operators that need it.

With over 250 hydrogen fuelling stations globally, we are well versed in this and continue to both invest in a fuelling network across Europe, and work with fleet operators on the ground to help them make the business case for conversion. This requires three key things: the conversion of vehicle fleets; the right refuelling infrastructure and network; and funding and support.

1) Converting your fleet

Consider, for example, an operator that wants to initially convert five vehicles to zero-emissions in a fleet of 100. This still requires investment in infrastructure so it's important to look at the bigger picture. Once you're converting 100 vehicles or more, the cost of investment really comes into its own. It's therefore critical not to be swayed by short-term economics. Such is the progress on this that some OEMs are even exploring liquid hydrogen fuel tanks to exceed diesel reach.

2) Choosing the right refuelling solution

For some operators who run a back to base operation, investing in their own refuelling station will be the right choice. Others will need access to a public hydrogen fuelling station network that can be used by HGVs. Both refuelling mechanisms are required for hydrogen to become a viable solution for operators.

For those looking to invest in their own refuelling station, the required infrastructure can differ significantly dependent on the size of the operation – gaseous, liquid and compressionless hydrogen supply are all options.

Smaller operations are generally better suited to gaseous hydrogen, for example, refuelling vehicles at 350bar. If you're using 500kg or less of hydrogen, then gaseous is most likely the best solution for your fleet.

By contrast, this is less attractive for a larger fleet conversion given that multiple daily trailer deliveries would be required. In this case, the best solution is likely to be a liquid hydrogen tank that delivers fuel much like a diesel tanker. A cryogenic pump draws liquid from the tank and feeds it through a vapouriser into the vehicles at 350bar.

3) Managing costs and securing funding

Interestingly, a large liquid-refuelling system is no more expensive to install than a gaseous system, once you're looking at upwards of 20 vehicles. In other words, it's one-off capital investment that can then grow with your fleet. For those freight transport operators looking at the case for conversion, there is funding and support available.

The Connecting Europe Facility (CEF) for Transport is the funding instrument to realise EU transport infrastructure policy. In late February this year, the Alternative Fuels Infrastructure Facility (AFIF) issued a call for proposals to support the deployment of alternative fuels supply infrastructure.

HYDROGEN

Specifically, this second phase of AFIF will support the objectives set in the new regulation for the deployment of alternative fuels infrastructure (AFIR) regarding publicly accessible electric recharging pools and hydrogen refuelling stations across the European Union's main transport corridors and hubs. It covers the roll-out of alternative fuels infrastructure for road, maritime, inland waterway and air transport.

The diagram below gives a clear indication of the types of hydrogen refuelling stations that could be supported by this funding. All successful projects have three years from submission date to ensure the refuelling station is operational.

A POSITIVE PATH FORWARD

The overarching message? This is no longer a concept or vision for the future, but instead the reality of what is happening on the ground, right now. Air Products is investing in green hydrogen and will deploy the first hydrogen fuelled trucks in the near future.

To be net-zero in 2050 we need to act today. This is the time to establish your business case for conversion and start talking to OEMs about when hydrogen fuel cell-electric vehicles will be coming to market.

Immingham green energy facility – taking up to 20,000 diesel trucks off the road

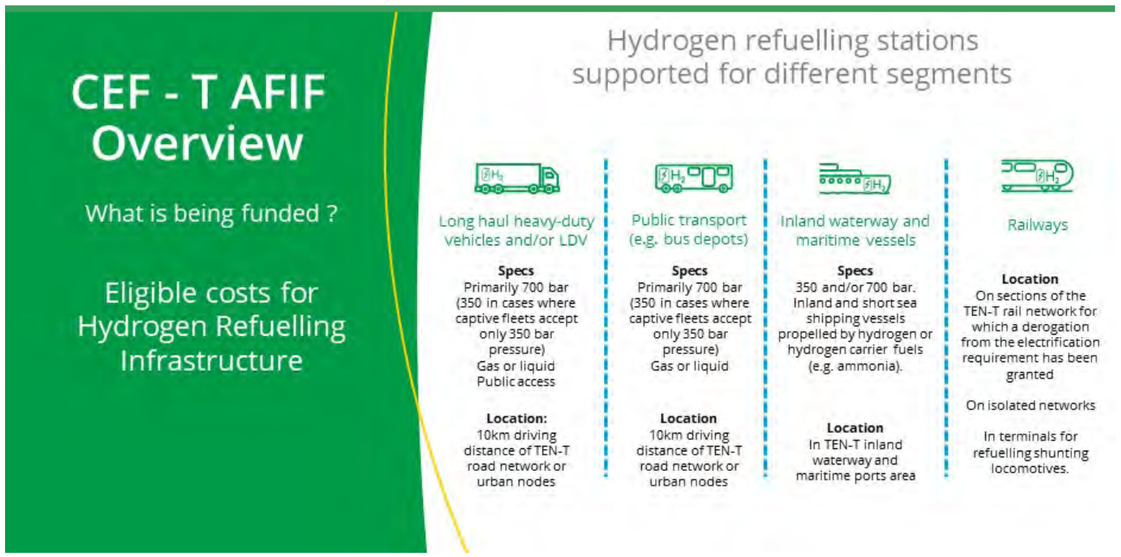
The UK Government has identified Immingham as a top priority area for 'levelling up' via investment and growth. Air Products plan to build and run a new green hydrogen production facility at Immingham in partnership with Associated British Ports (ABP), the UK's largest ports operator with 21 ports across England, Scotland and Wales, together with a downstream delivery network. This planned green hydrogen production facility in Immingham could produce up to 300MW – that's 3% of the UK Government's 10GW hydrogen by 2030 target.

This facility would be operational by 2027 and deliver:

- 1,400 highly skilled jobs in a region where people risk losing jobs in the transition to a net-zero economy, ensuring an equitable and just transition.
- Up to €5.4 billion economic value for the region (GVA)
- Up to 580,000 tonnes of CO_2 savings, equivalent to converting 20,000 diesel trucks to zero emissions, resulting in improved air quality for the region.

NEOM – harnessing the power of renewables

Together with ACWA Power and NEOM, we are building the world's largest green hydrogen-based ammonia production facility in Neom, Saudi Arabia. 4GW of dedicated wind and solar spanning 300 km2 will capture renewable energy and store it as ammonia, to be shipped cost effectively where required to decarbonise industry and heavy-duty transport. The intention is that it will supply three proposed renewable energy facility in the UK, Germany and the Netherlands, that can use the ammonia to produce hydrogen domestically.



