Energy Strategy for Northern Ireland

Submission to: Department of Economy

Date: 20th March 2020

[redacted]

Calor Gas Northern Ireland Ltd

CALOR

INTRODUCTION

Calor welcomes the opportunity to respond to the Department of Economy consultation on Northern Ireland's Energy Strategy. The transition to a low-carbon economy brings opportunities for clean technology growth, job creation and competitive advantage, as well as wider benefits including improved standard of living, cleaner air and better health.

Calor recognises that if Northern Ireland is to maximise these opportunities and deliver the benefits, a whole of government approach is critical, together with strong collaboration with energy suppliers, industry and local communities. Calor will actively support the Department's goals to deliver a new innovative approach on the introduction of this proposed Energy Strategy.

In this submission Calor aims to introduce three fuels that are available today and will support Northern Ireland transition to decarbonisation.

I. INTRODUCTION TO CALOR

Calor is part of the SHV Energy group, the world's largest distributor of LPG and one of the leading suppliers of LNG for industries and transport in Europe. SHV Energy operates in more than 29 countries and is proud to serve 30 million customers across three continents. Calor has the experience and the expertise to play a leading role in Northern Ireland's energy transition. Our customers and our society demand that change and we look forward to delivering it for them.

Calor has been supplying the lower carbon fuel, liquefied petroleum gas (LPG) to rural homes, businesses and communities across Ireland for over 80 years. Sustainability is at the heart of Calor's business strategy and we aim to continue to supply Northern Ireland's consumers and businesses to 2050 and beyond. By 2037, the company's centenary year, Calor's ambition is that all of its energy products will be from renewable sources. The company is on track to achieve its ambition of 10% renewable energy supply by the end of 2020.

With the launch of a renewable liquefied petroleum gas (BioLPG) in 2018, Calor demonstrated its commitment to playing an active role in Ireland's transition to a decarbonised economy. BioLPG offers up to 90% lower carbon emissions than fossil fuels.

Building on this success, Calor introduced Liquefied Natural Gas (LNG) to Ireland in 2019, supplying a leading food manufacturer in the agri-food sector. LNG will also provide a new alternative low carbon and cost effective fuel for the freight transport sector in Northern Ireland.

Our products can be supplied anywhere on the island of Ireland and are fuels of choice for homes and businesses in rural Ireland that are looking for a cleaner and more flexible fuel source. LPG is available in bulk tanks and cylinders storage, for domestic, commercial applications (such as heating, catering and manufacturing) and transport both in road (cars) and non-road (fork lift trucks) applications.

In preparation for this call for evidence Calor commissioned Ecuity a UK consultancy firm to consider the options for "Rural heat decarbonisation in Northern Ireland"[1]. The report aims to provide an overview of the challenges and opportunities involved with decarbonising heat in predominantly rural off-gas grid homes in Northern Ireland. The authors have modelled a number of representative scenarios using publicly available data where possible to explore the scale of transformation needed in homes that are heated using high-emission fossil fuels (oil and coal). The technology pathways are considered in two ways, an individual domestic house and a wider context for the energy market.

A copy of the report is provided in this submission and its findings are referenced in relevant question responses. It is noted as the Ecuity NI report (2020)[1]. Throughout the submission other reports and studies are referenced with the full details provided in the references list, web links have been provided where possible. Calor would be happy to provide email copies on request.

LPG and BioLPG can play a key role in Northern Ireland's energy transition by providing off-grid communities and businesses with an alternative to carbon-intensive fuels, allowing off-grid communities and businesses in Northern Ireland to set and achieve ambitious growth plans, while reducing their impact on the environment.

SEAMLESS TRANSITION TO LOWER CARBON AND RENEWABLE ENERGY

LPG: AN ALTERNATIVE LOWER CARBON FUEL

LPG is one of the cleanest fossil fuels with a low carbon emission value of 0.214kg/kW[2] and under the 2014/94/EU Directive for the deployment of alternative fuels infrastructure, Liquefied Petroleum Gas (LPG) was identified as a principal alternative fuel with a potential for long-term oil substitution. LPG is a by–product of oil and natural gas extraction. It can be supplied anywhere on the island of Ireland and is the fuel of choice for homes and businesses in rural Ireland that are looking for a cleaner and more flexible fuel source. LPG is available in bulk tanks and cylinders storage, for domestic, commercial applications (such as heating, catering and manufacturing) and transport both in road (cars) and non-road (fork lift trucks) applications.

LPG contributes directly to climate and energy policy by reducing greenhouse gas (GHG) emissions and air pollutants from domestic, commercial, industrial and transport sectors, predominantly in rural areas where there is no alternative low carbon fuel. Unlike many other off-grid fuels, LPG & BioLPG contain low levels of nitrous oxides (NOx) and particulate matter (PM), contributing to better air quality. Also, LPG delivers 13% GHG emission savings against oil and 38% against coal[2].

The LPG products (butane and propane) are sourced from refineries at Milford Haven in the United Kingdom, the Whitegate refinery in county Cork (25%) and elsewhere in Europe.

Calor's infrastructure includes sea terminals in Belfast, Cork and Dublin. These are supported by the largest LPG tanker fleet in Ireland. Combined with our logistics and automatic telemetry technology, Calor can ensure efficient, optimised fuel supply to rural energy users.

In Northern Ireland, LPG is currently not as widely used as natural gas or oil. It should be noted there are no technical or supply barriers to increasing the use of this lower carbon fuel in Northern Ireland. Calor has been supplying LPG in Northern Ireland for over 80 years; we believe it can make a significant contribution to a decarbonised energy market. LPG is the lowest carbon conventional fuel source available to homes and businesses off the grid, providing an immediate and cost effective energy solution.

BioLPG: A RENEWABLE ENERGY BEING USED TODAY IN NORTHERN IRELAND

BioLPG delivers up to 90% certified carbon emission savings compared to fossil fuels[3]. BioLPG is chemically identical to LPG, so BioLPG is transported and stored in the same bulk tanks and cylinders and used in the same boilers and appliances as LPG. The transition from LPG to BioLPG is totally seamless, in the same way it was before for a company switching from electricity made from coal to electricity derived from green energy. There is just one important difference - the production process.

Calor's first BioLPG supply is produced by Neste, a specialist in advanced biofuels, at a custom-built refinery in Rotterdam. This biopropane is a by-product of a conventional hydrogenation process that mainly produces 'renewable' biodiesel and is made from a mix of sustainably-sourced renewable vegetable oils and waste materials. The HVO production process is only one method, later in this submission, we share more details on future pathways.

BioLPG and its feedstocks are International Sustainability and Carbon Certification (ISCC) scheme approved and BioLPG is fully traceable as a renewable fuel. ISCC is a global sustainability certification scheme for biofuels production. The production of BioLPG is fully compliant with the sustainability requirements of the EU Renewable Energy Directive on the promotion of the use of energy from renewable sources.

The World LPG Association issued a report on BioLPG called *The Renewable Future (2018)* and supports Calor's claim BioLPG offers up to 90% lower carbon emissions than existing fossil fuels and carries the same low NOx, SOx and PM as conventional LPG. The UK Department for Transport also recognises these savings in *The Road to Zero Strategy*.

Calor launched BioLPG in 2018 and will shortly reach its goal of 10% renewable energy supply by 2020. Calor continues to grow its market place with forward thinking environmentally conscious consumers. As expected renewable BioLPG is a premium product so will have a slightly greater cost than fossil fuels and this will remain to be the case until global supply increases. Northern Ireland is in a unique position being one of the 8 countries chosen by SHV Energy to launch this biofuel. The potential for supplies into Northern Ireland will increase and should not be seen has a barrier to this innovative fuel.

We believe BioLPG can support Northern Ireland's ambitions for decarbonising both the heat and transport sectors, reducing consumer's impact on GHG emissions and local air quality. Combined with LPG, the transition will be seamless.

LNG & BIOLNG: LOWER CARBON ALTERNATIVE TO DIESEL

Liquefied Natural Gas (LNG) is natural gas which has been cooled to a cryogenic level, allowing it to be easily transported via road or ship in specially designed transport containers. This means it does not need a pipeline infrastructure to be in place. LNG is most commonly used by very large businesses and in heavy goods transport.

LNG offers a lower carbon alternative for large energy users unable to use the natural gas grid for location or capacity reasons. Switching an industrial oil user to LNG will have a substantial impact on emissions, up to 25%[2]. LNG also offers the opportunity to address the highly challenging issue of transport emissions.

Calor LNG is shipped, through a number of routes, from continental Europe with the potential to source within the United Kingdom. As one of Europe's leading energy companies, SHV Energy has an established network of LNG supply points. This additional supply can enhance Northern Ireland's energy security, while using a lower carbon fuel.

LNG offers the Department and Heavy Goods Vehicle (HGV) fleet operators a lower carbon and cost competitive solution to reduce the negative environmental impact from transport. With the transport sector accounting for 23% of Northern Ireland's emissions and as the second largest emitting sector[4], it will have a significant role to play in any decarbonisation agenda. Recently, Calor, alongside Volvo and Dennison's Commercial, a leading Northern Ireland HGV provider, launched the concept of LNG to our customer base and the feedback was extremely positive.

The adoption of LNG as a low carbon fuel opens the possibility to utilise renewable BioLNG in the future. BioLNG is biomethane which is liquefied in the same process as LNG, like LNG it emits negligible NOx or particulate matters when burned but BioLNG will go further to reduce GHG emissions by up to 90%. Once LNG is established in Northern Ireland, the transition to BioLNG will be seamless in the future.

II. CONSULTATION QUESTION RESPONSES

Energy in Northern Ireland

Q1. What lessons can we learn from elsewhere in addressing energy within an overarching climate action framework?

Q2. What are the key considerations for decarbonising Northern Ireland's energy sector given existing linkages to other jurisdictions?

- Energy imports are an important element of the current energy supply market and this is unlikely in change before 2030, but decarbonisation by 2050 opens opportunities for local production of biofuels.

- The UK Department for Transport recognise and support LNG for HGV transport through a lower taxation rate on the fuel. As recently as November 2019 the Republic of Ireland announced plans to support the uptake of LNG for HGV transport[5]. The Northern Ireland government is in a unique position to benefit from the actions taken in both GB and ROI if they promote and support LNG refuelling for heavy goods vehicles and there is also potential for shipping.

- The Northern Ireland equipment market is linked to the wider UK market, there is a need to consider this when setting timelines. If the GB market moves faster than the NI market, old or less efficient equipment could be introduced into NI because it is restricted in the GB market.
- Calor advocates the UK and NI continue best practice on renewable certification, for current and new emerging biofuels being locally produced or imported in to Northern Ireland.
  - An essential element for the use of renewable fuels and bioenergy used in Northern Ireland is sustainability and renewable certification. In order to properly calculate the carbon impact of any fuel, it is important to look at the life cycle greenhouse gas emissions of that fuel, including each stage of its production and use.
  - The whole life cycle of Calor BioLPG is calculated as part of its ISCC certification. Voluntary schemes verify compliance with the EU's biofuels sustainability criteria. They check that biofuel production did not take place on land with high biodiversity, that land with high carbon stock was not converted for biofuel production, and that the production of biofuels leads to a sufficient level of greenhouse gas emissions savings. Several schemes also take into account additional sustainability aspects such as soil, water, air protection and social criteria.
  - By implementing this full life cycle approach to carbon immediately, we will give certainty to businesses and homes who are looking to invest in new energy solutions. A number of EU approved voluntary schemes could immediately support the assessment of life cycle greenhouse gas emissions (GHG) for the heat sector.

Q3. To what extent should Northern Ireland implement the key energy-related recommendations from the CCC 'Reducing Emissions in Northern Ireland' report?

