The Green Pages
NEW FUELS GUIDE

SUMMER 2020 • ISSUE 2

Welcome to the second edition of our new supplement in INSITE magazine

At the PEIMF, we support our members, and the petroleum industry with education and help on traditional petroleum products and services. The pages of INSITE are always packed with information, which is almost totally provided by PEIMF members (a great member benefit). With the massive onset of change and developments in new fuels, we are proud of our new addition – The Green Pages.

'The Green Pages' is a series of regular special supplements, in which we endeavour to cover many aspects of new and alternative fuels in each edition.

Electric vehicle charging is front and centre of the debate, but there is a lot more to it, for both fuelling and the infrastructure involved.

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All of these areas, and more, will be covered on a regular basis, and we are keen to engage with all organisations involved.

We're open to your contributions, thoughts and comments; and as a not-for-profit organisation, we welcome sponsorship and advertising support.

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Car registrations
April 2020

April

	2020	2019	% change	Mkt share -20	Mkt share -19
Diesel	1,079	45,239	-97.6%	25.0%	28.1%
Petrol	1,553	101,153	-98.5%	35.9%	62.8%
BEV	1,374	1,522	-9.7%	31.8%	0.9%
PHEV	95	1,922	-95.1%	2.2%	1.2%
HEV	48	6,752	-99.3%	1.1%	4.2%
MHEV diesel	75	1,435	-94.8%	1.7%	0.9%
MHEV petrol	97	3,041	-96.8%	2.2%	1.9%
TOTAL	4,321	161,064	-97.3%		

Year to date

	YTD 2020	YTD 2019	% change	Mkt share -20	Mkt share -19
Diesel	92,498	232,959	-60.3%	19.0%	27.0%
Petrol	293,562	559,141	-47.5%	60.2%	64.9%
BEV	19,630	7,519	161.1%	4.0%	0.9%
PHEV	13,757	10,504	31.0%	2.8%	1.2%
HEV	28,438	33,010	-13.9%	5.8%	3.8%
MHEV diesel	17,224	5,500	213.2%	3.5%	0.6%
MHEV petrol	22,769	13,467	69.1%	4.7%	1.6%
TOTAL	487,878	862,100	-43.4%		

BEV - Battery Electric Vehicle; **PHEV** - Plug-in Hybrid Electric Vehicle; **HEV** - Hybrid Electric Vehicle, **MHEV** - Mild Hybrid Electric Vehicle

These figures are courtesy of the society of motor manufacturers and traders. www.smmt.co.uk

Liquefied natural gas (LNG)

An alternative fuel for road transport

Here is an introduction to LNG; its source, usage and viability, which has been compiled with help from Grain LNG, an LNG import terminal based in North Kent.

Natural gas is the cleanest burning fossil fuel available today. Cooling it to approximately −162 °C transforms it into liquefied natural gas (LNG) which comprises predominantly methane, but with variable small quantities of other gases, such as ethane and propane. The subsequent LNG has a volume 1/600th of its original volume; making it easy to transport and store.

LNG is transported to the UK from various global locations on large ships, and delivered to import terminals such as National Grid's Isle of Grain terminal in the South East. The LNG is later warmed up and delivered into the transmission system in the form of natural gas, to heat our homes and power our industries. Alternatively, it is collected from the terminal in its liquid form by specialist LNG trailers and delivered to 'off-grid' areas, or to fuelling stations for use as a transport fuel.

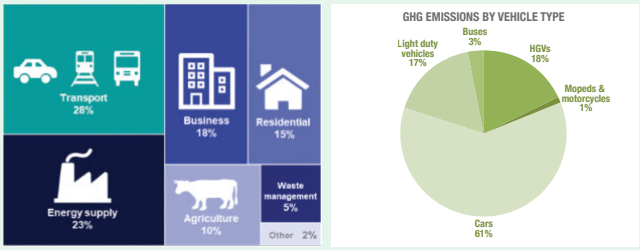
The specialist LNG trailers have custom-designed pressurised tanks, ensuring the prevention of any leakage. At the site of the fuelling station, the product is stored in well insulated tanks and the cold temperature is maintained using evaporative cooling. This means the liquid 'boils off' and a small amount reverts back to its natural gas state. This vapour can be captured and converted to compressed natural gas (CNG) to fuel CNG vehicles. Provided there is continual refilling of the storage tank, the temperature will remain fairly constant.