HYDROGEN

Associated British Ports - first hydrogen terminal tractor trial

Associated British Ports (ABP) is the first UK port operator to trial a hydrogen fuelled tractor at its container terminal at the Port of Immingham alongside a mobile hydrogen filling station provided by Air Products.

This joint pilot project received funding from ORE Catapult through Innovate UK's Hydrogen Innovation Initiative (HII), following funding of initial feasibility from the Department for Transport's Clean Maritime Demonstration Competition. The Terberg hydrogen terminal tractor has been tested at the UK's largest port by the volume of goods moved.

This demonstration is a key activity in the bid to decarbonise port operations, and an important step in the creation, delivery, and use of hydrogen at the Port of Immingham. Alongside this, HII is developing market, technology, and economic assessments of hydrogen technologies to support the larger UK industry with hydrogen adoption.

The project has been a collaboration between ABP, Toyota Tsusho UK, Terberg, Air Products, and the Offshore Renewable Energy (ORE) Catapult

ABOUT AIR PRODUCTS

As the world's largest hydrogen producer, we have over 60 years' experience in safely producing, distributing, storing, and dispensing hydrogen. We own and operate over 100 hydrogen plants and 1100km of hydrogen pipelines globally, and we already have $15 billion committed to renewable and low carbon energy transition projects globally by 2027.

We're also expanding our network of refuelling stations across the EU, with work underway on Rotterdam's first large scale public green hydrogen refuelling station, and a recent agreement in place to build the EU's first commercial scale liquid-hydrogen station in Belgium.

For further information please visit:

www.airproducts.ie

A CGI of the proposed green hydrogen production facility at Immingham (NB: For illustrative purposes only)

Data Appendix

TABLE 01: MILESTONES: SHIFTING ACTIVITY TOWARDS SUSTAINABLE TRANSPORT MODES
Scheduled collective travel under 500 km should be carbon-neutral by 2030 within the EU.
Traffic on high-speed rail will double by 2030 and triple by 2050
By 2030, there will be at least 100 climate-neutral cities in Europe
Rail freight traffic will increase by 50% by 2030 and double by 2050
Transport by inland waterways and short sea shipping will increase by 25% by 2030 and by 50% by 2050
SOURCE: EUROPEAN COMMISSION SUSTAINABLE AND SMART MOBILITY STRATEGY 2020

TABLE 02: SUMMARY OF MILESTONES FOR A SMART AND SUSTAINABLE FUTURE		
BY 2030	**BY 2050**	**CHALLENGES FOR IRELAND**
At least 30 million zero emission cars will be in operation on European roads	Nearly all cars, vans, buses as well as new heavy-duty vehicles will be zero emission	As an island with a very limited Core Ten T Network, a population that is urban and East Coast centric, it is difficult to transpose general EU Sustainable Transport Policy such as greater use of inland waterways and rail freight. The focus must therefore be on ensuring that Ireland's circumstances are conveyed to Europe to support a just transition that works for all in the freight, distribution and logistics sector
100 EU cities will be climate neutral	Rail freight traffic will double	
Scheduled collective travel for journeys under 500km should be carbon neutral	A fully operational multimodal Trans European Transport Network (TEN-T) for sustainable and smart transport with high speed connectivity	
Zero emission marine vessels will be market ready		
Additional policy summaries can be found at: *https://alternative-fuels-observatory.ec.europa.eu/policymakers-and-public-authorities/european-policies-and-legislation* SOURCE: FTA IRELAND FREIGHT IN ESG 2023		

TABLE 03: KEY ACTIONS OF IRELAND'S ROAD HAULAGE STRATEGY RELATING TO DECARBONISATION	
Action 4	Advocate EU regulations that promote more stringent vehicle emission standards
Action 5	Establish a certification/accreditation system for eco-driving courses. Consider incentives for operators
Action 6	Examining the feasibility of Freight Consolidation Centres
Action 7	Examine the role of biofuels tax and inform renewable transport fuels policy development
Action 8	Work with private sector to establish a Longer Semi-Trailer Trial
Action 9	Examine policy options to reduce carbon emissions through operational and digital efficiencies
Action 10	Support an ambitious EU Green Deal / ensure Ireland's interests are reflected in the EU Fit for 55 package
Action 11	Support ZEVI leading to the 2025 EV Infrastructure Strategy Review
Action 12	Update National Policy Frameworks on the use of Alternative Fuels in Transport
Action 13	Maintain the Alternatively Fuelled Heavy Duty Vehicle Grant Scheme at least until 2027
Action 14	Develop a national Hydrogen Strategy
Action 15	Examine the scope for behavioural change through an emissions based taxation
Action 16	Support the Whole of Government Circular Economy Strategy
Action 23	NTA to lead the development of Strategies for Sustainable Freight Distribution for the Greater Dublin Area and the Metropolitan Areas Cork, Galway, Limerick and Waterford
SOURCE: DEPARTMENT OF TRANSPORT - IRELAND'S ROAD HAULAGE STRATEGY 2022–2031	

Decarbonising the Road Freight Sector - Ireland

TABLE 04: TOTAL NO OF ALTERNATIVE FUELLED TRUCKS BY COUNTRY (BEV, PHEV, H2, LPG, CNG, LNG)							
COUNTRY	**BEV**	**PHEV**	**H2**	**LPG**	**CNG**	**LNG**	**SUB-TOTAL**
France	904				9,345		10,249
Poland	116			8,453	491		9,060
Spain	636				5,790	2,523	8,949
Germany	5,053	103	55	280	1,514	955	7,960
Italy	192				3,795	3,836	7,823
Netherlands	1,796	73	35	27	487	1,149	3,567
Sweden	551	89			2,568		3,208
Belgium	166	3			619	631	1,419
Lithuania	9			690	150	19	868
Denmark	477				230		707
Czech Republic	25			26	353	38	442
Finland	70			2	354	4	430
Latvia	21			375	9		405
Portugal	46				251	48	345
Austria	198			1	108		307
Hungary	57				106		163
Greece	4				117		121
Bulgaria	8				98		106
Luxembourg	20			25	13	33	91
Estonia	3				83		86
Ireland	46				2	19	67
Slovakia	18				28		46
Romania	19				15		34
Slovenia	7				15		22
Croatia	2				9		11
Cyprus							0
Malta							0
SOURCE: EUROPEAN ALTERNATIVE FUELS OBSERVATORY (JUNE 2024)							