- The Committee on Climate Change issued a report on the UKs Net Zero ambitions in May 2019, "Net Zero - The UK's contribution to stopping global warming". This report states that one quarter of the heat pumps installations required will need an alternative fuels to meet heat demand at peak. The study uses BioLPG for homes situated off the natural gas grid, positioning BioLPG beside the on grid alternative hydrogen.
    - Technical report extract Pg 85 "Alongside 5 million homes connected to low-carbon heat networks, our Further Ambition scenario includes around 19 million heat pumps in homes. Around three quarters of these are full heat pump installations,92 whilst a quarter are heat pumps installed as part of a hybrid system, relying on alternative fuels to meet heat demand at peak - hydrogen for homes on the gas grid and bio-based fuels (modelled as bio LPG) for homes off the gas grid. Deploying heat pumps at this scale will require a very substantial increase in the rate of uptake in homes. In addition to requiring growth in the number of heat pumps installed at the point of heating system replacement, there is scope for hybrid heat pumps to be retrofitted at the same time as energy efficiency improvements are made. The scale of deployment should be such that hybrids are widely used by 2035 (e.g. in 10 million homes), reducing the later challenge of tackling residual gas use."
    - When considering the CCC report the latest information should be used that includes amore wide ranging package of solutions included hybrid gas heat pumps and BioLPG.

- In relation to the that the Committee on Climate Change 2019 Northern Ireland report Calor is encouraged it highlighted "support to incentivise consumers to install low-carbon heating in homes off the gas grid;" however the report is limited in the options it recommends. Reducing the future potential to ensure better access to a range of energy sources.

- Calor also supports the option to incentivise energy efficiency improvements in homes; however this should consider high efficient gas boilers as they require a lower level of retrofit requirements compared to other solution like heat pumps. Heating controls should be considered to encourage consumers to take responsibility of their fuel use.

Q4. Do you agree with the 30-year timeframe? If not, please state your preferred approach and reasons.

- We support the timeframe of 30 years and feel it is needed to provide certainty to drive private sector investment in innovation, research & development on biofuel solutions.
- The suggested five year action plans with comprehensive formal review points are vital to ensure policy remains fluid to benefit quickly from innovation.

- Liquid Gas UK launched their 2040 vision[6] in 2019, promoting that the LPG industry is already transitioning to be 100% renewable by 2040, this is in response to the marketplace and is ahead of government policy. It is important to remember to achieve this vision this takes time and a combined effort of all stakeholders.
- The current production pathway HVO, is only one of the possible ways to produce BioLPG, for new BioLPG production pathways set out in Q6 to move from the laboratory to commercial scale facilities will take time and investment.

The Energy Transition in Northern Ireland

Q5. What are the unique characteristics of Northern Ireland that need to be considered in a net zero carbon energy transition?

- Off-grid communities should form a central part of Northern Ireland's decarbonisation agenda and their unique needs should be addressed and recognised. A multi-technology pathway, which recognises the central role that gas and bio-gas will play in the decarbonisation of off-grid communities and businesses, is crucial. It will also assist Northern Ireland in making the transition from polluting fuels to low carbon alternatives, without costly infrastructure investment.
  - Despite significant investment in the national gas network since the 1990s, there are still many energy customers, and indeed customers close to towns and cities, who are not connected to the natural gas grid. The CCC 'Reducing Emissions in Northern Ireland' report states that Northern Ireland has a higher percentage than the rest of the UK with 76% of homes off grid.
  - It is also important to note that where a town is served by the Natural Gas network it is often only the main commercial areas and urban centre that are connected. In many cases, the strongest demand for LPG comes in areas adjacent to connected towns, where there is a strong understanding of the benefits of gas, but where there is no economic basis to extend the network into housing estates and satellite communities.
  - Rural consumers who are not connected to the gas network, must rely on the available alternatives, which include electricity for cooking as well as oil and solid fuel for heating.

- Ecuity NI report (2020) "Rural heat decarbonisation in Northern Ireland: analysis of potential pathways" [1] highlights,
  - Northern Ireland has several unique characteristics that differ from Great Britain as a whole. Specialised policy is required to tailor Northern Ireland's approach to decarbonisation to support these characteristics.
  - Oil leads household final energy usage and provided 68% of heating in 2016, rising to 80% for rural areas. There was a 5.9% increase in CO2 emissions from NI households from 2014 to 2017. Potential reasons for the increase in emissions is the fall in heating oil prices (-44% between 2012 and 2017). Also the economic recovery which increased the disposable income leading to higher energy consumption. The link to heating oil prices and disposable income is important when considering the policy measures needed to support to transition to renewables for households and businesses.

- Oil heating systems are in all house types. A high proportion of bungalows and semi-detached homes (79%) use oil heating. This reflects one of the highest levels of oil consumption across Europe.
- The majority (60%) of buildings are old, built before 1980, and are more likely to be inefficient and need retrofitting measures. The efficiency of homes will impact the effectiveness of new low carbon technologies, particularly heat pumps.
- Fuel poverty affected 18% of Northern Irish households in 2018, particularly significant in comparison to only 12% of households in Great Britain. Although it has fallen from 42% in 2011, mainly due to the drop in oil prices, this number remains significant. Homes in rural areas are disproportionately affected. In 2016, 31.5% of rural and 16.2% of urban homes were fuel poor.
- Domestic sector accounted for ~65% of particulate matter (PM2.5) emissions in Belfast in 2018. This is due to the high levels of oil consumption for heating. PM2.5 emissions were associated with 178 premature deaths in Belfast alone, in 2017. Compared to other UK cities, Belfast had the highest level of PM2.5 emissions per 10,000 inhabitants in 2017. The reliance on Oil heating needs to be addressed as soon as possible to improve local air quality.

The Heavy Goods Vehicle (HGV) transport industry is under pressure to find alternative solutions, with 23% of GHG emissions in 2017 being recorded against transport[4].

- Northern Ireland has an opportunity to pioneer the transition to more sustainable transport through liquefied natural gas (LNG) refuelling infrastructure and supporting the HGV sector to transition from the use of diesel.

- Liquefied Natural Gas (LNG) is natural gas which has been cooled to a cryogenic level, allowing it to be easily transported via road or ship in specially designed transport containers. This means it does not need a pipeline infrastructure to be in place.
- LNG has the benefit of being available anywhere in Ireland, meaning that individual haulage or public transport companies nationwide, could be offered the opportunity to come on board.
- LNG is recognised as an alternative fuel at European level under 2014/94/EU directive for the deployment of alternative fuels infrastructure. The combustion of natural gas releases significantly less CO2, NOx and SOx and virtually no ash or particulates compared to diesel and petrol. And as it evaporates rapidly when exposed to the air, it leaves no residue on water or soil.

Q6. Is your organisation undertaking or planning to undertake projects to support the energy transition? If so, please provide further details.

- Today's Lower Carbon Alternatives for domestic, commercial, industrial and transport
  - LPG contributes directly to climate and energy policy by reducing greenhouse gas (GHG) emissions and air pollutants from domestic, commercial, industrial and transport sectors, predominantly in rural areas where there is no alternative low carbon fuel.
  - Calor has not stopped with this solution, launching renewable BioLPG in 2018 and LNG in 2019, with ambitious plans for BioLNG in the future.
- Calors takes the responsibility to its customers to safety deliver cost effective fuels seriously, while recognising the need to diversify and take a lead in the development of sustainable and environmentally friendly fuels.
  - Since 2013 SHV Energy has been investigating renewable pathways to produce BioLPG (Biopropane & Biobutane). Calor's first BioLPG supply is produced by Neste, a specialist in advanced biofuels, at a custom-built refinery in Rotterdam as mentioned previously.
  - The transition from LPG to BioLPG is totally seamless. BioLPG delivers up to 90%[3] certified carbon emission savings compared to fossil fuels. BioLPG is chemically identical to LPG, so BioLPG is transported and stored in the same bulk tanks and cylinders and used in the same boilers and appliances as LPG.
  - Calor was to first to invest in infrastructure, resources and skills to launch LNG in Ireland at a commercial level with a sustained supply chain. LNG offers a lower carbon alternative for large energy users unable to use the natural gas grid for location or capacity reasons. Switching an industrial oil user to LNG will have a substantial impact on emissions, up to 25% savings[2].
  - LNG offers the Department and Heavy Goods Vehicle (HGV) fleet operators a lower carbon and cost competitive solution to reduce the negative environmental impact from transport. With the transport sector accounting for 23% of Northern Ireland's emissions and as the second largest emitting sector, it will have a significant role to play in any decarbonisation agenda.
  - The adoption of LNG as a low carbon fuel opens the possibility to utilise renewable BioLNG in the future.
- Today's Transport solution for Cars and People
  - Calor supports the UK Government's ambitions within the Clean Growth Strategy to decarbonise transport, explored further in its Road to Zero strategy, where it states that LPG vehicles "may be a good current alternative to diesel in urban driving conditions."
  - LPG Autogas can help to reduce pollution immediately as one diesel vehicle emits the same quantities of NOx as over 20 LPG vehicles, and PM emissions from LPG-fuelled vehicles on an urban cycle are below reliably measurable levels. Well-to-wheel analysis also demonstrates that an LPG-fuelled vehicle generates 14% and 10% fewer CO2 emissions than its petrol and diesel run counterparts[7].

- In Northern Ireland, Calor has switched 100% of the forecourts supplying Autogas to BioLPG. The result is over 2,000 tonnes of GHG emissions were saved and removed from Northern Ireland Road Transport since 2018.
- The Government already recognises the benefits of LPG & BioLPG by providing lower fuel duty compared with petrol and diesel. BioLPG is recognised under the UK Renewable Transport Fuel Obligation Scheme and the Motor Fuel Greenhouse Gas Emissions scheme, supporting its renewable and sustainable credentials.

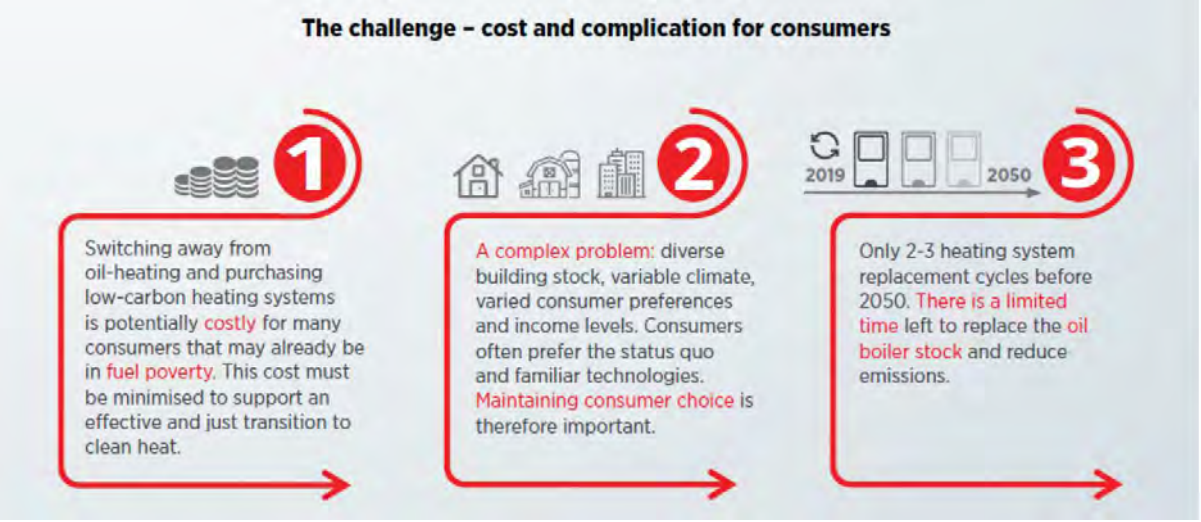
- Innovation: Working Now to Create Tomorrow's Seamless Solutions
  - In 2018, the first supply of BioLPG in Europe and Ireland was only the beginning, Calor aims to diversify the production methods for BioLPG and BioLNG exclusively or alongside other biofuels.
  - In the last two years interest in the current production pathway has increased with 25 new HVO facilities with other potential suppliers planning for the production of BioLPG.
  - Calor and SHV Energy are working with feedstock providers, technology suppliers and policy makers to ensure that bio-based and renewable gas innovation continues to prosper. Both our presently selected, as well as future technology pathways must all achieve increasingly stringent sustainability criteria. Our present and future upstream feedstock providers must also demonstrate their commitment to increasingly sustainable certified feedstocks as well as complying with officially recognised ethical and land use criteria.
  - Liquid Gas UK launched a report in September 2019 on Biopropane: Feedstocks, Feasibility and our Future Pathway[8] in conjunction with NNFCC (York UK), a leading international consultancy with expertise on the conversion of biomass to bioenergy, biofuels and bio based products. This built on a 2018 report released by the World LPG Association, BioLPG: The Renewable Future[3] in conjunction with Atlantic Consulting (Zurich, Switzerland). These reports highlight several waste and biomass-to-energy conversion processes in which BioLPG is produced as a co-product and there are a range of feedstocks that can be used in those processes.
  - Advanced conversion technologies would allow for indigenous feedstock and production technologies to contribute to energy independence in Northern Ireland which is currently reliant on imported fossil and renewable fuels to satisfy energy demand. These near to medium term technology pathways being explored by SHV Energy include options to exploit the 230kt municipal wastes produced in Northern Ireland each year.
  - In May 2019, SHV Energy, KLM and SkyNRG announced plans to build the first European sustainable aviation fuel (SAF) production facility in Delfzijl in the Netherlands. Planned for 2022, the plant will produce 100,000 tonnes of SAF in addition to 15,000 tonnes of BioLPG. In November 2019, SHV Energy announced its participation in the KLM Corporate Biofuel Programme, which supports SHV Energy's strategic decision to actively contribute to the development and production of sustainable energy products.