LNG IN TRANSPORT

LNG is an excellent fuel option for powering large long-distance trucks. Its use in passenger cars is far less viable (unless in its CNG form) because they stand idle more often, which would give rise to high evaporative losses.

Nevertheless, the use of LNG in the transport sector still has substantial environmental benefits. It is reported that a truck powered by a 'cleaner' LNG engine will emit up to 95% lower NO_x emissions and there is evidence of substantial reductions in 'Well-To-Wheel' CO_2 emissions, compared to diesel powered trucks. Overall, the technology to use LNG as a transport fuel is a well-developed (if niche) market.

Transport in the UK remains the highest greenhouse gas emitting sector. Despite the Government's commitment to a 'net-zero' target by 2050, there was relatively little improvement in transport emissions between 1990 and 2018. The government's 'Road to Zero' whitepaper looks to address this and encourage further uptake of ultra-low emissions vehicles ("ULEV").



UK Greenhouse gas emissions 2018, BEIS

LNG FOR HGVS

Within the transport sector, road transportation remains the highest emitting category, accounting for 91% of emissions. Heavy goods vehicles (HGVs) represent just 5% of road vehicles and yet are responsible for 18% of the CO_2 emissions.

Switching to natural gas as a fuel is one of the few available options for HGVS, with the immediate effect of reducing CO_2 by up to 20%. Natural gas also produces 95% less NOx, 99% less Sox and 100% less particulates than diesel.

Natural gas vehicles could also utilise biomethane, which offers a pathway to a much higher CO_2 reduction for LNG and CNG vehicles. Other lower carbon alternatives, such as battery-electric or hydrogen fuel cells, currently remain costly and impractical in HGV applications.

The UK has seen a remarkable evolution of natural gas HGVs since they were first introduced in 2012. The technology has undergone a complete overhaul, moving from post- manufacture conversions to original equipment manufacturer ("OEM") produced trucks as illustrated below.

Euro 5 Post manufacture conversion Jan 12 - Nov 14	**Euro 6** OEM manufactured Dec 14 - Dec 19	Scania 340hp LNG/CNG
		Iveco 400hp (2 axle) LNG/CNG
		Iveco 420hp LNG/CNG Scania 420hp LNG/CNG Volvo 420/460hp LNG

During 2017 and 2018 there was a drop in the number of natural gas-fuelled HGVs as older post-manufacture conversions came to their end of life, without a readily available replacement. The numbers recovered in 2019 as the availability of OEM manufactured trucks ramped up.

Fuelling stations

There is a total of 27 LNG and CNG fuelling stations in the UK[1]. The stations are setup in various operational combinations including bio-CNG, bio LNG and L-CNG.

Fuel Type	No. of Stations
Bio-CNG	8
Bio-LNG	14
CNG	5
LNG	18

SUPPORT SCHEMES

The UK government has in place a fuel duty differential fixed until 2032 (to coincide with the end of the 5th Carbon Budget). This differential results in significant savings for gas operated HGVs of up to £16,429 per year as shown in the table below:

	D	LNG / CNG
Road fuel duty	57.95ppl	24.7 p/kg
Volume (truck/yr) 160,000km/yr	45,400 litres	40,000 kg
Annual cost of fuel duty	£26,309/yr	£9,880/yr
Saving	**£16,429/yr**	