Please note:
A time-lag in the preparation of European data may exist. Updated figures for Ireland are presented elsewhere in this report

TABLE 05: FUEL TYPE BY VEHICLE TYPE (HGV & LGV) - AS OF 30TH APRIL 2024				
GOODS VEHICLES	**HEAVY GOODS > 3,500T**	**LIGHT GOODS < 3,500T**	**04/2024 TOTAL**	**TOTAL SHARE**
Petrol	8	1,085	1,093	0.267%
Diesel	43,444	360,460	403,904	98.611%
Petrol and Electric	3	157	160	0.039%
Diesel and Electric	11	391	402	0.098%
Petrol and Ethanol		5	5	0.001%
Electric	35	3,066	3,101	0.757%
Petrol Plug-in Hybrid Electric		675	675	0.165%
Diesel Plug-in Hybrid Electric		118	118	0.029%
Gas	98(1)	35	133	0.032%
Other Fuel types incl unknown		2	2	0.000%
Total	**43,599**	**365,994**	**409,593**	**100.000%**

SOURCE: DEPARTMENT OF TRANSPORT / (1) NOTE: SIMI HAS AN ALTERNATIVE VALUE OF 128

TABLE 06: FUEL TYPE				
GOODS VEHICLES	**2019**	**2020**	**2021**	**2022**
Petrol	611	648	698	799
Diesel	365,516	376,102	382,062	385,364
Petrol and Electric	65	67	86	106
Diesel and Electric	5	26	38	279
Petrol and Ethanol	0	0	0	0
Electric	454	878	1,770	2,135
Petrol Plug-in Hybrid Electric	57	96	170	294
Diesel Plug-in Hybrid Electric	0	7	187	85
Other	52	66	88	122
Total	**366,760**	**377,890**	**385,099**	**389,184**
SHARE (%)	**2019**	**2020**	**2021**	**2022**
Petrol	0.167%	0.172%	0.181%	0.205%
Diesel	99.661%	99.527%	99.211%	99.018%
Petrol and Electric	0.018%	0.018%	0.022%	0.027%
Diesel and Electric	0.001%	0.007%	0.009%	0.072%
Petrol and Ethanol	0.000%	0.000%	0.000%	0.000%
Electric	0.124%	0.232%	0.460%	0.549%
Petrol Plug-in Hybrid Electric	0.016%	0.025%	0.044%	0.076%
Diesel Plug-in Hybrid Electric	0.000%	0.002%	0.049%	0.022%
Other	0.014%	0.017%	0.024%	0.031%
Total	**100.000%**	**100.000%**	**100.000%**	**100.000%**

SOURCE: DEPARTMENT OF TRANSPORT

Decarbonising the Road Freight Sector - Ireland

TABLE 07: TOTAL NUMBER OF AC AND DC RECHARGING POINTS - AFIR CATEGORIZATION							
COUNTRY	**SLOW AC RECHARGING POINT, SINGLE-PHASE (P < 7.4KW)**	**MEDIUM-SPEED AC RECHARGING POINT, TRIPLE-PHASE (7.4KW ≤ P ≤ 22KW)**	**FAST AC RECHARGING POINT, TRIPLE-PHASE (P > 22KW)**	**SLOW DC RECHARGING POINT (P < 50KW)**	**FAST DC RECHARGING POINT (50KW ≤ P < 150KW)**	**LEVEL 1 - ULTRA-FAST DC RECHARGING POINT (150KW ≤ P < 350KW)**	**LEVEL 2 - ULTRA-FAST DC RECHARGING POINT (P ≥ 350KW)**
Austria	665	16862	253	283	1114	1935	364
Belgium	1043	45391	233	156	706	1477	166
Bulgaria	72	1273	60	53	312	198	91
Croatia	1	638	36	30	251	90	27
Cyprus	1	345	5	2	14	7	-
Czech Republic	2	3308	83	33	1004	263	36
Denmark	23	17541	5280	70	453	2165	112
Estonia	-	404	-	100	110	96	22
Finland	78	9383	26	27	903	1944	136
France	40644	62426	1608	2489	7418	5068	4873
Germany	2117	98109	1478	1910	5154	13692	3537
Greece	19	3065	26	46	184	82	2
Hungary	26	2736	26	208	207	191	24
Iceland	1	1399	-	2	65	143	36
Ireland	154	2120	79	5	268	194	28
Italy	463	29687	6274	257	3540	2105	273
Latvia	-	316	2	22	178	62	6
Liechtenstein	1	71	1	-	9	22	-
Lithuania	13	1031	176	56	200	64	20
Luxembourg	2	1902	6	-	23	93	69
Malta	-	101	-	-	-	-	-
Netherlands	5486	136655	2875	197	723	2844	245
Norway	3712	13224	38	29	1615	5964	574
Poland	65	4508	78	199	1258	272	69
Portugal	764	5248	571	85	1627	332	42
Romania	4	1901	55	226	488	308	28
Slovakia	16	1651	79	74	431	213	20
Slovenia	17	1301	48	53	113	58	45
Spain	1577	20117	2625	513	3879	1658	349
Sweden	7399	26496	279	59	1011	3634	573
Switzerland	268	11675	122	314	722	1128	87
Turkey	25	6040	2	140	2204	756	4
United Kingdom	17205	41577	1789	445	6464	4576	645

SOURCE: EUROPEAN ALTERNATIVE FUELS OBSERVATORY

TABLE 08: NATURAL GAS REFUELLING POINTS (CNG AND LNG)

COUNTRY	CNG	LNG	SUB-TOTAL
Italy	1,468	103	1,571
Germany	807	74	881
Sweden	204	25	229
Czech Republic	223	4	227
Netherlands	187	28	215
France	154	52	206
Spain	109	76	185
Belgium	163	19	182
Switzerland	152	3	155
Austria	124	3	127
Bulgaria	120	0	120
Finland	59	11	70
Poland	24	8	32
Norway	26	3	29
United Kingdom	10	15	25
Greece	24	0	24
Portugal	14	10	24
Estonia	21	2	23
Hungary	17	2	19
Slovakia	17	1	18
Denmark	17	0	17
Turkey	10	1	11
Lithuania	6	0	6
Slovenia	5	1	6
Iceland	5	0	5
Latvia	5	0	5
Croatia	2	2	4
Ireland	3	0	3
Romania	3	0	3
Luxembourg	2	0	2
Liechtenstein	1	0	1
Cyprus	0	0	0
Malta	0	0	0

