UK Regulatory Roadmap: Blueprint for Emissions Reductions in the Energy Sector

June 2025

CLEAN AIR TASK FORCE

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Section I

Overview

1.1 The importance of methane action in the energy sector

Methane is the second largest contributor to climate change, and traps over 80 times more heat than CO2 in the atmosphere over a period of 20 years. Methane has contributed 0.5°C degrees to the global warming we are feeling today.[1] As a short-lived climate pollutant, cutting methane emissions is the fastest way to slow climate change and avoid dangerous climate tipping points. Reducing methane emissions can also reduce pollution, as methane contributes to the formation of ground-level ozone, which degrades air quality, deteriorates human health and threatens food security.[2]

Capturing and selling the methane released during oil and gas production can improve UK energy security and generate revenue in a declining sector.[3] Historically, the energy sector has facilitated cuts in UK methane emissions, largely due to coal mine closures.[4] Oil and gas production is predicted to continue to decline, but this will only result in a reduction of around ten per cent of today's UK energy sector emissions by 2030, equating to one per cent of overall UK methane emissions.[5] Additional methane reductions in the energy sector are cost-effective, generate revenue and enhance energy security by preventing wasted gas, and can be deployed faster than in any other sector.

UK leadership is even more critical given the U.S. retreat from the global stage. The UK has played a key role in elevating the issue of tackling methane emissions internationally. At COP26, the UK hosted and facilitated the launch of the Global Methane Pledge, which aims to reduce global methane emissions by 30 per cent by 2030. It has taken further positive steps internationally, including becoming co-Chair of the Climate and Clean Air Coalition (CCAC), and providing support for the CCAC's Fossil Fuel Regulatory Programme (FFRP).[6] However, the UK has fallen behind other countries domestically – including Canada and the EU – where measures have been adopted to cut emissions in the energy sector. To be a credible leader internationally, the UK must demonstrate further progress domestically.

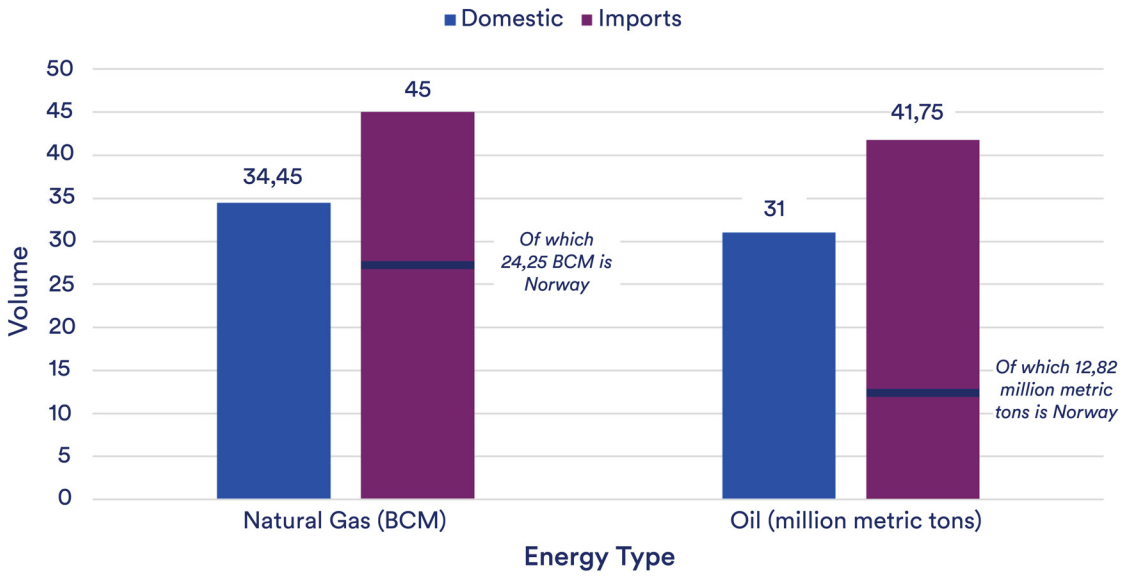
1.2 Why the UK needs an oil and gas methane regulation