- In June 2019 SkyNRG also signed a Memorandum of Understanding with the University of Limerick to explore the development of sustainable aviation fuel manufacturing in Ireland.
- Calor has been working with Ulster University since 2018 on research and development pathways to produce BioLPG in particular. A major breakthrough was achieved in 2019, whereby microbes, capable of producing propane were identified. This is a similar process to biomethane production from anaerobic digestion. In addition to direct funding from Calor, the promise of this approach has also been recognised by Invest NI who are now providing funding to accelerate the commercialisation of this promising technology. This is an example of just one of our long term research projects that shows Calor's commitment to invest in the local knowledge. We are enthusiastic to build our local capacity to provide a long-term renewable solution for our customers.
- There are strong local academic institutes and private companies willing to innovate in this space, once clear policy support is in place. The Northern Irish market is a great platform to lead on pilot schemes, testing new environmentally friendly and innovative ideas across technologies and energy sources to reduce the impact of climate change. The inclusion of BioLPG in any local strategy going forward would allow us to attract more global funding for such projects in Northern Ireland. Consumers

Q7. How should we ensure that energy remains affordable for domestic consumers?

- Eurogas commissioned ComRes to conduct consumer research to better understand consumers' preferred heating choices and appetites for various energy resources. Many would be put off upgrading their heating system if it meant they had to undertake significant renovation work or pay an upfront cost
  - Around two in five people in several markets including Spain, the Netherlands, Latvia and Ireland say they would be unlikely to upgrade their heating system to one that is more environmentally friendly if they have to do renovations or pay money up front.
  - All in all, these findings suggest that in each of the countries surveyed, there is a significant proportion of the population who would be unwilling to make significant changes to their heating system, especially if there are not significant financial incentives to outweigh it.
  - Any policy that requires replacing existing heating systems is likely to meet with inertia and resistance from a significant minority of people.
  - A copy pf the full report is accessible here: https://eurogas.org/website/wp-content/uploads/2019/12/Eurogas_Energy-Report_ComRes.pdf .

- Ecuity NI report (2020) "Rural heat decarbonisation in Northern Ireland: analysis of potential pathways"[1] highlights 3 key considerations for policy makers,



- Rural households and businesses face more complex fuel options and housing types than their on-grid counterparts. The unique needs of off-grid rural communities and businesses should be addressed in the development of the energy strategy for the period to 2050.
- Calor recommends the department provides a mixed technology approach to heat decarbonisation, providing choice for energy customers while ensuring new policy doesn't unintentionally restrict options.
- The study modelled the options available for a typical NI homeowner using heating oil considering a new low carbon heating solution. The findings highlight LPG and BioLPG provide a cost effective solution for domestic heating when compared to other renewable options.
- Like other renewables, BioLPG is a premium product over the cost of fossil fuels and will remain to be the case until global supply increases. Northern Ireland is in a unique position being one of the 8 countries chosen by SHV Energy to launch this biofuel. The potential for supplies into Northern Ireland will increase and should not be seen has a barrier to encourage this innovative fuel.
- The findings are positive but based on the Eurogas study above, active policy and support will still be required to encourage a more effective move away from oil and towards a mix of low-carbon heating technologies, including LPG and BioLPG.

The full findings are available in the appendix, which shows additional considerations than noted below.

  - The first consideration for any homeowner is the upfront cost. The BioLPG boiler has by far the lowest upfront cost, over £4,500 cheaper than the next cheapest option being the biomass boiler. It can make use of existing emitters and can provide high temperature heat. As expected the model shows heat pumps work best when installed alongside energy efficiency improvements to the home but is still more expensive. This can be disruptive and involve underfloor and internal/external wall insulation.

- The homeowner will also consider the running costs of each option. Without any energy efficiency improvements to the homeowner, the biomass boiler has the lowest running costs. LPG offers the potential for a transitionary fuel to a BioLPG 'drop-in' that lowers the fuel bill for the consumer.
- BioLPG offers the cheapest option for the homeowner across the heating system lifetime. The yearly fuel bill saving of the heat pumps and biomass boiler do not outweigh the additional upfront cost that these systems have. Heating systems are expected to last for 15-years, LPG/BioLPG saves £6,000 compared to a heat pump installation across a typical 15-year lifetime.
- In conclusion preventing a mixed technology approach to heat decarbonisation will cost more for the NI homeowner, when selecting a low carbon heating solution.

Q8. What steps could be taken to improve the relative cost competitiveness of larger non-domestic consumers?

- Calor advocates providing a choice of energy sources and ensuring new policy doesn't unintentionally restrict options. A mixed technology approach offers several advantages to large energy users including an increased the competitive energy landscape. This supports a regionally balanced economy enabling rural businesses to remain competitive compared to similar businesses utilising natural gas.
- The full potential of gaseous fuels needs to be further exploited by Northern Ireland, especially with respect to their potential to reduce emissions in rural areas.
- To date, a range of industrial, agri-food, tourism and hospitality businesses have made the switch to LPG and also BioLPG. Their commitment to make environmentally driven purchasing decisions highlights LPG is a chosen transition fuel away from Oil. Some companies have taken the next step to purchase renewable BioLPG which a viable solution today and can support more businesses in the future.
- Combined with the seamless transition BioLPG delivers gas technologies are proven and accepted, increasing the consumer's confidence to use renewables. To hear from business already using LPG and BioLPG please refer to the Calor website[9].
- As expected renewable BioLPG is a premium product over the cost of fossil fuels and will remain to be the case until global supply increases. As mentioned previously Northern Ireland is in a unique position being one of the 8 countries chosen by SHV Energy to launch this biofuel. The potential for supplies into Northern Ireland will increase and should not be seen has a barrier to utilising this innovative fuel.
- Even though some business have chosen BioLPG, there is a need to clear policy support for gaseous fuels, through active policy and support will still be required to encourage more business to move away from oil and towards a mix of low-carbon heating technologies, including LPG, BioLPG and LNG.

Q9. Is a strategic position of "enable and protect" the correct policy stance?

a) What policies or schemes are needed to enable active consumers?

b) What policies or schemes are needed to protect vulnerable consumers?

- Calor advocates an enable and protect stance and has highlighted some points below for consideration when deciding on policies.
  - Affordable solutions are needed for energy consumers both active and vulnerable, Calors recommends a phased transition from high carbon fossil fuels to lower emission heating options. This could be delivered using building regulations, a mandated carbon standard through revised EPCs (addressed in Q15).
  - Old inefficient oil heating must be tackled, LPG provides a quick win solution to lower carbon emissions and improved local air quality, while ensuring the use of future proofed renewable technology through the future use of BioLPG. LPG gas technology requires a lower upfront investment compared to other solutions[1].
  - Despite the ability of consumers to make significant carbon savings, it will be difficult to motivate a proportion of householders and businesses to move away from heating oil. Oil infrastructure is owned by the home or business owner, therefore the cost of removing a tank and the value of the remaining fuel causes customer reluctance to move on to lower carbon solutions. Consideration to this barrier is needed, in Northern Ireland the ownership of LPG and BioLPG storage tanks is retained by the energy supplier. This ensures safety standards are upheld to the highest level.

- Implementing straight forward measures that off-grid consumers will understand like low interest loans or an old oil equipment scrappage scheme is recommended. This will allow them to make carbon emissions savings now with LPG, in addition to locking in far deeper decarbonisation in the future with BioLPG. It would also allow heating engineers and installers to actively promote alternative, cleaner heating systems.
  - Technology is the key element when considering energy efficiency and reducing energy use, it determines how the fuel is used to generate the heat or electricity output. It is important to highlight building regulations promote energy efficient technology for the use of some renewables but they do not enable bio energies like BioLPG to be used. The advantage of a bioenergy is the drop in element but this is currently penalised in building regulations, this needs to be addressed with suppliers and industry.

Q10. What types of advice and information are required by all consumers and what are the best mechanisms for facilitating this?

- Calor advocates providing a non-biased information resource for the general public, businesses and energy industry stakeholders.
- Calors requests support to address the knowledge gap on biofuels in the general public.

Q11. Are there examples of successful citizen energy projects in Northern Ireland and elsewhere that have delivered improved energy efficiency and/or clean energy to local communities?

Q12. What opportunities are there in both urban and rural areas for citizen energy communities in Northern Ireland? What role could government have in facilitating these?

- Calor does not have a position on the topic of citizen energy projects

Q13. What evidence can you provide that identifies the challenges and opportunities for NI energy consumers in decarbonising energy?

Ecuity NI report (2020) "Rural heat decarbonisation in Northern Ireland: analysis of potential pathways"[1] available with this report highlights a number of challenges and opportunities.

Energy Efficiency

Q14. What, if any, energy efficiency target or targets should be set for Northern Ireland?

Q15. How should we define, measure and monitor energy efficiency to optimise its potential in our homes, business, economy and environment?

- Energy performance certificates (EPC) are promoted as the mechanism by which energy efficiency standards are driven and measured, however in their current form they place a disproportionate focus on input fuel cost.
  - This method is particularly distorting when comparing various fuel types between similar properties and is a problem for off-gas grid properties where all fuel options (heating oil, electricity, solid fuel or LPG) are more expensive than natural gas.
  - Off-grid properties are instantly disadvantaged as their location dictates their fuel options which automatically results in lower EPC rating than their mains gas counterparts. This means that two identical properties, one off-grid and one on-grid, will have different EPC scores.
  - In addition, fuel price fluctuations can result in EPC rating variations when no material changes to a property's building fabric have occurred. Removing the cost element from the EPC calculation would ensure EPCs accurately advise property owners of the energy efficiency of their property as intended.
  - EPCs in their current form act as a barrier to the uptake of lower carbon solutions in off-grid homes because it ultimately drives off-grid homeowners away from low carbon fuels and onto higher carbon, cheaper energy sources to gain a higher EPC rating.
  - As EPCs are increasingly being used by policy makers as the mechanism by which improvements in energy efficiency and performance standards will be driven and measured. This consultation is a timely opportunity to review EPC methodology to

ensure they are an accurate, fair and effective tool to support the decarbonisation of heat and achieve its other policy aims.