SOURCE: EUROPEAN ALTERNATIVE FUELS OBSERVATORY

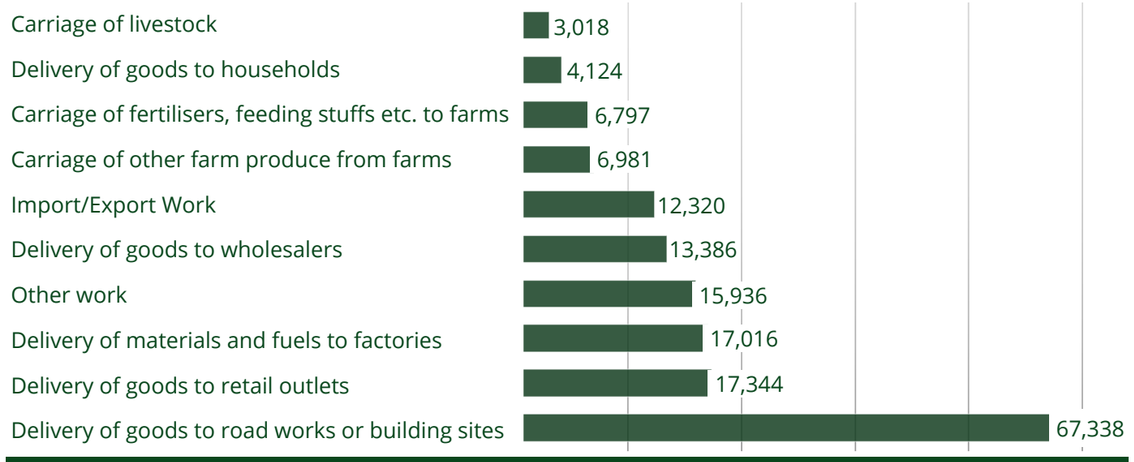
Decarbonising the Road Freight Sector - Ireland

TABLE 09: ROAD FREIGHT ACTIVITY 2019 - 2022

CATEGORY	2019	2020	2021	2022	% CHANGE 2021/2022
Tonne-km (million)	12,403	11,383	12,485	12,384	1%
Tonnes carried (thousand)	159,414	140,998	154,900	164,258	6%
Vehicle kilometres (million)	1,734	1,488	1,685	1,788	6%
Laden journeys (thousand)	14,480	11,775	13,092	13,814	5%

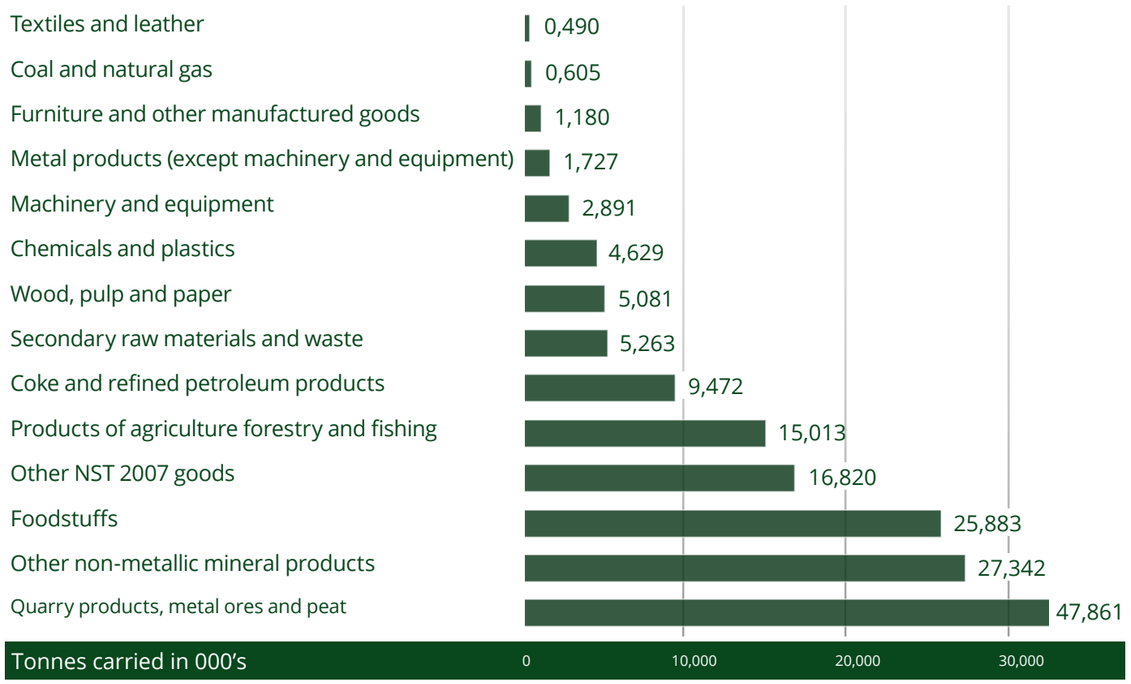
SOURCE: CSO, CENTRAL STATISTICS OFFICE, IRELAND