The UK is the second largest oil and gas producer, and the third largest oil and gas methane emitter in Europe (behind Ukraine and Romania).[7] The UK produces a total of 62 million metric tons of crude oil and natural gas liquids each year, resulting in approximately 192 kt of methane in 2023.[8] The breakdown of the UK's upstream emissions is as follows: roughly 58% of methane emissions come from venting, 5% from flaring, 21% from fugitive emissions, and 16% from other sources.[9]

The UK is responsible for important methane emissions outside of its borders. When the UK's wider footprint from imported oil and gas is considered, it is significantly higher than domestic emissions alone. In 2023 the UK imported a total of roughly 42 million metric tons of crude oil and natural gas liquids.[10] While emissions associated with production and handling of these fuels largely occur outside of the UK, they can be attributed to the UK's consumption. As a major importer, the UK has an opportunity to incentivise its trading partners to apply best practices and technologies to reduce the methane intensity of their oil and gas exports.

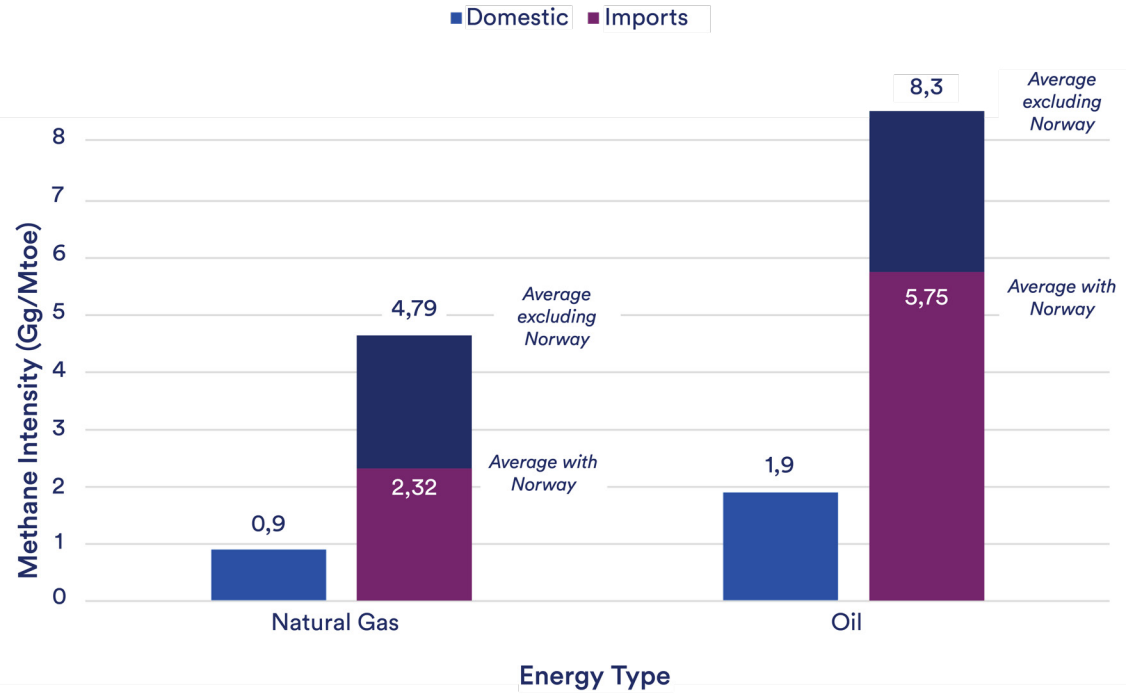
The European Union (EU) methane regulation requires the UK to do this anyway. The UK is the EU's fifth most important trading partner for oil and petroleum products.[11] Starting in May 2025, importers within the EU are required to report information on measures to control methane emissions, including Leak Detection and Repair (LDAR), equipment standards, and restrictions on venting and flaring at producer level. By January 2027, importers should demonstrate and report that imports are subject to Measurement, Monitoring, Reporting and Verification (MMRV)[12] requirements similar to the EU Methane Regulation or OGMP Level 5. Furthermore, by 2028, importers should report the methane intensity of the production of oil and gas and by 2030, they will have to demonstrate that the methane intensity is below a maximum value established by the EU. All requirements on importers will rely on information being provided by the exporting producers, based in the UK.