CURRENT BARRIERS TO FURTHER USE OF LNG/CNG AS A FUEL FOR ROAD TRANSPORT

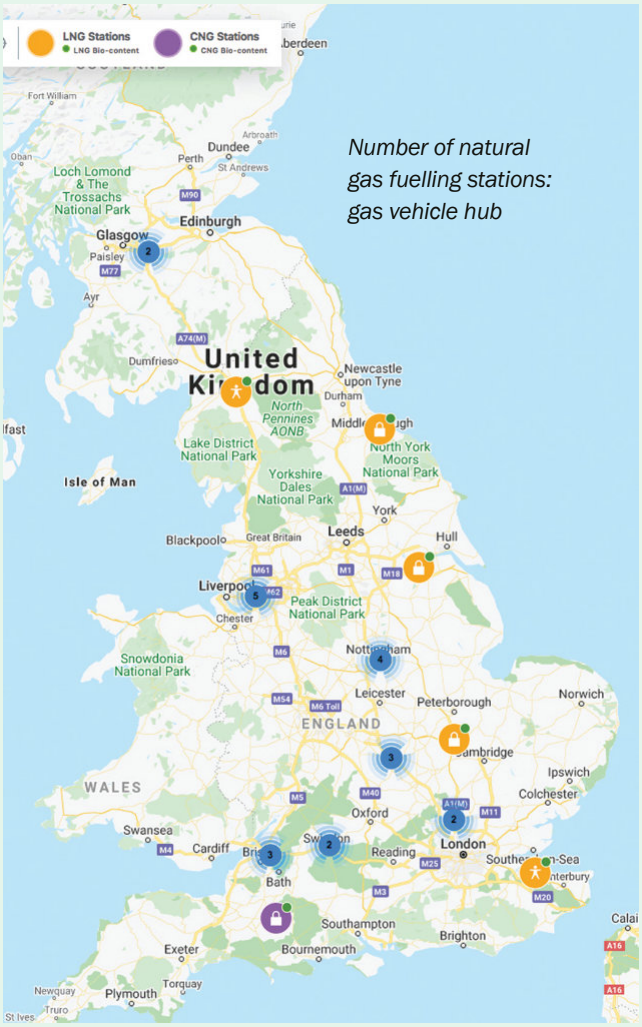
The key barrier to further use of LNG/CNG as a fuel for road transport is the availability of refuelling stations in the UK. Secondary barriers include:

- The cost of LNG trucks compared to Euro 6 trucks
- The uncertainty of the green policies versus fossil fuels
- The availability of biomethane as a substitute

Loading of LNG trucks/ containers/trains

AVAILABLE TRUCK LOADING INFRASTRUCTURES

Currently all LNG as transport fuel in the UK is supplied by the National Grid Grain LNG terminal in Kent, which is the largest in Europe with around one million cubic metres of storage. Grain LNG has sold long term regasification capacity to six major global LNG companies and has several truck loading customers currently operating at the terminal.



ISO containers via road and rail

Small scale LNG distributors are currently performing over 500 round trips of intermodal transportations of ISO containers to Scotland. The route involves loading an ISO container at Grain LNG (already loaded onto a truck), which is then transported to the midlands, where it is shunted onto a train.

The ISO container is then delivered to Glasgow, where it is then moved back onto a truck for the final leg of its journey. Intermodal transportations not only offer security of supply but are also a safer, greener, scalable and cost-effective solution as demand grows in the extremities of UK.

[1] *Please note some bio-LNG and bio-CNG are also included in the LNG and CNG stations numbers and vice versa*

LNG fuelled Anthony Veder vessels off Teesport

LNG for inland and maritime transport

LNG is currently the most cost-effective and sustainable alternative fuel solution for the marine sector. It is possible however that it will serve only as an interim fuel, before being replaced by other greener alternatives. There is therefore uncertainty in the marine sector, with fleet operators delaying the purchase of new vessels, which represent a 25 to 30-year investment. These has however not stopped several companies leading the way in purchasing and using LNG powered vessels with 2 examples below.

Saudi Arabia Basic Industries Corporation (SABIC) developed an LNG bunkering facility at Teesport in the UK in 2015. This serves two LNG-fuelled vessels.

A major cruise operator will be operating a new ship, which will be bunkered by ship to ship using Shell's Cardissa LNG bunkering vessel at Southampton Port.