CHART 1: QUANTITY OF GOODS CARRIED BY MAIN TYPE OF WORK 2022



SOURCE: CSO, CENTRAL STATISTICS OFFICE, IRELAND

CHART 2: ROAD FREIGHT ACTIVITY BY COMMODITY - NATIONAL AND INTERNATIONAL JOURNEYS 2022



SOURCE: CSO, CENTRAL STATISTICS OFFICE, IRELAND

Decarbonising the Road Freight Sector - Ireland

TABLE 10: ROAD FREIGHT ACTIVITY 2019 - 2022

000 TONNES CARRIED	2019	2020	2021	2022
Transport	89,343	76,362	87,734	91,331
Mining and quarrying (including sand and gravel merchants)	14,154	12,243	13,490	16,666
Cremeries and agricultural co-operative societies	498	666	769	326
Manufacture of food and feeding stuffs	2,657	3,799	3,380	3,641
Manufacture of drink and tobacco	139	20	83	32
Manufacture of glass, cement and clay products	13,591	12,569	10,703	16,333
Other manufacturing	2,169	1,870	2,371	1,949
Building and construction	4,061	3,471	3,609	3,099
Distribution	18,383	16,188	16,000	16,159
Agriculture and livestock dealing	3,485	2,982	3,573	3,551
Local authorities	1,771	1,881	2,082	2,388
Other	9,162	8,948	11,107	8,783
Manufacturing industry	33,208	31,167	30,796	n/a
All business activities	159,414	140,998	154,900	164,258
GROWTH	**-**	**2020**	**2021**	**2022**
Transport	-	-14.5%	14.9%	4.1%
Mining and quarrying (including sand and gravel merchants)	-	-13.5%	10.2%	23.5%
Cremeries and agricultural co-operative societies	-	33.7%	15.5%	-57.6%
Manufacture of food and feeding stuffs	-	43.0%	-11.0%	7.7%
Manufacture of drink and tobacco	-	-85.6%	315.0%	-61.4%
Manufacture of glass, cement and clay products	-	-7.5%	-14.8%	52.6%
Other manufacturing	-	-13.8%	26.8%	-17.8%
Building and construction	-	-14.5%	4.0%	-14.1%
Distribution	-	-11.9%	-1.2%	1.0%
Agriculture and livestock dealing	-	-14.4%	19.8%	-0.6%
Local authorities	-	6.2%	10.7%	14.7%
Other	-	-2.3%	24.1%	-20.9%
Manufacturing industry	-	-6.1%	-1.2%	n/a
All business activities	-	-11.6%	9.9%	6.0%

SOURCE: CSO, CENTRAL STATISTICS OFFICE, IRELAND

TABLE 11: NUMBER OF GOODS VEHICLES (IRELAND) 2000-2022

YEAR	NO OF GOODS VEHICLES	GROWTH (%)
2000	205,575	8.9%
2001	219,510	6.8%
2002	233,069	6.2%
2003	251,130	7.7%
2004	268,082	6.8%
2005	286,548	6.9%
2006	318,064	11.0%
2007	345,874	8.7%
2008	351,307	1.6%
2009	343,940	-2.1%
2010	327,096	-4.9%
2011	320,966	-1.9%
2012	309,219	-3.7%
2013	317,849	2.8%
2014	317,378	-0.1%
2015	330,541	4.1%
2016	342,259	3.5%
2017	349,143	2.0%
2018	355,273	1.8%
2019	366,760	3.2%
2020	377,890	3.0%
2021	385,099	1.9%
2022	389,184	1.1%

SOURCE: HTTPS://WWW.GOV.IE

Decarbonising the Road Freight Sector - Ireland

TABLE 12: NUMBER OF GOODS VEHICLES BY WEIGHT, KG, 2022 - IRELAND

CATEGORY	NUMBER USED FOR CARRIAGE OF GOODS FOR HIRE OR REWARD	SHARE (%)	NUMBER USED FOR CARRIAGE OF LICENCEE'S GOODS ONLY	SHARE (%)	TOTAL	SHARE (%)
Not Exceeding 600	36	0.2%	1,055	0.3%	1,091	0.3%
601 to/go dtf 800	1	0.0%	38	0.0%	39	0.0%
801 to/go dtf 1000	16	0.1%	434	0.1%	450	0.1%
1,001 to/go dtf 1,250	464	2.4%	13,870	3.8%	14,334	3.7%
1,251 to/go dtf 1,500	2,592	13.4%	74,701	20.2%	77,293	19.9%
1,501 to/go dtf 1,750	1,544	8.0%	40,762	11.0%	42,306	10.9%
1,751 to/go dtf 2,000	2,647	13.7%	81,426	22.0%	84,073	21.6%
2,001 to/go dtf 2,250	2,282	11.8%	69,611	18.8%	71,893	18.5%
2,251 to/go dtf 2,500	998	5.2%	32,446	8.8%	33,444	8.6%
2,501 to/go dtf 2,750	547	2.8%	12,826	3.5%	13,373	3.4%
2,751 to/go dtf 3,000	233	1.2%	4,827	1.3%	5,060	1.3%
3,001 to/go dtf 3,250	45	0.2%	1,035	0.3%	1,080	0.3%
3,251 to/go dtf 3,500	48	0.2%	835	0.2%	883	0.2%
3,501 to/go dtf 3,750	71	0.4%	741	0.2%	812	0.2%
3,751 to/go dtf 4,000	79	0.4%	914	0.2%	993	0.3%
4,001 to/go dtf 5,000	327	1.7%	2,335	0.6%	2,662	0.7%
5,001 to/go dtf 6,000	308	1.6%	1,825	0.5%	2,133	0.5%
6,001 to/go dtf 7,000	222	1.1%	1,301	0.4%	1,523	0.4%
7,001 to/go dtf 8,000	320	1.7%	1,621	0.4%	1,941	0.5%
8,001 to/go dtf 9,000	521	2.7%	2,735	0.7%	3,256	0.8%
9,001 to/go dtf 10,000	441	2.3%	1,869	0.5%	2,310	0.6%
10,001 to/go dtf 11,000	547	2.8%	2,350	0.6%	2,897	0.7%
11,001 to/go dtf 12,000	1,046	5.4%	4,079	1.1%	5,125	1.3%
12,001 to/go dtf 13,000	574	3.0%	2,261	0.6%	2,835	0.7%
13,001 to/go dtf 14,000	758	3.9%	2,707	0.7%	3,465	0.9%
14,001 to/go dtf 15,000	762	3.9%	2,580	0.7%	3,342	0.9%
Exceeding 15,001	1,779	9.2%	6,657	1.8%	8,436	2.2%
Sub Total	19,208	99.2%	367,841	99.5%	387,049	99.5%
Electric <=1,250	1	0.0%	32	0.0%	33	0.0%
Electric >1,250	156	0.8%	1,946	0.5%	2,102	0.5%
Sub Total	157	0.8%	1,978	0.5%	2,135	0.5%
Total	**19,365**	**100.0%**	**369,819**	**100.0%**	**389,184**	**100.0%**