Figure 1: Comparison of UK imports versus domestic production (2023)



Natural gas: 34.45 BCM domestic production, 45 BCM imported (2023); Oil: 31 domestic production, 41.75 million tons imported (2023). Source: IEA[11], Rystad Energy, UK Department for Energy Security and Net Zero[12]

Figure 2: Comparison of estimated methane intensity of UK imports versus domestic production (2023)



Natural gas: 0.9 Gg/Mtoe for domestic production, 2.32 Gg/Mtoe for imports (2023); Oil: 1.9 Gg/Mtoe for domestic production, 5.75 Gg/Mtoe for imports (2023). Source: CATF calculations based on Rystad Energy and IEA data[13]

Current voluntary commitments do not go far enough. Whilst progress has been made – the UK upstream oil and gas industry reduced its methane emissions by 29% between 2020 and 2022 – there remain opportunities to further reduce emissions alongside declines in production.[16] Flaring and venting remained responsible for 71% of methane emissions in 2022, and requirements for the oil and gas industry to tackle other sources of methane emissions, such as fugitive emissions and equipment leaks are limited (see Section 1.4 below).[17] A lack of verification of industry emissions also likely means that methane emissions from oil and gas production are significantly underestimated, with studies showing that methane emissions from offshore oil and gas sites are overall five times higher than official reporting.[18]

A UK methane regulation and import standard would increase the competitiveness of the UK's oil and gas on global energy markets. As fossil fuels increasingly compete with cleaner energy sources, data from Rystad Energy and forwards markets suggest a potential over-supply of natural gas after 2027, which could catalyse the evolution of differentiated oil and gas markets. This will be supported by the continuing evolution of data tracking systems, spurred by the regulatory requirements of the EU Methane Regulation and other voluntary initiatives such as the Japanese-led CLEAN initiatives. A strong, enforceable UK methane regulation would help strengthen the business case for reducing emissions further, and position the UK to access premium markets.