How is Grain LNG supporting ssLNG developments?

TRUCK LOADING SERVICE

Grain LNG continues to offer a flexible and competitive service to both small and large ssLNG distributors on equitable terms. The truck loading bay has been built to ensure maximum reliability as this is key in supporting a growing market. There is already planning permission in place to enable a quick expansion to four bays should the market demand require the additional capacity.

In addition to the existing intermodal solution, Grain LNG is exploring the feasibility of transporting LNG ISO containers from the Isle of Grain directly on rail or ship.

COST-EFFECTIVE, BREAKBULK MARINE SERVICE

In the absence of any viable 'greener' alternative however, Grain LNG is continuing to investigate a cost-effective, flexible breakbulk marine solution, which would cater for the LNG marine fuel market and allow for the loading of small vessels (below 30,000 m^3) which would in turn proceed to bunker commercial vessels.

LNG fuelled P&O cruise ship, Iona

National Grid Grain, LNG Terminal

Office for low emission vehicles (OLEV)

Helping deliver a fit for purpose EV infrastructure network

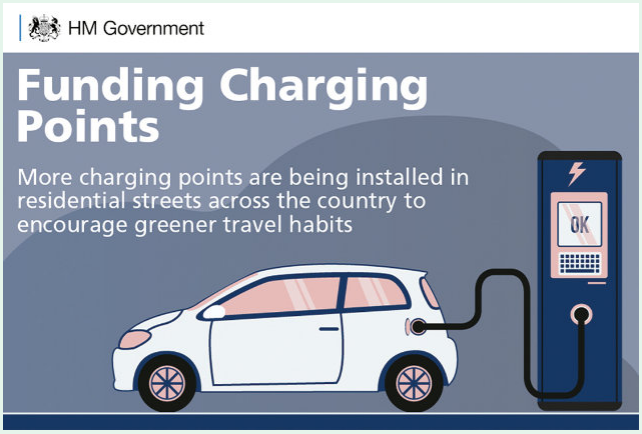
In mid-May the Transport Secretary announced a vision for the rapid chargepoint network in England.

The vision will be supported by a Rapid Charging Fund, which was announced in the March 2020 Budget as part of a £500 million commitment for EV charging infrastructure. Extensive public charging infrastructure across our motorways and major A roads is a key part of the transition to zero emission vehicles. Government will be working with the operators of major service areas to ensure that charging provision is in place ahead of consumer demand. The aim is to help support early adoption of electric vehicles and remove range anxiety concerns for drivers on long journeys.

CONFIDENCE IS VITAL

It is vital that EV drivers can have confidence in the public charging network, and the Government expects public chargepoints to be easy to use and hassle-free. That is why the Transport Secretary announced last weekend that the Government will consult on regulating to improve the consumer experience of using electric vehicle chargepoints. OLEV will take views on board in order to develop solutions that work for industry whilst putting the consumer experience at the heart of EV charging.

The Transport Secretary also announced a boost of green transport, by doubling of funding to £20m this financial year for local authorities under the On-street Residential Chargepoint Scheme. This will fund up to another 3,600 chargepoints (7,200 in total for 2020/21) across the country to make charging at home and overnight easier for those without an off-street parking space.



All installers should read the Government guidance on COVID-19, available at: **www.gov.uk/coronavirus** and working safely, available at: **www.gov.uk/guidance/working-safely-during-coronavirus-covid-19**.

This will provide the latest advice on how to ensure your workplaces are as safe as possible.

FUNDING CHARGING POINTS

Further efforts to encourage drivers to make the switch include the upcoming launch of a consultation which hopes to make charging electric vehicles just as easy as filling up a traditional petrol or diesel car. It will explore measures such as requiring rapid charging points – which are fundamental for longer journeys - to offer contactless payment, improving transparency on pricing and giving drivers better access to information about the chargepoints available on their journey.