SOURCE: HTTPS://WWW.GOV.IE

TABLE 13: AGE OF GOODS VEHICLES (HGV AND LGV), 2018 - 2022 - IRELAND		
AGE OF VEHICLES (AT 31ST DECEMBER, 2018)	**GOODS VEHICLES**	**SHARE %**
4 Years old and over	250,493	70.5%
6 Years old and over	213,393	60.1%
AGE OF VEHICLES (AT 31ST DECEMBER, 2019)	**GOODS VEHICLES**	**SHARE %**
4 Years old and over	260,512	71.0%
6 Years old and over	211,155	57.6%
AGE OF VEHICLES (AT 31ST DECEMBER, 2020)	**GOODS VEHICLES**	**SHARE %**
4 Years old and over	279,013	73.8%
6 Years old and over	218,188	57.7%
AGE OF VEHICLES (AT 31ST DECEMBER, 2021)	**GOODS VEHICLES**	**SHARE %**
4 Years old and over	284,797	74.0%
6 Years old and over	226,647	58.9%
AGE OF VEHICLES (AT 31ST DECEMBER, 2022)	**GOODS VEHICLES**	**SHARE %**
4 Years old and over	292,634	75.2%
6 Years old and over	240,202	61.7%
YEAR GOODS VEHICLES FIRST LICENSED		
GOODS VEHICLES	**2022**	**SHARE %**
2022	22,130	5.7%
2021	27,980	7.2%
2020	21,509	5.5%
2019	24,931	6.4%
2018	26,304	6.8%
2017	26,128	6.7%
2016	31,563	8.1%
2015	27,847	7.2%
2014	21,577	5.5%
2013	16,697	4.3%
2012	13,709	3.5%
2011	12,659	3.3%
2010	10,070	2.6%
2009	7,442	1.9%
2008	17,767	4.6%
2007	21,213	5.5%
2006	17,892	4.6%
2005 and earlier	41,766	10.7%
Total	**389,184**	**100.0%**
SOURCE: HTTPS://WWW.GOV.IE		

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TABLE 14: FLEET LICENCES AND SIZES							
YEAR	**TOTAL NO. OF LICENCES NATIONAL AND INTER-NATIONAL**	**LICENCES WITH 0-1 VEHICLES (AND CATEGORY SHARE OF OVERALL NUMBERS)**	**LICENCES WITH 2-3 VEHICLES**	**LICENCES WITH 4-5 VEHICLES**	**LICENCES WITH 6-10 VEHICLES**	**LICENCES WITH 11-20 VEHICLES**	**LICENCES WITH >20 VEHICLES**
2015	3,814	1,791	936	367	376	215	129
		(47.0%)	(24.5%)	(9.6%)	(9.9%)	(5.6%)	(3.4%)
2016	3,767	1,677	936	365	399	244	146
		(44.5%)	(24.8%)	(9.7%)	(10.6%)	(6.5%)	(3.9%)
2017	3,845	1,642	937	421	414	268	163
		(42.7%)	(24.3%)	(11%)	(10.8%)	(7.0%)	(4.2%)
2018	3,876	1,742	945	375	396	270	148
		(44.9%)	(24.4%)	(9.7%)	(10.2%)	(7.0%)	(3.8%)
2019	3,873	1,727	926	380	416	269	155
		(44.6%)	(24.0%)	(9.8%)	(10.7%)	(6.9%)	(4.0%)
2020	3,782	1,643	916	381	411	270	161
		(43.4%)	(24.2%)	(10.1%)	(10.9%)	(7.1%)	(4.3%)
2021	3,818	,541	872	426	453	330	196
		(40.4%)	(22.8%)	(11.2%)	(11.9%)	(8.6%)	(5.1%)
2022	3,816	1,490	893	419	467	338	209
		(39.0%)	(23.4%)	(11.0%)	(12.2%)	(8.9%)	(5.5%)
2023	3,809	1,473	887	427	463	341	218
		(38.7%)	(23.3%)	(11.2%)	(12.2%)	(8.9%)	(5.7%)
SOURCE: HTTPS://WWW.DTTAS.GOV.IE							

TABLE 15: FLEET LICENCES AND SIZES - FLEETS OF MORE THAN 10 VEHICLES

YEAR	LICENCES WITH 10+ VEHICLES (AND CATEGORY SHARE OF OVERALL NUMBERS)	NATIONAL LICENCES WITH 10+ VEHICLES (AND CATEGORY SHARE OF 10+ NUMBERS)	INTERNATIONAL LICENCES WITH 10+ VEHICLES (AND CATEGORY SHARE OF 10+ NUMBERS)
2015	400	111	289
	(10.5%)	(27.8%)	(72.2%)
2016	438	115	323
	(11.6%)	(26.2%)	(73.8%)
2017	487	131	356
	(12.7%)	(26.9%)	(73.1%)
2018	466	121	345
	(12.0%)	(26.0%)	(74.0%)
2019	476	120	356
	(12.2%)	(25.0%)	(75.0%)
2020	482	118	364
	(12.7%)	(24.5%)	(75.5%)
2021	583	193	390
	(15.3%)	(33.1%)	(66.9%)
2022	614	167	447
	(16.1%)	(27.2%)	(72.8%)
2023	627	171	456
	(16.5%)	(27.7%)	(72.7%)

SOURCE: HTTPS://WWW.DTTAS.GOV.IE

TABLE 16: NEW VEHICLES LICENSED IN 2022 BY TYPE OF FUEL

GOODS VEHICLES	2022	SHARE %
Petrol	121	0.512%
Diesel	22.974	97.121%
Petrol and Electric	15	0.063%
Diesel and Electric	99	0.419%
Electric	411	1.737%
Petrol or Diesel Plug-in Hybrid Electric	10	0.042%
Other	25	0.106%
Total	**23,655**	**100.000%**

SOURCE: HTTPS://WWW.GOV.IE

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TABLE 17: GREENHOUSE GAS EMISSIONS PER CAPITA BY COUNTRY 2023 (TOP 80 OF 210 - 1 IS HIGHEST)