1.3 What a UK methane regulation should include

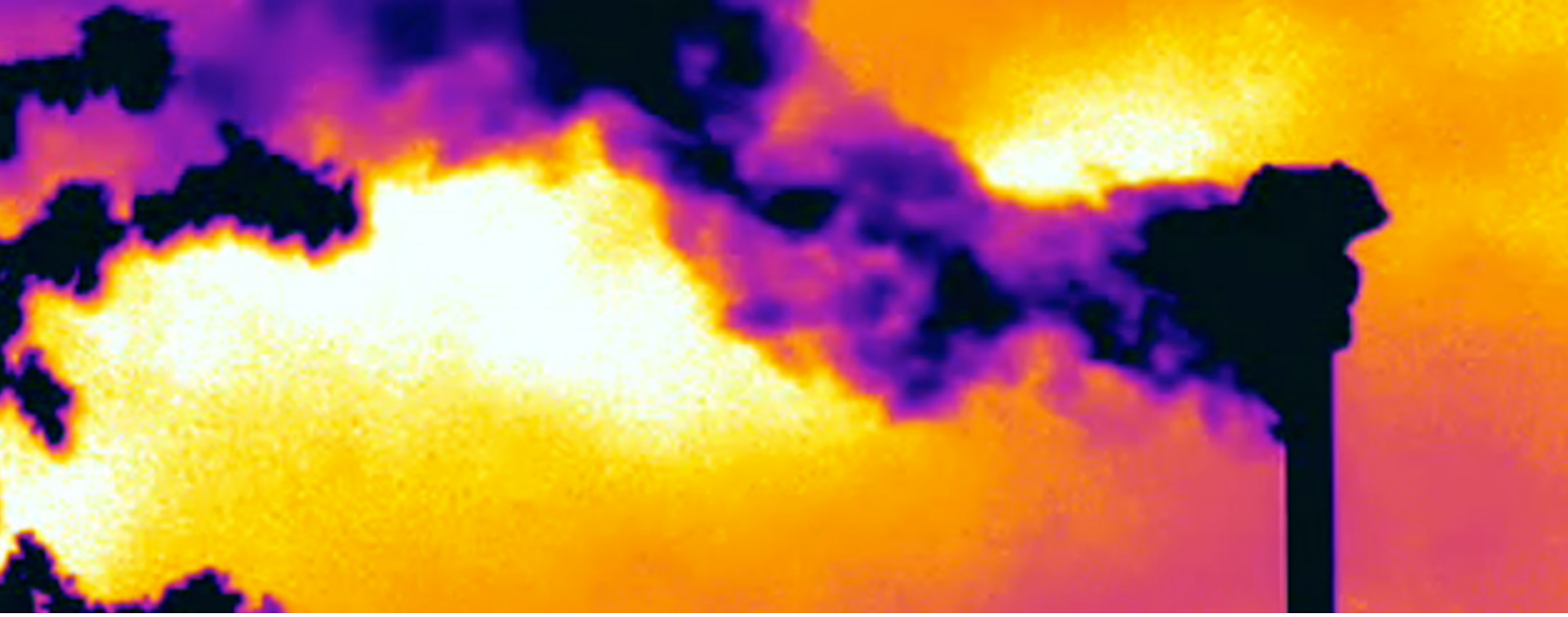
Regulatory component	Requirement
Fugitive emissions and equipment leaks	■ Leak Detection and Repair (LDAR) surveys should comprise all components in each facility and should be conducted quarterly using an optical gas imaging device or using an alternative approved device that is equally or more effective at detecting leaks. ■ Repair or replacement of all components found to be leaking must be done immediately or as soon as possible and no later than five days after detection. ■ Operators must submit an annual report with information on the facilities inspected, identified leaks and components, details on repair and reinspection, and any leaks where repair has been delayed due to process or safety reasons.
Venting and flaring	■ Venting and flaring should be prohibited except in case of an emergency or during: • An emergency or malfunction. • Wellbore liquids unloading. • The first 12 months of production for an exploratory well. • Well tests, tank sampling. • Normal operation of pneumatic controllers, pump, storage tanks, dehydration units, amine treatment units, and compressors. ■ Regulators should leverage satellite data to verify reported data, where appropriate. ■ Operators should notify competent authorities of venting and flaring events caused by an emergency or malfunction or lasting more than 8 hours within a 24-hour period. ■ Venting should be prohibited whenever flaring is technically feasible. ■ Set penalties on flaring to reduce the net cost of flare reduction. Penalties must be consistently applied to be considered in a cost-benefit analysis of a potential project. ■ Require gas-capture plans for new operations.
Equipment venting	■ For all new or repaired sites, require the installation and use only of commercially available zero-emitting pneumatic devices and pumps and protective quantitative emissions standards and/or gas capture systems at compressors and storage tanks. ■ Existing sites should be required to retrofit / replace higher emitting equipment with low / zero emitting equipment, over a prescribed timeline. ■ Operators must monitor as part of instrumental LDAR all equipment to ensure that it is operating properly and not emitting above design specification. ■ For any vented equipment, operators must periodically measure emissions rates to ensure standards compliance. ■ Operators should keep records for at least five years of inspections and measured natural gas emissions rates.
Measurement, Monitoring, Reporting and Verification (MMRV)	■ Build on the current system with phased-in requirements to move, over the period of a few years, to require all UK operators to adopt MMRV programs equivalent to OGMP 2.0, Level 5. ■ The UK should establish a verification system to guarantee that measurement data are based on an appropriate methodology, that the reporting methods respect the requirement, and that reported emissions match what is measured. This can be done internally by regulators, by authorised third parties, or by a combination of internal and third-party verifiers.
Performance standard	■ Establish an emissions intensity standard. This would represent the maximum level of acceptable emissions, meaning operators exceeding the standard would face some consequence, for example being required to pay a fee. ■ Setting such a standard for domestic operators would also allow the UK to set an intensity standard for imported fuels.