The government is also working alongside the tech sector to see how technology could be used to help commuters stagger their journeys and advise on alternative modes of travel. Leading transport tech experts including Google, Zipabout and Trainline met this week at a roundtable chaired by the Transport Secretary, to explore how technology could help ease overcrowding and reduce the risk of a second spike in coronavirus cases.

Potential solutions could include mobile phone apps warning when public transport is particularly busy or advising on a quieter time to travel, allowing people to flex their hours and prevent the transport network from being overburdened.

www.gov.uk

The future of LPG:
Use as an automotive fuel up to 2050

Liquid Gas UK is the trade association representing companies that operate in the Liquefied Petroleum Gas (LPG) and bioLPG industry in the UK. Members include LPG producers, distributors, equipment and service providers, and vehicle converters.

They commissioned a report just a few years ago, on the future use of Liquefied Petroleum Gas (LPG) in transport through to 2050.

CONTEXT
There are currently more than 144,000 LPG vehicles in the UK, with more than 1,400 refuelling points. In addition, more than 2,000 private depots, including facilities for non-road mobile machineries (NRMM) and approximately 30% of all forklift trucks (FLTs) in the UK run on LPG.

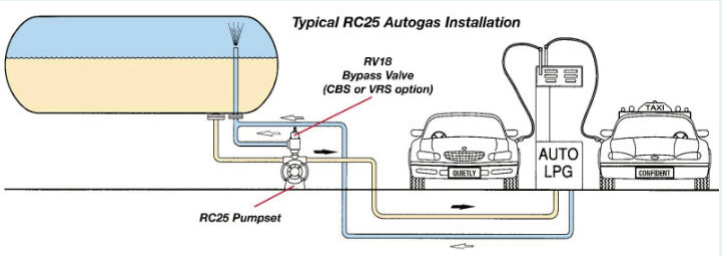
While it is clear that a continued investment in robust engine performance and emission testing data is needed for automotive LPG to further support its case, this report demonstrated that there is already a significant research base available.

ENVIRONMENTAL RETURNS
The report reinforced the potential environmental returns from automotive LPG. For example, the EU Fuel Quality Directive publishes carbon intensities of current major fuels and notes that LPG has 23% reduced carbon intensity versus diesel and a 21% reduction versus petrol.

Greater recognition of the air quality benefits of automotive LPG is also crucial, and data from an independent German test facility showed that, compared with diesel, LPG is lower on the pollutants that are harmful to human health.

POWERTRAIN OPPORTUNITIES
There is no doubt that vehicle mix will be markedly different in 2050 from today; Internal combustion engines, electric propulsion (pure EV, fuels cells, hybrid or plug-in hybrids) and low carbon liquid and gaseous fuels will all have a role to play.

PLUG IN HYBRIDS:
With appropriate development, LPG could be used as the single fuel when a compatible IC engine is used, with similar advantages to its use in conventional petrol vehicles. Alternative types of APU (free piston engines, rotary engines, Stirling engines, etc.) are in the research and development phase, and some of these may also lend themselves to using LPG as fuel.



COMMERCIAL AND OFF-ROAD HGVS:
This represents an important potential opportunity for LPG, provided compatible vehicles are available to the marketplace and the commercial considerations are favourable

BUSES:
Within urban areas, where air quality can be a very significant issue, LPG powered vehicles can be produced with very low levels of regulated emissions.

LONG-TERM SUPPORT AND POLICY:
While the various Automotive Council road maps (passenger car low carbon technology; power train technology; commercial and off-road technology, bus technology) suggest a significant shift away from conventional petrol/diesel vehicles to alternative propulsion based on electrification (batteries or hydrogen) by 2050, there is still a recognised space for sustainable liquid/gaseous fuels.

UKLPG continues to work with government, lobbying to ensure that LPG is considered and included in policy making decisions for the transport sector. This includes calling for parity for LPG in its fuel duty differential, and its inclusion in the National Policy Frameworks revisions resulting from the Alternative Fuel Directive to name a few examples.