- The recommendation would be to remove the fuel cost element of the EPC calculation and include carbon emissions as part of the EPC methodology. If the methodology is appropriate and acts as an equitable measure of energy efficiency, using EPCs as a tool to promote energy efficient choices could be promoted.

Q16. What are the most important policy levers for government to ensure zero carbon in:

a) New domestic and commercial buildings by 2050?

b) Existing domestic and commercial buildings by 2050?

- Energy efficiency as a tool to reduce the amount of energy consumed needs to be the first step in any approach. Technology is the key element when considering energy efficiency and reducing energy use, it determines how the fuel is used to generate the heat or electricity output.
- First step support should focus on encouraging energy consumers to move away more low efficient technology using high polluting fuels to more energy efficient proven gas technologies.
  - In the domestic setting this moving from high polluting old oils boilers to high efficient condensing gas central heating boilers, direct water heaters and hybrid gas heat pumps.
  - In a commercial setting this is the same appliances as domestic at larger scale, also industrial burners powering equipment like steam boilers and industrial scale dryers.
- It is important to highlight building regulations promote energy efficient technology for the use of renewables but they do not enable bio energies like BioLPG to be used. The advantage of a bioenergy is the drop in element but this is penalised in building regulations, this needs to be addressed with suppliers and industry.
- Energy Performance Certificates are increasingly being used by policy makers as the mechanism by which improvements in energy efficiency and performance standards will be driven and measured. This consultation is a timely opportunity to review EPC methodology to ensure they are an accurate, fair and effective tool to support the decarbonisation of heat and achieve its other policy aims.

  The recommendation would be to remove the fuel cost element of the EPC calculation and include carbon emissions as part of the EPC methodology. If the methodology is appropriate and acts as an equitable measure of energy efficiency, using EPCs as a tool to promote energy efficient choices could be promoted.

Q17. What should the future of energy efficiency support look like and who should be the key delivery bodies?

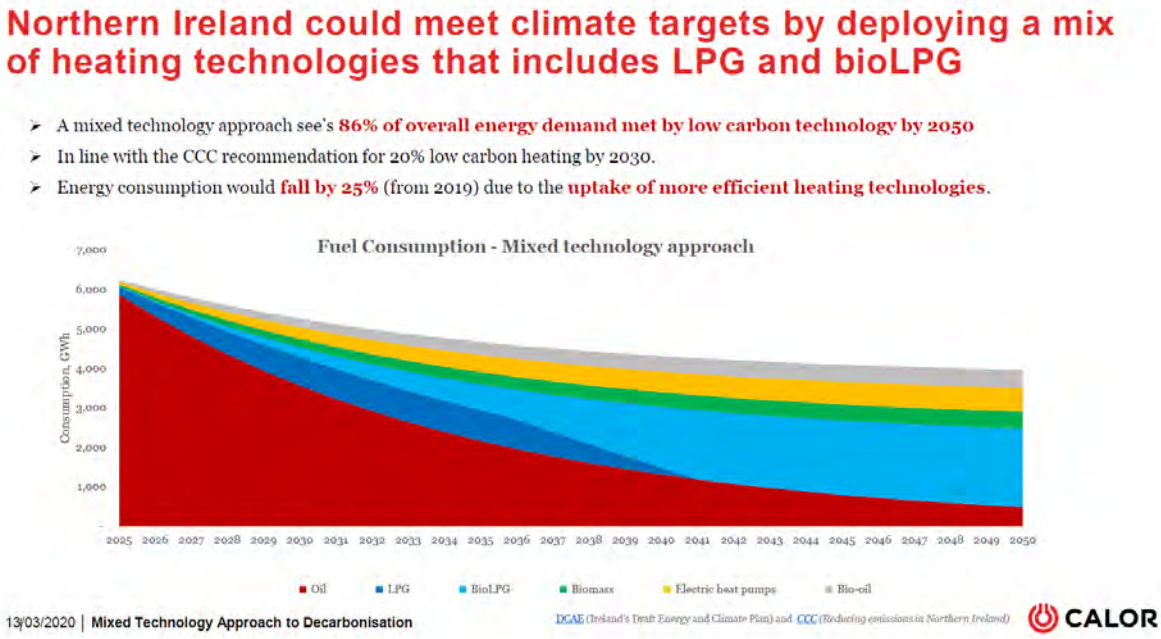
- Implementing straight forward measures that off-grid consumers will understand like low interest loans or an old equipment scrappage scheme is recommended. This will allow them to make carbon emissions savings now with LPG, in addition to locking in far deeper decarbonisation in the future with BioLPG. It would also allow heating engineers and installers to actively promote alternative, cleaner heating systems.

Heat

Q18. What is the appropriate pathway and timeline for the decarbonisation of heat between now and 2030, and subsequently to 2050?

- The Ecuity NI study (2020) "Rural heat decarbonisation in Northern Ireland: analysis of potential pathways" sets out a potential 30-year decarbonisation pathway. The full findings and references are available in the appendix.

- A mixed technology approach that includes LPG and BioLPG, is a cost-effective and viable solution towards decarbonisation. It is essential that government extends support to BioLPG in the heat sector. Deploying a mix of low-carbon heating technologies that includes LPG and BioLPG could see emissions fall by 86% in line with proposed targets[1].



Inputs:

- The high level and significant finding is Northern Ireland could meet climate targets by deploying a mix of heating technologies that includes LPG and BioLPG
- The key scenario parameters were, 1. Household oil consumption is phased away to a mix of low-carbon heating energy sources. 2. This includes, LPG, bioLPG, biomass, bio-oil and electric heat pumps. 3. Uptake of each technology is informed by analysis undertaken by Ecuity, supplemented by SHV's ambition to be 100% renewable by 2040.

Demonstrated pathway and timeline,

1. Energy efficiency as a tool to reduce the amount of energy consumed needs to be the first step in any approach. Technology is the key element when considering energy efficiency and reducing energy use, it determines how the fuel is used to generate the heat or electricity output. The modelled highlighted the opportunity is a reduction of 25% on overall energy consumption.
2. Support a phased transition from high carbon fossil fuels to lower emission heating options. This could be delivered using building regulations and a mandated carbon standard. This would need to a gradually timeline in order of the old housing stock to be switched to low carbon fuel and then renewable fuels.
3. Old inefficient oil heating must be tackled, LPG provides a quick win solution to lower carbon emissions and improved local air quality, while ensuring the use of future proofed renewable technology through the future use of BioLPG. LPG gas technology is also more cost effective the timeline demonstrated for the steep decline in fossil oil by 2035.
4. Need to recognise the unique position Northern Ireland can take to utilise BioLPG is a key part of the solution, it should be included in any future heat decarbonisation support schemes. This is vital to achieve the timeline demonstrated for the phase out of LPG in 2040.

Q19. What are the appropriate ways to measure the progress of decarbonising heat?

Q20. What are the most cost-effective and sustainable steps that government might take to accelerate the reduction of the carbon intensity of heating fuels?

- Confidence is key to building success. This Call for Evidence, and the formal response to it, provides the government with an opportunity to signal its support for a mix of heating solutions, including LPG as a transition fuel and BioLPG for more advanced consumers, which reflect the many and varied needs of Northern Irish buildings. A clear signal will give industry players, across a variety of technologies, impetus to invest further and faster.

- Calor and the UK LPG industry's ambition is to be 100% renewable by 2040[6]; a strong message from Government stating that there is a role for LPG and biopropane as Northern Ireland transitions to low carbon heat, would enable swifter investment and more opportunities for NI homes or businesses to decarbonise.

- Despite the ability of consumers to make significant carbon savings, it will be difficult to motivate a proportion of householders and businesses to move away from heating oil. Oil infrastructure is owned by the homeowner, therefore the cost of removing a tank and the value of the remaining fuel causes customer reluctance to move on to lower carbon solutions. Consideration to this hurdle is needed, LPG and Consideration to this barrier is needed, in Northern Ireland the LPG and BioLPG storage asset ownership is retained by the energy supplier. This ensures safety standards are upheld at the highest level

- Implementing straight forward measures that off-grid consumers will understand like low interest loans or an old equipment scrappage scheme is recommended. This will allow them to make carbon emissions savings now with LPG, in addition to locking in far deeper decarbonisation in the future with BioLPG. It would also allow heating engineers and installers to actively promote alternative, cleaner heating systems.

- Independent gas installers and large gas companies are a key part of the LPG industry; Calor does not directly employ gas installers but have a trusted network. These companies are heavily linked to the gas industry, the governments support of BioLPG will ensure their business and skills remain relevant into the new low carbon energy market. These installers are the frontline for energy decisions by homeowners and businesses, providing technical and safety advice, they are key stakeholders to be consider when deciding policies or scheme to promote low carbon and renewable technology.

- The Northern Ireland equipment market is linked to the wider UK market, there is a need to consider this when setting timelines. If the GB market moves faster than the NI market, old or less efficient equipment could be introduced to NI because it is banned in the GB market.

- Building regulations could include a mandated carbon standard, which limits the carbon intensity of fuels. Regulating the carbon intensity of heating fuels could effectively limit residential emissions, and encourage the uptake of low carbon technologies.

Q21. Is decarbonisation of the gas grid a viable option and what evidence can be provided on both the speed and affordability of decarbonising the gas grid?

- Calor does not have a position on the gas grid, although it is important to note any developments or investment in decarbonising the gas gird consumers consideration should also be given to off grid gas users.
- When biomethane is produced by anaerobic digestion, the biogas generated may need enriched to improve the calorific value, bringing it in line with conventional natural gas. Calor has experience in the enrichment of biogas providing both conventional propane and renewable BioLPG for this purpose in the wider UK market.

Q22. **What evidence can you provide on the opportunities for district heating schemes in Northern Ireland and where should responsibility lie for facilitating these?**

- Calor does not have a position on district heating schemes.

Q23. **Can you provide any evidence or information on the opportunities for geothermal heat supply?**

- Calor does not have a position on geothermal heat.

Power

- Calor fully supports the development of renewable electricity for consumers across Northern Ireland as long as it is economically viable and does not have a negative impact on the local environment.

Transport

Q.30. What would be an appropriate pathway to decarbonised energy for transport by 2050?

- Transport Solutions for Heavy Goods Vehicles and Goods:
  - The Heavy Goods Vehicle (HGV) transport industry is under pressure to find alternative solutions, with 23% of GHG emissions in 2017 being recorded against transport[4].
  - The competitive landscape in this industry is moving quickly supporting more environmental friendly practices. For decades diesel has been the default option for vehicle fleets, and Heavy Goods Vehicles in particular, contributing substantially to harmful transport emissions. But with the advent of commercial vehicles powered by liquefied natural gas (LNG) that is changing. Mainstream manufacturers including Iveco, Scania and Volvo now offer a choice of LNG-powered trucks that have comparable performance to diesel vehicles in terms of power, acceleration, and cruising speed.

  - LNG is recognised as an alternative fuel at European level under 2014/94/EU directive for the deployment of alternative fuels infrastructure. The combustion of natural gas releases significantly less CO2, NOx and SOx and virtually no ash or particulates compared to diesel and petrol. And as it evaporates rapidly when exposed to the air, it leaves no residue on water or soil.

  - The positive impact of LNG on air quality cannot be taken lightly, delivering a 98% saving in particulate matter and a 48% saving in NOx emissions compared to an equivalent diesel vehicle. LNG powers large vehicles more efficiently than electricity, offering better ranges and lower maintenance requirements.

  - LNG will also have the benefit of being available anywhere in Ireland, meaning that individual haulage or public transport companies nationwide, could be offered the opportunity to come on board. The process of cooling natural gas into a liquid form shrinks the volume so that it takes up around 600 times less space than when in its gaseous form. And it weighs even less than water. This makes it easier and cheaper to transport and store.