1.4 Methane regulations around the world

Regulatory component	United Kingdom	European Union[19]	United States[20]	Alberta, Canada (Provincial)[21w]	Nigeria[22]
Fugitive emissions and equipment leaks	Not regulated. No Leak Detection and Repair standards - inspection not required at a specific frequency. Data on leaks is entered into the UK's Environmental and Emissions Monitoring System (EEMS) database voluntarily.[23] NSTA expects operators to continuously work to monitor and reduce the accidental leakage of greenhouse gases (GHGs) from faulty infrastructure and equipment that transports fossil fuels.[24]	Requires inspections at different frequencies depending on site type and characteristics. Includes both Type 2 inspections (optical gas imaging camera) and Type 1 inspections (flame ionisation device / "sniffer"). Rapid reaction mechanism for super-emitting events.	Requires LDAR at all sites, quarterly for all compressor stations and production sites with leak-prone equipment, semi-annually for other production sites. Matrix to allow for inspections with approved advanced technologies. Super-emitter program allows approved third-party to alert EPA of large emissions, EPA then requires companies to mitigate.	Requires annual or triannual inspections depending on site characteristics.	Requires quarterly inspections at all onshore sites (after phase in period). Reduced frequency required for unmanned offshore sites (minimum annual inspection for these sites).

Regulatory component	United Kingdom	European Union[19]	United States[20]	Alberta, Canada (Provincial)[21]	Nigeria[22]
Venting and flaring	NSTA is the regulator for flaring and venting under the Energy Act 1976 (as amended by the Energy Act 2016) and the Petroleum Act 1998. This legislation requires operators to have consents in place for flaring and venting of hydrocarbons during production operations.[25] NSTA issues fines for flaring and venting consent breaches. NSTA regulates the vent consent based on total hydrocarbon to be vented and not directly on methane itself.[26] NSTA has outlined flaring and venting guidance for offshore production, with operators expected to prepare Flaring and Venting Management Plans.[27] NSTA expects industry to adhere to zero routine venting and flaring by 2030, though this is not mandatory.[28] CO2 released through flaring and venting in the upstream oil and gas sector is incorporated into the scope of the UK Emissions Trading Scheme (ETS) and independently verified.[29] Venting in decommissioned wells is regulated by OPRED; however, methane emissions are not included in decommissioning plans and currently there is no mechanism for reporting.[30]	Venting and flaring is prohibited except in case of an emergency, malfunction, where it cannot be completely eliminated or is necessary for safety reasons. For new or refurbished facilities, operators shall install only flare stacks or combustion devices with an auto-igniter or continuous pilot burner and with a destruction and removal efficiency by design level of at least 99%.	Existing wells shall not vent, or flare associated gas except in specific cases or demonstrated and documented infeasibility. New wells after 2026 may not vent or flare associated gas.	Operators must follow rules eliminating venting and flaring, except in specific cases and following specified durations.	Routine flaring and venting are banned. The Federal Government owns the associated gas at the flare, free of cost and without payment of royalty. The government may issue Permits to Access Flare Gas to third parties. After an access permit holder uses their allotment of associated gas, producers may commercialise the remainder through a midstream subsidiary owned or use associate gas for their own purposes. Producers may only flare gas as permitted under the provisions of the Associated Gas Re-Injection Act. An operator that produces more than 10,000 or more barrels of oil per day must pay the government USD $2.00 for each 28.317 cubic metres of gas flared, irrespective of whether the flaring is routine or non-routine. Small facilities pay USD $0.50 per 28.317 m3 methane flared.[31]