CONCLUSIONS AND NEXT STEPS:
Following the launch of the LPG Autogas Blueprint in January 2015 and the Evidence Report of February 2015, UKLPG is calling for a number of steps to be taken in partnership with UK and European policymakers and the automotive industry;

Overtly promote an integrated fuels strategy that sets out a framework for all fuels, including automotive LPG

Implement a level playing field; setting the same duty rate for all gaseous fuels to achieve fuel parity in the UK

Explore LPG applications in line with upcoming powertrains and the requirements of OEMs

Establish LPG/bio-propane as an integral player in the long-term strategy for emissions reduction

www.uklpg.org

How feasible is LPG

Kyle Palmer is LPG Sales & Service Manager at PEIMF member MDM Services Ltd. At the tender age of just 31, he has vast experience in the industry including bulk LPG installation, sales and service to major gas companies and design & project management of large-scale gas recovery systems.

His current role lends itself to helping explain the merits of LPG to our readers.

LPG is everywhere, at least as far as the broad understanding of the term is concerned. LPG - originally abbreviated specifically from Liquid Propane Gas - has become a "roll off the tongue" identification for all gas in general, to a degree.

Across the country, butane is feeding barbecues, patio heaters, roofing torches and refrigerators. It's being used to produce lighters and aerosols and in many other applications. Propane is fuelling forklift trucks; a massive industry in itself. It's heating homes, being used to tarmac roads and power boats for industry and recreational purposes.

Lesser known forms of gas such as Pentane (Iso or other) are used as blowing agents to create polystyrene foam, on production lines to charge containers, in laboratories as solvents and the list goes on! All of the above could easily fall under the now broadly know term "LPG".

Nevertheless, as we are addressing the readers of INSITE magazine, the obvious reference will be to the original Liquid Propane Gas or Autogas.

AUTOGAS

Initial momentum for LPG started as far back as the 1930s, but it wasn't until the mid-60s that we started to fuel cars, buses, taxis and even heavy plant. It wasn't until this point that we could really identify an 'Autogas industry'.

So, the question on everyone's mind is;

'Can LPG/ Autogas come back for a second leg in the UK? Is it an alternative clean fuel that can compete with the likes of our modern movements towards electric & hydrogen?'

There are some 1500 LPG fuelling stations across the UK. Some under large canopies branded with oil company names we know and trust; others tucked away behind buildings in the most unlikely of places. Even now at a time considered to be the dying age for Autogas, the infrastructure is there to take a lot more traffic than it is currently serving.

Speak to any private seller of LPG and they will tell you that the margins are good, but the volume is poor. My point is that if we were to increase the number of Autogas vehicles on the road, not only would we be utilising this cleaner, cheaper fuel, the infrastructure costs would be a fraction of that required to see a large increase of electric or hydrogen vehicles.

So why isn't this happening? In my opinion, it's all down to a lack of government backing and the import / manufacturing costs within the industry. Put simply; everything in the Autogas industry is so damn expensive. Converting your car to LPG is difficult to say the least. It's seen as a specialist job so you will pay higher labour costs than most average car garages. Cut corners on the installation or opt for a cheaper product and it will give you unreliable results. So at stage one of the process, people are going to face hurdles.

Making your car tax exempt is definitely not enough of an incentive to get people lining up to convert their vehicles over to LPG. However, if a grant was on offer, it could convince more people to make the change. I don't drive an LPG car myself, but if I was given £1000 to cover the conversion costs, I'd certainly be more inclined to do so.

TOUGH FOR DISTRIBUTORS

Also, I feel for distributors of Autogas; with smaller numbers of sales going through the till. It must be a hard pill to swallow when a company such as ours comes along and quotes thousands of pounds for a pump-set swap out or other seemingly smaller works. I wish we could offer our customers a better price on equipment that would boost the likelihood of the Autogas market picking up, but the truth is, as a service provider in the industry, we are bound by the costs decided by our suppliers. The suppliers of Autogas equipment need to drive down prices if the market is going to pick up. Drop the profit margins now so that those costs can be made up by higher volume further down the line. I agree that it's very easy to type that up as a suggestion, but in practice it's one hell of a gamble.