  - In 2018 there were 4,000 HGVs operating on LNG on the roads of Europe and 955 of these vehicles are in France, Italy, Benelux and the UK to date. This number is expected to grow to 30,000 by 2023.
  - The adoption of LNG as a low carbon fuel opens the possibility to introduce renewable BioLNG in the future. BioLNG is biomethane which is liquefied in the

same process as LNG, it emits negligible NOx or particulate matters when burned and reduces CO2 by up to 90%. Once LNG is established in Ireland, the transition to BioLNG will be seamless. The first farm-based AD plant anywhere in the world is now generating biomethane in the form of BioLNG from animal waste, is operating in Co. Tyrone and demonstrates an excellent example of the local circular economy.

- In late 2019, the Republic of Ireland Government's Low Emission Vehicle Taskforce recognised and plans to support the roll out of LNG refuelling and the use of LNG in HGVs. Northern Ireland has an opportunity to pioneer the transition to more sustainable transport providing support for LNG refuelling infrastructure and supporting the HGV sector to transition from the use of diesel. Calor is positioned strongly to support the Northern Ireland government in this endeavour, with UK and European wide expertise.
- The successful roll out of LNG in the UK and Europe has been based on a collaborative approach between policy makers, vehicle manufacturers, energy companies, forecourt operators and customers. Barriers to adoption have been identified and where possible steps have been taken to promote adoption, with policy solutions provided by Government.
- Calor fully supports the measures already put in place by the UK government to ensure the fuel duty differential between diesel and LNG remains until at least 2032. This enables fleet operators to commit to alternative fuel HGV's knowing that the upfront additional premium of a LNG truck over the diesel equivalent will be recouped over its working lifespan.

- Today's Transport solution for Cars and People
  - Calor supports the UK Government's ambitions within the Clean Growth Strategy to decarbonise transport, explored further in its Road to Zero strategy, where it states that LPG vehicles "may be a good current alternative to diesel in urban driving conditions."
  - LPG Autogas can help to reduce pollution immediately as one diesel vehicle emits the same quantities of NOx as over 20 LPG vehicles, and PM emissions from LPG-fuelled vehicles on an urban cycle are below reliably measurable levels. Well-to-wheel analysis also demonstrates that an LPG-fuelled vehicle generates 14% and 10% fewer CO2 emissions than its petrol and diesel run counterparts[7].
  - In Northern Ireland, Calor has switched 100% of the forecourts supplying Autogas to BioLPG. Delivering up to 90% GHG emission savings compared to fossil alternatives in accordance with the current legalisation available, EU Renewable Energy Directive. The result is over 2,000 tonnes of GHG emissions were saved and removed from Northern Ireland Road Transport since 2018.
  - The Government already recognises the benefits of LPG & BioLPG by providing lower fuel duty compared with petrol and diesel. BioLPG is recognised under the UK Renewable Transport Fuel Obligation Scheme and the Motor Fuel Greenhouse Gas Emissions scheme, supporting its renewable and sustainable credentials.

- Transport solutions for non-road mobile machinery.
  - The UK government recognises non road mobile machinery (NRMM) as a form of transport under the Renewable Fuel Obligation Scheme. Under this term Fork Lift Trucks are mentioned, Calor Gas NI Ltd was the first company in the UK to successfully apply for Renewable Fuel Obligation Certificates for FLTs in 2018. Since then 100% of our sales into our FLT market have been allocated 100% BioLPG. This as delivered a GHG emission saving over 4,000 tonnes in the NI FLT sector since 2018. This is a small volume of fuel sales in the wider context.
  - Northern Ireland has a big challenge to address under transport so every opportunity should be considered. The promotion of bioenergy in the form of BioLPG is something Calor would like the department to consider for NRMM FLTs.

Q31 - Q34 Calor does not have a position on electric vehicles.

Q34. To what extent can alternative low carbon transport fuels contribute to decarbonisation of the transport sector?

- Key messages repeated

Q35. Do you have any data/research to help inform and reduce the carbon intensity of our transport energy in order to achieve net zero carbon by 2050?

- Data is directly available from the truck manufacturers who have right-hand-drive LNG / BioLNG variants available for the UK marketplace. The CO2 emissions performance has already been assessed during stringent testing and approval certification process. Further information can be obtained via the following web links;
  https://www.volvotrucks.com/en-ir/trucks/volvo-fh/volvo-fh-lng.html#
  https://www.scania.com/ie/en/home/products-and-services/articles/alternative-fuels.html
- There has been a number of projects focused on the development of BioLNG production and refuelling facilities across Europe including the EU funded BioLNG EuroNet project. Calor would welcome the opportunity to be a collaborative partner in a similar project for Northern Ireland. https://bioIngeuronet.eu/

Other Issues:

a. **Security of Supply**

Q36. What specific risks to security of energy supply are likely to emerge as a result of our changing energy mix, and what actions can be taken to mitigate these?

Q37. What measures or indicators could be adopted or developed to monitor energy security of supply?

- Energy imports are an important element of the current energy supply market and this is unlikely in change before 2030, but decarbonisation by 2050 opens opportunities for local production of biofuels.
- As mentioned previously under Q6, Calor is devoting significant resources to product innovation and diversification as part of the company's decarbonisation strategy. Calor & SHV Energy have, with our partners, led the development of BioLPG. This is the first renewable gas on the Northern Irish market. Calor is investing in research & development both in Northern Ireland and elsewhere to further develop our BioLPG offering.
- Advanced conversion technologies would allow for indigenous feedstock and production technologies to contribute to energy independence in Northern Ireland which is currently reliant on imported fossil and renewable fuels to satisfy energy demand. These near to medium term technology pathways being explored by SHV Energy include options to exploit the 230kt municipal wastes produced in Northern Ireland each year
- It is vital supply chains for importing low carbon transition fuels like LPG and renewables biofuels like BioLPG are protected in the long term. These supply chains ensure these fuels are available until local production is set up and commercially viable.

b. **The Role of Data:** Calor does not have a position on the role of data.

c. **Carbon Capture and Storage:** Calor does not have a position on carbon capture and storage.

d. **Energy and the Economy**

Q43. What specific economic opportunities will arise from the decarbonisation of energy?

Q44. What skills are needed to realise the potential economic benefits of energy in the future?

- The green economy is an area Calor regards as vital, we are committed to remaining an energy supplier and local employer in Northern Ireland. Through investing in our gas products and in particular BioLPG we want build on our already strong foundations.
- BioLPG is chemically identical to LPG, so BioLPG is transported and stored in the same bulk tanks and cylinders and used in the same boilers and appliances as LPG. The transition

from LPG to BioLPG is totally seamless. This statement is key to how we choose the products we invest in and introduce to markets.

- Calor can contribute to the green economy by utilising our skilled workforce and infrastructure to provide a seamless transition to renewables.
- The LPG industry is closely linked to the natural gas industry in terms of the level of safety standards and training centres supporting a skilled direct and indirect workforce. The uptake in other renewable technologies like heat pumps will require retraining, new regulations and governance. LPG and BioLPG do not require any major development in these areas, as it is already delivering these services today.
- Our impact to local economy is broader than our own direct energy supply, it includes cylinder dealers and retailers from the rural corner store to large DIY stores. LPG and BioLPG is available in bulk storage tanks and cylinder form for domestic and commercial applications including heating, cooking and industrial processes. Since the launch of BioLPG we have strategically chosen sectors to share the environmental benefits. In 2019 we launched BioLPG into our patio gas cylinders, spplying our retailers a renewable solution to sell to their customers for leisure outdoor living and cooking. A small impact in the wider energy market but important for these local business and their customers wanting to reduce their environmental impact.
- Independent gas installers and large gas companies are a key part of the LPG industry; Calor does not directly employ gas installers but have a trusted network. These companies are heavily linked to the gas industry, the governments support of BioLPG will ensure their business and skills remain relevant into the future energy market. These installers are the frontline for energy decisions by homeowners and businesses, providing technical and safety advice, they are key stakeholders to be consider when deciding policies or scheme to promote low carbon and renewable technology.
- The government supporting LPG as a transition fuel and Renewable BioLPG, will enable Calor to continue working with local retailers, installers and expand the reach of bioenergy and renewables.

Q45. What are your views on the future of overall energy demand in NI and how can we ensure that any potential demand growth aligns with our net zero carbon target?

e. Delivery Framework for an Energy Strategy

Q46. Do the existing division of responsibilities and powers across government enable the most effective approach to the overall aim of decarbonising energy? If not, what are your suggestions for improvement?

- Calor supports the development of a cross functional division or department to lead the future energy strategy. It is important the division or team responsible has the knowledge to make informed decisions across energy, climate change and local air quality, including the environmentally, economically and implementation considerations.

Q47. What are the opportunities for local government to contribute to the delivery of the net zero carbon target?

- Purchasing decision by local government can may made with decarbonisation in mind. The ability to tender to supply renewable solutions is not always available limiting the opportunity for energy suppliers and end users to introduce the concept of renewable use in local government.

Q48. What are your views on how statutory duties and accompanying legislation and regulatory frameworks would need to change to facilitate the transition to net zero carbon by 2050?

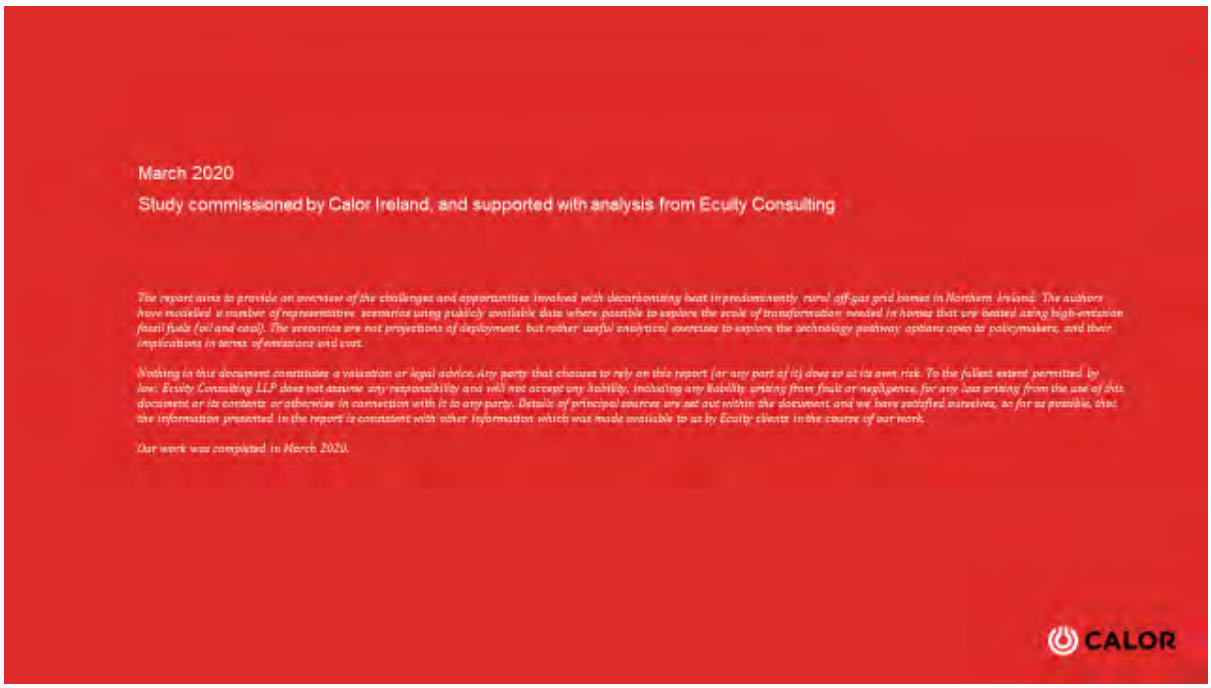
Q49. Is there a need for a dedicated organisation to champion, lead and deliver sustainable energy interventions? If so, what should this look like?