RANK	COUNTRY	2022	RANK	COUNTRY	2022
1	Qatar	67.38	41	Belgium	9.74
2	Palau	61.65	42	Netherlands	9.72
3	Bahrain	39.29	43	Germany	9.49
4	Kuwait	37.96	44	Greenland	9.47
5	Trinidad and Tobago	33.27	45	Japan	9.41
6	Brunei	32.66	46	South Africa	8.91
7	United Arab Emirates	29.33	47	Slovenia	8.78
8	Oman	25.59	48	Austria	8.70
9	Saudi Arabia	22.64	49	Cyprus	8.68
10	Australia	21.98	50	Bosnia and Herzegovina	8.41
11	Turkmenistan	20.80	51	Iraq	8.41
12	Canada	19.79	52	Slovakia	8.36
13	Gibraltar	19.68	53	Falkland Islands	8.35
14	New Caledonia	19.35	54	Gabon	8.32
15	Mongolia	19.07	55	Argentina	8.27
16	Russia	17.99	56	EU27	8.09
17	United States	17.90	57	Türkiye	8.09
18	Kazakhstan	17.33	58	Denmark	7.84
19	New Zealand	16.83	59	Equatorial Guinea	7.71
20	Libya	15.32	60	Suriname	7.67
21	South Korea	14.01	61	Serbia and Montenegro	7.54
22	Iceland	13.70	62	Lithuania	7.37
23	Luxembourg	13.69	63	Chile	7.31
24	Curaçao	13.06	64	Spain and Andorra	7.08
25	Taiwan	12.86	65	Cook Islands	6.96
26	Norway	12.60	66	Hungary	6.93
27	Ireland	12.58	67	Greece	6.88
28	Seychelles	12.36	68	*GLOBAL TOTAL*	6.76
29	Uruguay	11.91	69	Azerbaijan	6.72
30	Czechia	11.71	70	Italy, San Marino and the Holy See	6.70
31	Singapore	11.67	71	Uzbekistan	6.67
32	Iran	11.20	72	Thailand	6.67
33	China	10.95	73	France and Monaco	6.50
34	Estonia	10.68	74	Algeria	6.38
35	Belarus	10.65	75	Saint Pierre and Miquelon	6.30
36	Poland	10.62	76	Paraguay	6.30
37	Malaysia	10.50	77	United Kingdom	6.27
38	Bulgaria	10.00	78	Romania	6.10
39	Finland	9.76	79	Brazil	6.05
40	Guyana	9.75	80	Israel / Palestine	6.02

SOURCE: EU GREENHOUSE GAS EMISSIONS OF ALL WORLD COUNTRIES REPORT 2023

TABLE 18: FUEL CONSUMPTION (KTOE) BY ROAD FREIGHT				
CATEGORY	2019	2020	2021	2022
Gasoil/diesel/DERV	748	683	751	742
Biodiesel	40	41	43	52

SOURCE: CSO, CENTRAL STATISTICS OFFICE, IRELAND

TABLE 19: SHARE OF ENERGY FROM RENEWABLE SOURCES, BY COUNTRY, 2022		
COUNTRY	RENEWABLE ENERGY SHARE 2021	RENEWABLE ENERGY SHARE 2022
Sweden	62.69	66.00
Finland	42.85	47.89
Latvia	42.1	43.32
Denmark	41.01	41.60
Estonia	37.44	38.47
Portugal	33.98	34.68
Austria	34.57	33.76
Lithuania	28.17	29.60
Croatia	31.29	27.92
Slovenia	25.00	25.00
Romania	23.87	24.14
EU-27	21.93	23.02
Greece	22.02	22.68
Spain	20.74	22.12
Germany	19.40	20.80
France	19.20	20.26
Cyprus	19.07	19.43
Bulgaria	19.45	19.10
Italy	19.16	19.01
Czechia	17.67	18.2
Slovakia	17.42	17.5
Poland	15.61	16.88
Hungary	14.13	15.19
Netherlands	12.99	14.97
Luxembourg	11.73	14.36
Belgium	13.01	13.76
Malta	12.67	13.40
Ireland	12.38	13.11
...		
Norway	74.03	75.82

SOURCE: EUROPEAN ENVIRONMENT AGENCY

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TABLE 20: REQUIRED LEVEL OF DECARBONISATION FOR THE TRANSPORT SECTOR				
2018 EMISSIONS MTCO2EQ.	INDICATIVE TARGET FOR 2025 EMISSIONS MTCO2EQ.	INDICATIVE TARGET % REDUCTION FOR 2025	2022 EMISSIONS MTCO2EQ.	% INCREASE (+) / REDUCTION (-) TO DATE
12.2	10	20%	11.6	-5%

SOURCE: HTTPS://ENTERPRISE.GOV.IE/EN/PUBLICATIONS/PUBLICATION-FILES/POWERING-PROSPERITY.PDF

TABLE 21: EMISSION FACTORS	
EUROPEAN SOURCES	GHG EMISSION (OPERATIONAL / TTW) KG CO2e/KG TTW: TANK TO WHEEL
Diesel	3.17
Biodiesel (50% rapeseed, 40% used cooking oil, 10 % soybean)	0.0019
Liquefied Petroleum Gas (LPG)	3.05
Hydrogen from steam reforming of natural gas HVO/HEFA (SAF) (50% rapeseed, 50% used cooking oil)	0
HVO/HEFA (SAF) (50% rapeseed, 50% used cooking oil)	0.0022
Electricity European average (EU 27, 2019, including average losses)	n.a.
Compressed Natural Gas (CNG)	2.71
Liquefied Natural Gas (LNG)	2.77
Bio-CNG	0.0025
Bio-LNG	0.0025

SOURCE: GLOBAL LOGISTICS EMISSIONS COUNCIL FRAMEWORK

TABLE 22: TRUCK PURCHASING AND LEASING COSTS	
AVERAGE PRICE EXCL VAT	**OCT 2023**
Diesel	
7.5 Tonnes	€64,020
16 Tonnes	€72,030
18 Tonnes	€76,980
46 Tonnes	€137,720
Electric	
4x2 Tractor Unit	€323,330
Annual change in monthly leasing costs 5.7%	

SOURCE: FTA IRELAND MANAGER'S GUIDE TO DISTRIBUTION COSTS

TABLE 23: COMPARISON COSTS - DIESEL VS ELECTRIC HGV	
DIESEL	**ELECTRIC (400KW BATTERY – MAX CHARGE TO 80% CAPACITY)**
Average distances travelled 282 km per day	Average distance covered in a charge 282 km
Average fuel consumption (L per 100km): **24.3L/100km (equivalent to 220KW/100km)**	Average Energy Consumption (320kw / 282km = 1.135 * 100km) **113.5KW/100km**
Average cost per km €0.46	Average cost per km: - Depot based night rate charging (€0.1398/kWh): €0.14/km - Public rapid charging services (€0.70/kWh): €0.79/km
Average fuel cost per day (68.5 litres a day) - €129.67	Average energy cost per day (320kWh) - Depot based night rate charging (€0.1398/kWh): €44.73 - Public rapid charging services (€0.70/kWh): €224.00
Note: Average cost per KM & average distance travelled taken from FTA Ireland Managers Guide to Distribution Costs Report 2023	Note: * Example is based on public service station pricing. If electric vehicles are charged on business site and avail of Night Energy Rate, the cost of running an electric vehicle changes dramatically – Rate is €0.1398 Kw/h. This rate would deliver Average cost per KM of €0.14 cent per KM and a daily energy cost of €40.00