So to answer the question; 'Is LPG still a feasible fuel alternative?' I'm sorry ladies and gentlemen but I really don't know. I'd certainly like to think so. OK, I'm biased: I work in the industry, but there are a lot of elements in its favour and it could potentially take only a few small steps by people in higher places to make an industry boom a reality. Only time will tell, I guess. In the meantime, anyone looking to invest in or expand on their Autogas equipment, MDM and I will be here to offer an honest opinion.

Many thanks to our present customers; you are appreciated.

Keep safe in these uncertain times everyone & all the best for the future!

www.mdmservices.co.uk

Hydrogen helps keep key workers moving

ITM Power, the clean fuel and energy storage company, is proud to be continuing to play a part in the support of key workers during the COVID-19 pandemic.

These customers include the FCEV Metropolitan Police vehicles used for policing activities in London and Green Tomato Cars, who are helping to get key workers where they need to be. Both the MET Police and Green Tomato Car drivers are continuing to use the company's hydrogen refuelling stations in and around the London area in Teddington, Cobham on the M25, Beaconsfield on the M40 and Rainham. Each three minute car refuel provides a range of up to 400 miles.

ITM Power electrolysers generate hydrogen fuel on-site, using renewable electricity and water, with the fuel dispensed at the station where it is generated. This means a zero carbon footprint and no use of further transport infrastructure. An additional benefit of hydrogen is its role in supporting the drive for cleaner air; especially important in high population cities. When hydrogen fuel cell electric vehicles are driven, the only emission is water vapour.

Dr Graham Cooley, CEO, ITM Power, said:

"We should all recognise the contribution made by the UK's key workers who are keeping the country running in these difficult times. Keeping our hydrogen refuelling stations open means that we can play our part in helping them continue to work, for the benefit of all UK citizens."

Jiggs Bharij, Head of Fleet Services, Metropolitan Police added:

"Fulfilling our duties during the coronavirus lockdown does not mean that we should abandon our commitments to lowering carbon emissions. We salute all those key workers who are keeping us all going."

Jonny Goldstone, Founder, Green Tomato Cars said:

"Thanks to the reliability and range of our zero emission fleet of fuel cell electric vehicles, we can get people where they need to be to keep us all safe and well, and, at the same time, help provide London with cleaner air."

Jon Hunt, Manager Alternative Fuels, Toyota GB said:

"We are delighted that ITM Power has taken the decision to keep its refuelling infrastructure operational during this important time, allowing the emergency services and other UK key workers to continue to use the zero emission Toyota Mirai in confidence despite the difficult circumstances."

Sylvie Childs, Nexo Product Manager, Hyundai Motor UK, said:

"In these difficult times, it is our responsibility to do what we can to support our key workforce. This move by ITM ensures that zero emission hydrogen cars can continue to operate as normal ensuring key workers mobility and additional improvements in air quality."

ABOUT ITM POWER PLC

ITM Power plc manufactures integrated hydrogen energy solutions for grid balancing, energy storage and the production of renewable hydrogen for transport, renewable heat and chemicals. ITM Power plc was admitted to the AIM market of the London Stock Exchange in 2004.

In October 2019, the company announced the completion of a £58.8 million fundraise, including a subscription by Linde of £38 million, together with the formation of a joint-venture with Linde to focus on delivering renewable hydrogen to large scale industrial projects worldwide.

ITM Power signed a forecourt siting agreement with Shell for hydrogen refuelling stations in September 2015, (which was extended in May 2019 to include buses, trucks, trains and ships) and in January 2018 a deal to deploy a 10MW electrolyser at Shell's Rhineland refinery.

ITM Power announced the lease of the world's largest electrolyser factory in Sheffield with a capacity of 1GW (1,000MW) per annum in July 2019. Customers and partners include Sumitomo, Ørsted, Phillips 66, National Grid, Cadent, Northern Gas Networks, Gasunie, RWE, Engie, BOC Linde, Toyota, Honda, Hyundai and Anglo American among others.

For further information please visit **www.itm-power.com**