- Please note response to Q46.

III. REFERENCES

1. Calor commissioned Ecuity a UK consultancy firm to consider the options for "Rural heat decarbonisation in Northern Ireland" Shown in Appendix 1.
2. Department for Environment Food & Rural Affairs UK Government GHG Conversion Factors for Company Reporting https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/806027/Conversion-Factors-2019-Full-set-for-advanced-users.xls
3. World LPG Association study "The Renewable Future"
   Atlantic Consulting (2018), BioLPG: The Renewable Future: A survey of markets, feedstocks, process technologies, projects and environmental impacts. Commissioned by Liquid Gas Europe – AEGPL/WLPGA., Gattikon (Zürich), Switzerland
   https://www.wlpga.org/wp-content/uploads/2018/10/BioLPG-The-Renewable-Future-2018.pdf
4. Department for Economy (Energy Strategy Call for Evidence 2019)
5. Irish Department for Communications, Climate Action and Environment
   Low Emission Vehicle Taskforce - Phase 2 Report
   https://www.dccae.gov.ie/en-ie/news-and-media/publications/Documents/38/Low_Emission_Vehicle_Taskforce-Phase2Report.pdf
6. Liquid Gas UK 2040 Vision Industry pathway to Net Zero and beyond
   https://www.liquidgasuk.org/resources/2040-vision
7. DriveLPG.co.uk https://www.drivelpg.co.uk/about-autogas/environmental-benefits/
8. Liquid Gas UK study "Biopropane: Feedstocks, Feasibility And Our Future Pathway"
   The analysis within this report, undertaken by NNFCC Ltd on behalf of Liquid Gas UK, demonstrates that a deployment pathway for a full switch from fossil LPG to biopropane in the UK by 2040 is a feasible solution to meet the objectives of climate change. https://www.liquidgasuk.org/resources/biopropane-feedstocks-feasibility-and-our-future-pathway
9. Calorgas.ie Link to Customer testimonials: https://www.calorgas.ie/about-us/biolpg

IV. APPENDIX



March 2020

Study commissioned by Calor Ireland, and supported with analysis from Ecuity Consulting

The report aims to provide an overview of the challenges and opportunities involved with decarbonising heat in predominantly rural off-gas grid homes in Northern Ireland. The authors have modelled a number of representative scenarios using publicly available data where possible to explore the scale of transformation needed in homes that are heated using high-emission fossil fuels (oil and coal). The scenarios are not projections of deployment, but rather useful analytical exercises to explore the technology pathway options open to policymakers, and their implications in terms of emissions and cost.

Nothing in this document constitutes a valuation or legal advice. Any party that chooses to rely on this report (or any part of it) does so at its own risk. To the fullest extent permitted by law, Ecuity Consulting LLP does not assume any responsibility and will not accept any liability, including any liability arising from fault or negligence, for any loss arising from the use of this document or its contents or otherwise in connection with it to any party. Details of principal sources are set out within the document and we have satisfied ourselves, so far as possible, that the information presented in the report is consistent with other information which was made available to us by Ecuity clients in the course of our work.

Our work was completed in March 2020.

CALOR

Report contents

1. Context: Northern Ireland's climate change targets, fuel mix and key conclusions

2. Supporting cost-effective decarbonisation – technology options

3. Transitioning away from heating oil – a mixed technology pathway

4. Top policy asks

Context

- Northern Ireland's climate change objectives
- Fuel mix
- Key conclusions

Transition to clean energy is happening

1. The IPCC's special report on Global Warming of 1.5°C said that we were already seeing the consequences of 1°C of global warming through more extreme weather, rising sea levels and diminishing Artic sea.

2. The UK legislated a net zero emissions target in June last year, as part of the UK Climate Change Act. It requires a 100% reduction in emissions by 2050 (from 1990 base). NI contributes to this carbon budget.

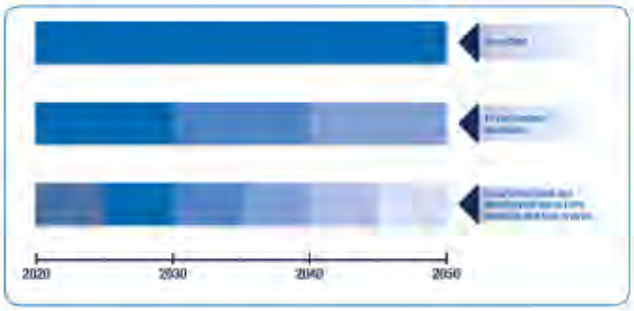
CALOR

Energy Strategy Call for Evidence

Northern Ireland *supports the legally mandated net zero target by 2050 at UK level*, and is evaluating the changes required to meet this target – in its open **Call for Evidence on the Energy Strategy**.

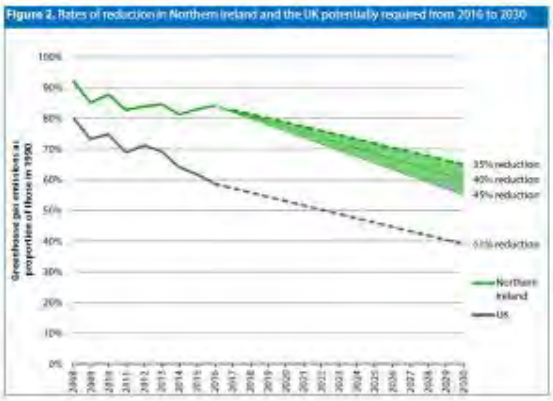
Looking at:

- ❑ Decarbonisation pathway for the next 30 years
- ❑ Opportunities and challenges for energy decarbonisation
- ❑ Unique characteristics of NI to consider
- ❑ Important policy levers for domestic and new build



CALOR

Current Climate Recommendations



- The most recent guidance was published last year by the Committee on Climate Change.
- It only gives **targets up to 2030**
- Northern Ireland's **must reduce emissions by 35% by 2030** (from 1990 base year) for the contribution to the UK's fifth carbon budget
- **Households to reduce emissions by 20%** by 2030

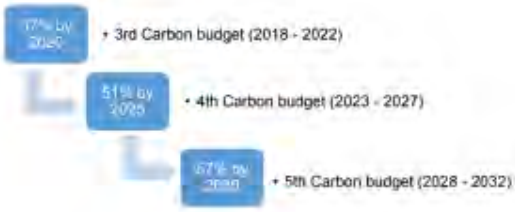
CALOR

Current Climate Recommendations

Department of Agriculture, Environment and Rural Affairs

- The Department for Agriculture, Environment and Rural Affairs (DAERA) projects a **23% decrease** in emissions from 2017 – 2030 to reach the UK carbon budget
- For households, emissions reduction will **slow to an 8%** decrease to 2030.
- From 2024, emissions will slowly increase "as policy savings reduce"

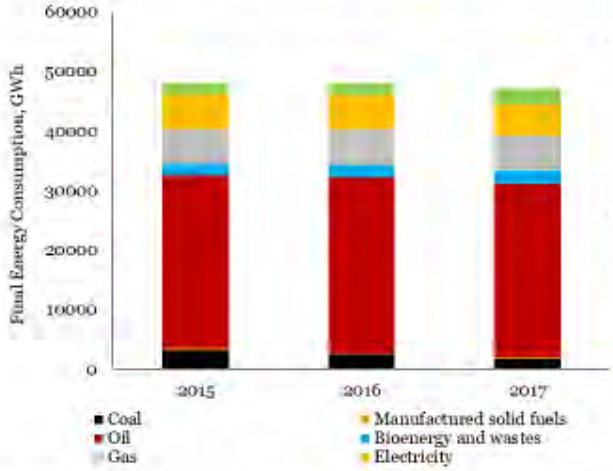
Reductions in Greenhouse Gas emissions below 1990 levels



CALOR

Northern Ireland's energy mix is highly fossil-based, led by oil

Final energy consumption by fuel type



- Oil accounts for over half (62%) of final energy consumption.
  - Largest non-transport sectors include industry and commercial (9 TWh) and domestic (8 TWh) (excluding electricity and gas)
- Renewables accounts for over 50% of electricity supply, although this is only a small proportion of total energy consumed (10%)

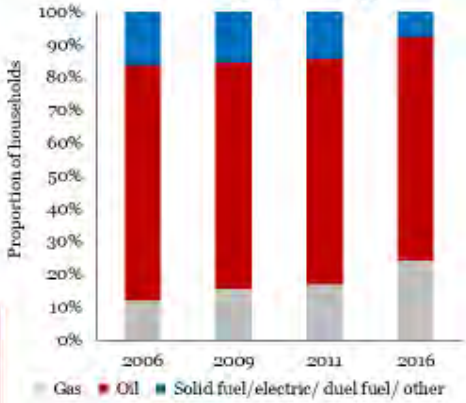
Northern Ireland has a high share of oil in final energy consumption. There is little sign of this consumption decreasing based on current policies.

CALOR

Oil consumption in the residential sector is significant

- Oil leads household final energy usage and provided 68% of heating in 2016, rising to 80% for rural areas.
- Approximately 267,000 premises are connected to the gas grid, accounting for 24% of fuel use.
- Gas has displaced the falling consumption of coal, and produces significantly lower emissions, by ~50%. However, oil consumption, which is carbon intensive, remains high.

Central Heating by Fuel Type



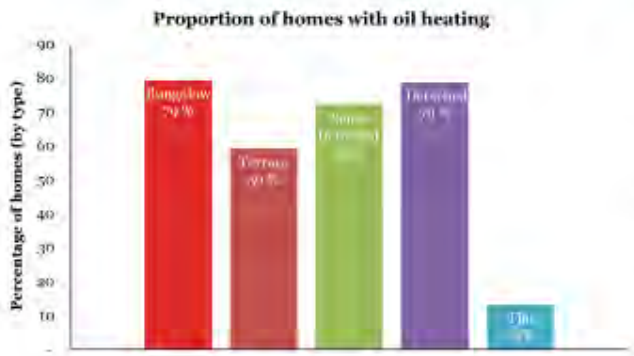
Residential emissions totalled 2.6 $MtCO_2$ in 2017

5.9% increase in CO_2 from 2014 to 2017

- Potential reasons for the increase in emissions:
  - Fall in heating oil prices (~44% between 2012 and 2017)
  - Economic recovery – increase in disposable income → higher energy consumption

CALOR

Oil consumption is high across all housing types in the building stock

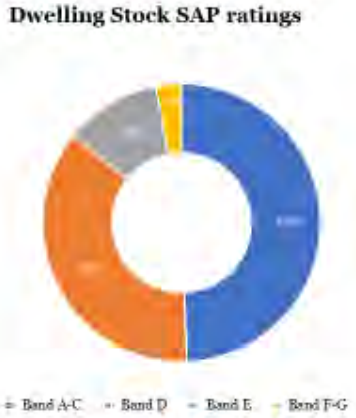


- The majority (60%) of the building stock is relatively old, built before 1980.
- Besides oil heating, older homes are more likely to use solid fuel whilst modern homes tend to use gas.
- Oil heating systems are in all house types. A high proportion of bungalows and semi-detached homes (79%) use oil heating. This reflects one of the highest levels of oil consumption across Europe.
- Northern Ireland has a high dependence on oil, a carbon intensive fuel, across the housing stock.