SOURCE: FTA IRELAND

TABLE 24: IF RESPONDENTS ARE NOT CURRENTLY OPERATING ALTERNATIVE FUEL VEHICLES, WHEN DO THEY EXPECT TO?	
2023	8.3%
2024	8.3%
2025	16.7%
2026	0.0%
2027	8.3%
2028	25.0%
No confirmed timescale	33.3%
TOTAL	**100.0%**

SOURCE: FTAI MANAGER'S GUIDE TO DISTRIBUTION COSTS

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TABLE 25: OBJECTIVES AND TARGETS APPLYING TO MEMBER STATES					
FUEL TYPE	**DEADLINE**	**ON THE CORE NETWORK**	**ON THE COMPREHENSIVE NETWORK**	**IN EACH SSTPA***	**IN EACH URBAN NODE**
HGV electric refuelling station (Art. 4)	31 December 2025	At least 1,400 kW of recharging points every 60km	—	—	Aggregated power output of at least 600 kW
	31 December 2030	At least 3,500 kW of recharging points every 60km	At least 1,400 kW every 100km	At least 1 station per SSTPA with at least 100kW	Aggregated power output of at least 1,200 kW
	01 December 2035	—	At least 3,500 kW every 100km	—	—
Hydrogen (Art.6)	31 December 2030	Stations with a minimum capacity of 2t/ day and equipped with at least a 700 bar dispenser every 150 km. Liquid hydrogen every 450 km		—	At least 1 station in each urban node (if possible, located in multimodal hubs)
LNG for road vehicles (Art. 8)	01 January 2025	An appropriate no of publicly accessible refuelling points for LNG heavy duty motor vehicles throughout the Union, where there is demand, unless costs are disproportionate to the benefits including environmental benefits	—	—	—

* Safe & Secure Truck Parking Areas (SSTPAs) - dedicated to overnight parking for HGVs

SOURCE: FTA IRELAND

TABLE 26: RISKS AND DEPENDANCIES FOR DELIVERING EV INFRASTRUCTURE		
RISK	**DEPENDANCY**	**STAKEHOLDERS**
Lack of available grid capacity to meet demand within the timelines	Investment in grid capacity Establish a working group to manage this particular risk Deliver a national EV charging network plan for AFIR	ZEVI ESB Networks Transport Infrastructure Ireland Commission for Regulation of Utilities Local Authorities Charge Point Operators SEAI
Lack of site availability for implementation of charge points across schemes	National Planning Framework	
Lack of available staff & resources for delivery	Resourced stakeholder recruitment plans	
Lack of adequate public & private funding in the years up to 2025	ZEVI funding plan within Department of Transport planning process Available private funding for investment	

SOURCE: ELECTRIC VEHICLE CHARGING INFRASTRUCTURE STRATEGY 2022-2025 (PG 45)

Further information

Where to find more information

European Union

European Green Deal

https://ec.europa.eu/info/publications/communication-european-green-deal_en

https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en

https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/transport-and-green-deal_en

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'Fit for 55': delivering the EU's 2030 Climate Target on the way to climate neutrality

https://www.europarl.europa.eu/legislative-train/package-fit-for-55

Trans-European Transport Network (TEN-T)

https://transport.ec.europa.eu/transport-themes/infrastructure-and-investment/trans-european-transport-network-ten-t_en

https://transport.ec.europa.eu/transport-themes/infrastructure-and-investment/trans-european-transport-network-ten-t/north-sea-mediterranean-corridor_en

https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A32021R1153

Fifth Work Plan: https://transport.ec.europa.eu/document/download/29aa251d-0245-4b62-b91e-116774363ef1_en?filename=5th_workplan_nsm.pdf

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Sustainable and Smart Mobility Strategy.

https://transport.ec.europa.eu/transport-themes/mobility-strategy_en

Alternative Fuels Infrastructure Regulation (AFIR).

https://transport.ec.europa.eu/transport-themes/clean-transport/alternative-fuels-sustainable-mobility-europe/alternative-fuels-infrastructure_en#alternative-fuels-infrastructure-directive

https://www.consilium.europa.eu/en/press/press-releases/2023/07/25/alternative-fuels-infrastructure-council-adopts-new-law-for-more-recharging-and-refuelling-stations-across-europe/

Corporate Sustainability Reporting Directive

https://finance.ec.europa.eu/capital-markets-union-and-financial-markets/company-reporting-and-auditing/company-reporting/corporate-sustainability-reporting_en

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Non Financial Reporting Directive

https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021PC0189

European Alternative Fuels Observatory

https://alternative-fuels-observatory.ec.europa.eu/

Ireland

National Policy Framework Alternative Fuels Infrastructure for Transport In Ireland 2017 To 2030

Department of Transport
https://assets.gov.ie/26377/3075c29a37b84b10acae95da89d756ea.PDF

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Climate Action Plan 2024

Government of Ireland
https://www.gov.ie/en/publication/79659-climate-action-plan-2024/#

Skills for Zero Carbon
Department of Enterprise, Trade and Employment

https://enterprise.gov.ie/en/publications/skills-for-zero-carbon.html

National Hydrogen Strategy
https://www.gov.ie/en/publication/624ab-national-hydrogen-strategy/

Road Freight Transport Survey

CSO
https://www.cso.ie/en/statistics/transport/roadfreighttransportsurvey/

Zero Emission Vehicles Ireland (ZEVI)

Government of Ireland
https://www.gov.ie/en/campaigns/18b95-zero-emission-vehicles-ireland/#

Electric Vehicle Charging Infrastructure Strategy 2022-2025

ZEVI
https://www.gov.ie/en/publication/bb0c8-zero-emission-vehicles-ireland-policy-documents/

Ireland's National Biomethane Strategy

Government of Ireland
https://www.gov.ie/en/publication/d115e-national-biomethane-strategy/

Ireland

ABOUT FTA IRELAND

The Freight Transport Association Ireland CLG is a not-for-profit membership trade association for the Irish freight and logistics industry. We are wholly owned and governed by our members and act solely in advancing their best interests.

FTA Ireland covers all aspects of private and public freight transport, passenger transport and logistics supply chain, including road, rail, sea and air. Our work enhances the influence and image of the freight industry in Ireland by promoting the highest standards of safety and compliance.

Our experience and expertise in the transport industry puts us at the forefront of new information and changes to legislation, ensuring our members are the first to know about the latest developments in supply chain activity and policy.

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