CALOR

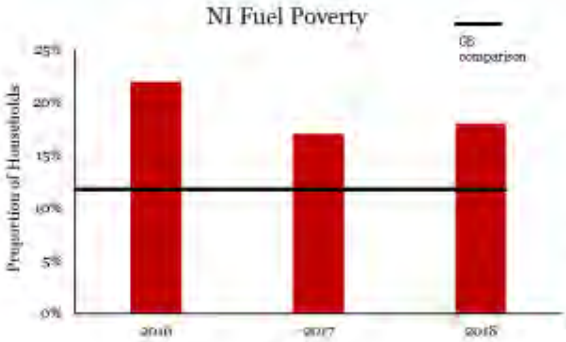
The building stock is old and inefficient, which is a challenge for the low-cost operation of electric heat pump

- Average SAP (Standard Assessment Procedure) rating of 65, in band D.
- Around 51% of the building stock is in SAP bands D-G, which are less efficient homes.
- The majority (60%) of buildings are old, built before 1980, and are more likely to be inefficient and need retrofitting measures. The efficiency of homes will impact the effectiveness of new low carbon technologies, particularly heat pumps.
- Current measures include the Affordable Warmth Scheme that retrofits approximately 3,000 homes per year with energy efficiency measures. It is targeted at homes in fuel poverty, with funding up to £7,500.



CALOR

Fuel poverty is higher in Northern Ireland than in England



- Definition: > 10% of total income on energy bills.
- Fuel poverty affected 18% of Northern Irish households in 2018, particularly significant in comparison to only 12% of households in Great Britain.
- Although it has fallen from 42% in 2011, mainly due to the drop in oil prices, this number remains significant.
- Homes in rural areas are disproportionately affected. In 2016, 31.5% of rural and 16.2% of urban homes were fuel poor.
- Weekly expenditure on energy is also 18% higher in NI compared to other UK regions, at £27.80 per week.

CALOR

Do oil-fuelled heating systems worsen air quality?

Assessment of PM(2.5) emissions in the residential sector

- Domestic sector accounted for ~65% of particulate matter (PM2.5) emissions in Belfast in 2018. This is due to the high levels of oil consumption for heating.
- PM2.5 emissions were associated with 178 premature deaths in Belfast alone, in 2017.
- Compared to other UK cities, Belfast had the highest level of PM2.5 emissions per 10,000 inhabitants in 2017.

PM(2.5) emissions are emitted through the combustion of solid and liquid fuels, such as for domestic heating. The biggest health risk is long-term exposure, which increases mortality risk particularly from cardiovascular causes.

CALOR

Northern Ireland presents a unique situation compared to Great Britain

Fuel Poverty affects 18% of NI households, disproportionately impacting rural homes (31.5%)

Only 12% of GB homes experience fuel poverty in comparison, falling to 10% in England.

Belfast had the highest level of per-capita PM2.5 emissions in 2017, at 25 tonnes per 10,000 people. This caused 178 related deaths.

UK cities with a similar population, such as Hull, had significantly lower per capita emissions, at 15 tonnes. The number of associated deaths were also much lower at 128.

NI's energy mix is reliant on oil, accounting for 62% of final energy consumption.

In Great Britain, only 40% of final energy consumption is oil.

68% of NI residential heating is oil-powered, rising to 80% in rural areas.

English homes are mainly heated with gas, at 85% of homes, or electricity.

Northern Ireland has several unique characteristics that differ from Great Britain as a whole. Specialised policy is required to tailor Northern Ireland's approach to decarbonisation to support these characteristics.

NI's upcoming Energy Strategy calls for a 30-year decarbonisation plan

2019 (Dec)
Department for the Economy (DfE) issued an Energy Strategy Call for Evidence. Includes requests for:
- A decarbonisation pathway and proposed timeline
- Ways to define, measure and optimise energy efficiency
- Ways to measure progress of decarbonising heat

2030
Northern Ireland's contribution to the UK's fifth carbon budget requires emissions reduction on 35% compared to 1990.

CCC showed a potential for NI to reach a 45% reduction by 2030

2020 → **2050**

2020 (20 March)
Consultation closes

2050
Energy Strategy is looking at 3 options for 2050:
- 60% emissions reduction
- 70% emissions reduction
- 80% emissions reduction

Government should support oil-heated homes switching to low carbon technologies

- Given the strong share of oil in household energy consumption it is imperative that households (mainly in rural areas) move away from this high-carbon fossil fuel, in favour of low carbon technologies, in order to meet the legally mandated carbon budgets.

How could the Northern Irish Government support a move away from oil?

- Enforce an emissions standard for heating (in Building Regulations) that takes a carbon intensity approach, setting a limit to the permitted emissions per kWh of heat provided, phasing out heating systems that are incompatible with net-zero

- This has a two-pronged impact:
  - Short term → switch to LPG which is a low-carbon conventional fuel – falling emissions (~20% lower than oil).
  - Medium & long-term → switch from LPG to bioLPG (a renewable equivalent of conventional LPG) **at zero additional infrastructure cost.** BioLPG is a renewable fuel with emissions that are 70-80% lower than heating oil.

The most effective way for Government to reduce emissions from Northern Ireland's rural building stock is to deploy a mix of low-carbon heating technologies that supports LPG and bioLPG as part of the transition.

CALOR

LPG and bioLPG can facilitate deep decarbonisation given Northern Ireland's unique rural characteristics

36% of Northern Irish people live in rural areas (EU average is 26%)

Off-grid rural areas have unique location and structural characteristics

Significantly less depth of electrical grid reinforcement in rural areas.

NI has 3.5 times the overhead lines per customer than the UK average. Costly switch to three-phase supply to accommodate heat pumps and EV uptake

Larger and older homes have low levels of energy efficiency and insulation.

Colder climate in rural regions.

Heating requirements can be around 10% higher in rural regions.

Unique end user needs in terms of fuel for heating.

~80% of rural homes use oil. Boilers are familiar and lower upfront cost than heat pumps
Only 1% of rural population have access to the gas grid

The Government's Energy Strategy must consider the unique characteristics of off-grid rural homes and businesses.

- If the end user's unique needs are not met, the transition to low-carbon will not happen.

Source: Northern Ireland Electricity / Grid capacity briefing | DAERA Long Term Off Grid Fuels Review | NI Housing Statistics

CALOR

BioLPG can facilitate deep decarbonisation while meeting the unique needs of homes and businesses in rural Northern Ireland

What is BioLPG? – a low-emission, off-grid fuel to complement electrification

Particularly for buildings in rural, off-gas grid areas, biopropane (BioLPG) is a crucial addition to the low-emission heating options available to consumers:

- **Low emissions** – BioLPG is clean burning and has a 70-80% lower carbon intensity than oil
- **'Drop in replacement'** – BioLPG can be used seamlessly in existing heating systems
- **Flexible** – the fuel can be easily transported, stored and flexibly used when needed in off-grid buildings. BioLPG boilers can also be integrated into hybrid heating systems with heat pumps.

- Switching to bioLPG foregoes the expensive cost of electricity grid reinforcement and the physical disruption it causes.
- While electric heat pumps will play a role, a switch to 100% electrical heating would be expensive for Northern Ireland, and require considerable grid reinforcements. This could increase energy bills and the depth of fuel poverty. A mixed technology approach reduces total system costs of decarbonising heat.

20/03/2020 | Mixed Technology Approach to Decarbonisation

CALOR

Supporting effective heat decarbonisation

"When considering the transition away from heating oil, which heating technologies are most cost-effective for off-grid areas of Northern Ireland?"

20/03/2020 | Mixed Technology Approach to Decarbonisation

CALOR

Reducing cost and complication to make heat decarbonisation work for all

- The following section of analysis considers the cost-effective route to decarbonised heat in Northern Ireland.

CALOR

The question – how to support effective decarbonisation in rural areas?

- Mr/Mrs X is a typical consumer in Northern Ireland. She currently heats her old (built 1945-64), semi-detached home using an oil boiler that needs replacing.

What options does Mr/Mrs X have for replacement of her oil boiler?

Heating Technology	Heat Pump	Heat Pump & Energy Efficiency Upgrades	Biomass Boiler	LPG/BioLPG Boiler	New Oil Boiler
A route to heat decarbonisation ?	Yes – renewables need to increase	Yes – renewables need to increase	Yes – although air pollution issues	Yes – using bioLPG	No

- Mr/Mrs X must switch away from oil to a low carbon alternative.
- Which low carbon option offers Mr/Mrs X the best choice?

CALOR

The question – how to support effective decarbonisation in rural areas?

- Mr/Mrs X is a typical consumer in Northern Ireland. She currently heats her old (built 1945-64), semi-detached home using an oil boiler that needs replacing.

What options does Mr/Mrs X have for replacement of her oil boiler?					
Heating Technology	Heat Pump	Heat Pump & Energy Efficiency Upgrades	Biomass Boiler	LPG/BioLPG Boiler	New Oil Boiler
A route to best decarbonisation?	Yes – renewables need to increase	Yes – renewables need to increase	Yes – although air pollution issues	Yes – using bioLPG	No

- Mr/Mrs X must switch away from oil to a low carbon alternative.
- Which low carbon option offers Mr/Mrs X the best choice?

CALOR

The first consideration for Mr/Mrs X is the upfront cost, an LPG/bioLPG route is the cheapest option

- The **bioLPG boiler has by far the lowest upfront cost**, over **£4,500 cheaper** than the next cheapest option. It can make use of existing emitters and can provide high temperature heat.
- Heat pumps work best when installed alongside energy efficiency improvements to the home. This can be disruptive and involve underfloor and internal/external wall insulation.
- When installed without upgrades the upfront cost of heat pumps is still considerably higher than bioLPG, this is substantially added to with energy efficiency upgrades.

What options does Mr/Mrs X have for replacement of her oil boiler?					
Heating Technology	Heat Pump	Heat Pump & Energy Efficiency Upgrades	Biomass Boiler	LPG/BioLPG Boiler	New Oil Boiler
A route to best decarbonisation?	Yes – renewables need to increase	Yes – renewables need to increase	Yes – although air pollution issues	Yes – from LPG to bioLPG over time	No
Upfront Cost*	£8,640	£24,215	£7,377	**£923**	

CALOR

Mr/Mrs X will also consider the running costs of each option

- Without any energy efficiency improvements to Mr/Mrs X's home, the biomass boiler has the lowest running costs.
- LPG offers the potential for a transitionary fuel to a bioLPG 'drop-in' that lowers the fuel bill for the consumer.
- Is this yearly fuel bill saving worth it for Mr/Mrs X considering the huge leap in upfront cost needed?

What options cost Mr/Mrs X have for replacement of her oil boiler?					
Heating Technology	Heat Pump	Heat Pump & Energy Efficiency Upgrades	Biomass Boiler	LPG/BioLPG Boiler	New Oil Boiler
A route to heat decarbonisation?	Yes – renewables need to increase	Yes – renewables need to increase	Yes – although air pollution issues	Yes – using bioLPG	No
Upfront Cost	£8,640	£24,215	£7,377	**£922**	
Yearly Fuel Bill	£811	£513	**£502**	£737 (LPG), £811 (bioLPG)	

CALOR

BioLPG offers the cheapest option for Mr/Mrs X across the heating system lifetime

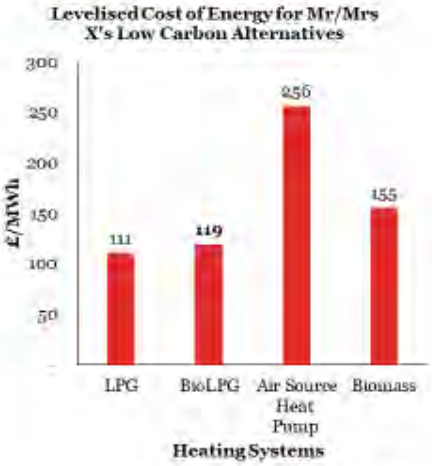
- The yearly fuel bill saving of the heat pumps and biomass boiler do not outweigh the additional upfront cost that these systems have.
- Heating systems are expected to last for 15-years[2], **LPG/BioLPG saves nearly £5,000 compared to a heat pump installation across a typical 15-year lifetime.**
- Preventing a mixed technology approach to heat decarbonisation will cost more for Mr/Mrs X.

What options cost Mr/Mrs X have for replacement of her oil boiler?					
Heating Technology	Heat Pump	Heat Pump & Energy Efficiency Upgrades	Biomass Boiler	LPG/BioLPG Boiler	New Oil Boiler
A route to heat decarbonisation?	Yes – renewables need to increase	Yes – renewables need to increase	Yes – although air pollution issues	Yes – using bioLPG	No
Upfront Cost	£8,540	£24,215	£7,377	**£922**	
Yearly Fuel Bill	£711	£513	**£502**	£737 (LPG), £811 (bioLPG)	
Lifetime Cost (15 Years)	£19,205	£31,910	£14,907	**£11,978 (LPG) £13,088 (bioLPG)**	

CALOR

Mr/Mrs X will also consider other factors, bioLPG offers more than just a cost advantage

- BioLPG is a **'drop-in' fuel** that can work in existing LPG boilers, removing the need for the upgrading of heat emitters and fabric efficiency of the home.
- This **minimises disruption** (which can be significant for a heat pump) and any replacement time for Mr/Mrs X, particularly important considering most heating replacements are distress purchases.
- In addition to the overall lifetime cost, Mr/Mrs X will likely place a greater emphasis on the upfront cost than fuel bills. This is particularly the case for consumers who aren't 'able-to-pay' – they simply cannot afford the higher upfront cost.
- A '**levelised cost**' takes this upfront cost weighting into consideration, **bioLPG would be the preferred option for Mr/Mrs X** under this measure also (see graph); offering an even greater saving to the consumer than the previous lifetime cost as a result.

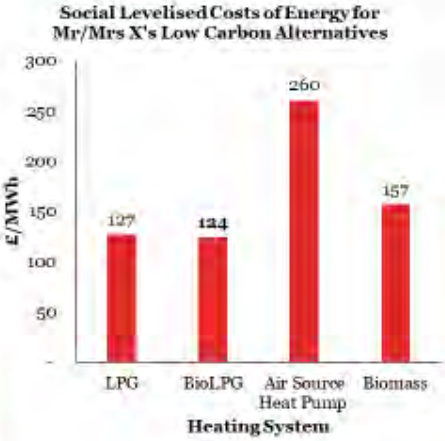


CALOR

Mr/Mrs X may be conscious of the social impact of her emissions

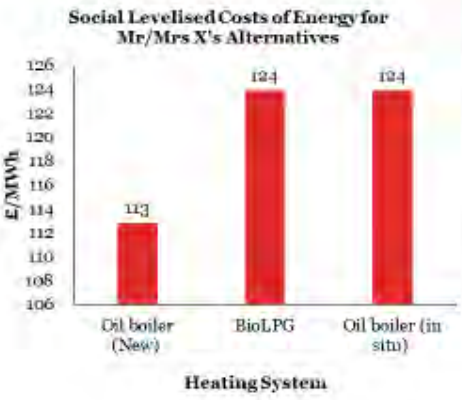
- A '**social levelised cost**' weighs up the economic harm of emitting carbon emissions against the heating systems costs. It assigns a price to each tonne of CO_2 that the system emits over its lifetime, and makes the consumer responsible for this cost.
- **BioLPG would still be the preferred option for Mr/Mrs X** under this measure (see graph); offering an even greater saving to the consumer than the previous levelised cost.
- This reflects the low emissions level of bioLPG.

Fact-check: GHGs trap heat and make the planet warmer; this includes carbon dioxide, methane, nitrous oxide and fluorinated gases, that are weighted to form a carbon dioxide equivalent (CO_2e) of warming.

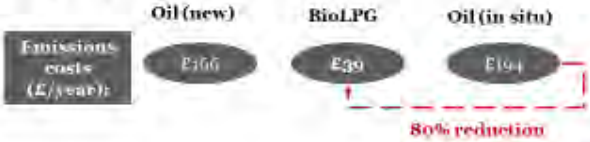


CALOR

Mr/Mrs X's carbon intensive alternative



- Although an oil boiler provides the lowest '**social levelised cost**', this is *not a path to decarbonisation.*
- Mr/Mrs X's oil boiler emits **5 times the emissions** of a new bioLPG boiler.
- Looking at the social costs of emitting CO_2 alone, against the annual emissions of each system, we can monetise the emissions as a form of '**carbon tax**'
  - BioLPG has the lowest annual emission cost at £39 – an 80% saving compared to oil boilers



CALOR

BioLPG has advantages over other low carbon technologies

BioLPG boiler	vs	ASHP
Upfront cost: £923 ✓		Upfront cost: £5,561
Levelised cost of energy: £119 ✓		Levelised cost of energy: £256
Including cost of carbon: £124 ✓		Including cost of carbon: £260

A mixed technology approach offers several advantages over a heat pump. For the consumer, the economic burden is significantly lower across the lifetime of the system, offering an affordable route to decarbonisation. With 18% of households in fuel poverty, the affordability of new technologies is particularly important.

CALOR

Transitioning away from heating oil – a mixed technology pathway

"Can Northern Ireland meet it's heat decarbonisation targets by supporting a mix of heating technologies – including LPG and bioLPG boilers"

CALOR

How can households switch away from oil in order to be consistent with Northern Ireland's long-term climate goals?

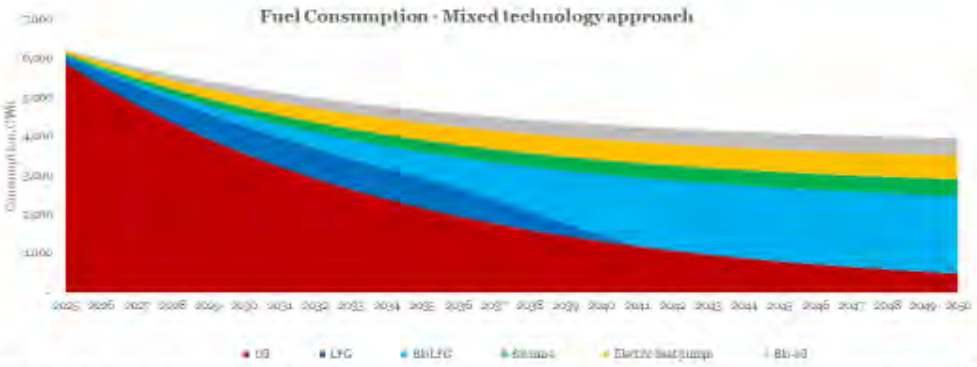
- The Energy Strategy Call for Evidence requests support on mapping out a 30-year decarbonisation pathway.
- The best solution is a Mixed Technology approach:
  - Raises consumer choice given the unique fuel mix in rural, off-grid areas in Northern Ireland
  - Raises consumer welfare because they are not burdened by new and complex heating systems
  - Considers and factors in the strong rurality of the Northern Irish housing stock

The government could consider **a Mixed Technology approach** with a **role for LPG and bioLPG** in the energy transition.

CALOR

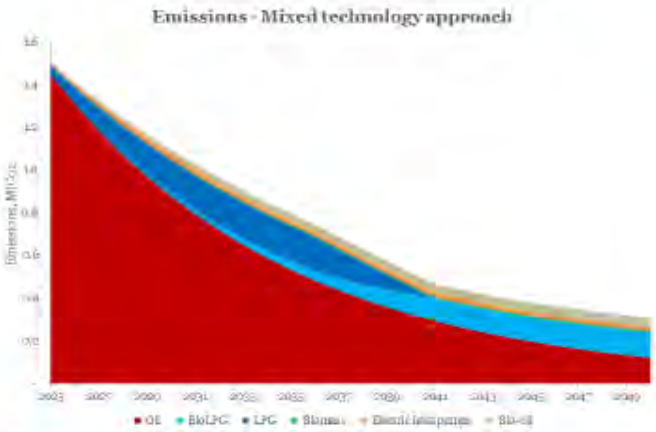
Northern Ireland could meet climate targets by deploying a mix of heating technologies that includes LPG and bioLPG

- A mixed technology approach see's **86% of overall energy demand met by low carbon technology by 2050**
- In line with the CCC recommendation for 20% low carbon heating by 2030.
- Energy consumption would **fall by 25%** (from 2019) due to the **uptake of more efficient heating technologies**.



CALOR

Northern Ireland could meet climate targets by deploying a mix of heating technologies that includes LPG and bioLPG



- A mixed technology approach see's a **90% reduction in household emissions by 2050** (compared to 1990 base year)[4].
- Emissions falling to 0.3 $MtCO_2$.
- Exceeds previous household emissions projections for 2030:
  - CCC: 2.5 $MtCO_2$
  - DAERA: 2.4 $MtCO_2$

CALOR

Potential policy options to support decarbonisation– with a mixed technology pathway

"Can Government support help Northern Ireland meet it's heat decarbonisation targets"

CALOR

Policy proposals

1. Support a phased transition from high carbon fossil fuels to lower emission heating options. This could be delivered using **building regulations.**

2. Building regulations could include a **mandated carbon standard,** which **limits the carbon intensity of fuels.**

3. Oil heating must be tackled, bio-LPG is a key part of the solution and should be included in **any future heat decarbonisation support schemes**

4. The Northern Irish Government could support the transition from oil heating through the implementation of a time-limited **boiler (or tank) scrappage scheme** to target the oldest and least efficient heating oil systems first

CALOR

Key takeaway points

Government Call for Evidence needs clear policy guidance to reduce emissions

- A mixed technology approach that includes LPG and bioLPG, is a cost-effective and viable solution towards decarbonisation.
- Essential that government extends support to bioLPG in the heat sector
- Regulating the carbon intensity of heating fuels could effectively limit residential emissions, and encourage the uptake of low carbon technologies

Government can best move away from oil by supporting LPG and bioLPG in Northern Ireland

- Switching to LPG enables the household to lower emissions but also locks them onto a deep decarbonisation pathway (at zero additional infrastructure cost) when they switch to bioLPG.
- Deploying a mix of low-carbon heating technologies that includes LPG and bioLPG could see emissions fall by 87% - in line with proposed targets.

CALOR

Appendix – data-table

Mr/Mrs X (Semi - detached house, built 1945-64)

	Units	(a) Oil	(b) LPG	(c) BioLPG	(d) ASHP	(e) Biomass	Source
Emission factor	kgCo2e/kWh	0.25	0.21	0.06	0.14	0.02	(a) (b) (e) DEFRA; (c) Bilsu-GES; (d) BEIS
Fuel prices	£/kWh	0.041	0.079	0.086	0.178	0.047	(a) Consumer Council (b) (e) BRE; (c) Liquid Gas UK, assumed 10% premium over LPG price; (d) BEIS
Capital costs	£/kW	150	62	62	1,080	1,360	(a) (d) (e) BEIS (b) (c) City Plumbing
Heating system efficiency	COP	0.76	0.92	0.92	Calculated for each housing archetype min. 0.89 max. 3.4	0.8	(a) (b) (c) (d) BEIS with Ecuity Economics modelling; (e) BRE
System lifetime	years	15	15	15	18	15	(a) (b) (c) (d) (e) CCC
System size	kW	18	15	15	8	9	(a) (b) (c) BEIS; (d) Element Energy; (e) Centre for Sustainable Energy; all with Ecuity Economics modelling
Annual maintenance	£/year	180	140	140	243	200	(a) (b) (c) Price Your Job; (b) Mitsubishi; (c) Renewable Energy Hub
Carbon value (social cost)	£/tCO2			69			(a) (b) (c) (d) (e) BEIS

** BioLPG price premium is reflective of current rates – however energy prices will fluctuate. To test the impact of fluctuations, at an increased 20% price premium, LPG boilers remain competitive with ASHPs as the technologies with the lowest lifetime cost in the analysis included in this report*

CALOR

Calor recognises that if Northern Ireland is to maximise these opportunities and deliver the benefits, a whole of government approach is critical, together with strong collaboration with energy suppliers, industry and local communities.

Calor is available actively support the Department in delivering the new energy strategy.

[redacted]

--END OF DOCUMENT--