Regulatory component	United Kingdom	European Union[19]	United States[20]	Alberta, Canada (Provincial)[21]	Nigeria[22]
Equipment venting	No specific regulation for equipment venting.	For new or refurbished facilities, operators shall install only commercially available zero-emitting pneumatic devices, compressors, atmospheric pressure storage tanks, sampling and measuring devices and dry gas seals. Delegated acts can be adopted to establish mandatory technical prescriptions for venting from pneumatic devices, compressors, tanks, sampling and measuring devices and dry gas seals, or other components designed to vent.	Specific requirements for venting equipment including tanks, reciprocating compressors, centrifugal compressors, liquids unloading, pneumatic controllers and pumps.	Vent gas limits for pneumatic devices, compressor seals, and glycol dehydrators.	Specific requirements for venting equipment including pneumatic controllers, pneumatic pumps, centrifugal compressors, reciprocating compressors, glycol dehydrators, and liquid storage tanks, as well as general limits on cold venting.[32]
Measurement, Monitoring, Reporting and Verification (MMRV)	No regulation in place.	Operators inside the EU shall submit annual reports with the quantification of source-level and site-level methane emissions by August 2025 and February 2027, respectively. Exporters should demonstrate and report annually that imports are subject to MMRV as in the EU or OGMP Level 5. "Equivalence" can be granted to a third country if their MMRV is as in the EU or OGMP Level 5. Exporters are exempt from MMRV obligations if its country is granted "equivalence".	Compliance reporting required as part of compliance with equipment and work practice standards required by the EPA. These rules allow for a mixture of generic and source-based measurements, but do not require systematic integration of site level measurements, which is a core component of the EU's rules and the essence of OGMP 2.0 Level 5. The Greenhouse Gas Reporting Program (GHGRP) remains equivalent to a mix of OGMP Level 3 and 4.	Operators required to submit an annual methane emissions report to regulator, including an inventory of all equipment, an estimate of routine venting from defined equipment (pneumatics, compressors), estimated leak volume, and details of LDAR surveys.	Operators required to measure/estimate emissions and report to regulator quarterly. Reporting must initially be in line with Tier 1 IPCC reporting requirements, and after a year reporting must be in line with a Tier 2 or 3 approach. A third-party verifier may be appointed.
Performance standard	No regulation in place.	By 5 August 2030 operators and exporters should demonstrate that the methane intensity of the production of oil and gas is below the maximum values established by the EU.	The GHGRP requires large facilities to report GHG emissions using a specified methodology. The Waste Emissions Charge was created as part of the Inflation Reduction Act, and, if implemented, would require companies emitting over a specified limit to pay a fee.	Not in place.	Not in place.



Section II

Policy targets

2.1 Policy options for methane abatement in the energy sector

Methane abatement strategies in the energy sector have been substantially developed and iterated in recent decades, and several approaches have been used in different jurisdictions. These have given rise to different regulatory approaches to mandating methane emission reductions, each with strengths and potential weaknesses.

- **Prescriptive approaches:** Prescriptive measures control specific actions or procedures. These include measures such as requirements for periodic leak detection and repair (LDAR) or equipment standards that ban devices designed to vent methane.

- **Performance-based approaches:** Performance-based measures establish quantitative emissions targets that operators must meet. These include the EU's performance standard, which will apply to all domestically produced fossil fuels and imported fossil fuels starting in 2030. These approaches require high-quality, measurement informed emissions data to function effectively. Implementing performance-based regulations is challenging, due to the complexities of requiring operators to design and implement appropriate measurement programmes and verifying the resulting measurement-informed emissions assessments.

- **Economic approaches:** Economic based approaches place either a cost for excess emissions or provide preferential access to a market by avoidance of a fee for lower methane gas. For example, the Methane Emissions Reduction Program (MERP) included in the Inflation Reduction Act (IRA) established a Waste Emissions Charge (WEC) on gas wasted to the atmosphere and creates an incentive for operators to reduce their methane emissions.

  The WEC was put in effect as of 1 January 2024. It applied to all medium and large-scale oil and gas facilities for all reported emissions above a segment-specific threshold, as below.

- Production: 0.20 percent of gas sent to sale or, for facilities that do not sell gas, 10 metric tons of methane per million barrels of oil sent to sale.
- Processing/Gathering and Boosting/ LNG: 0.05 percent of handled gas.
- Transmission and Storage: 0.11 percent of handled gas.
- The fee began at $900/tonne in 2024, before increasing to $1,200/tonne in 2025 and settling at $1,500/tonne in 2026. Emissions were to be assessed based on reports to U.S. Environmental Protection Agency's (EPA) GHGRP, which EPA updated in 2024 in response to a legislative mandate.

Collection of the WEC has effectively been indefinitely suspended and the fee is expected to be repealed.

- **Information-based approaches:** These improve understanding of emissions with data reporting requirements. For example, the EU's new data reporting requirements set out in Articles 27 and 28 of the EU Methane Regulation require importers to obtain and report information regarding the origins, emissions, and methane abatement efforts associated with their fossil fuel imports.

Evaluation of regulatory approaches to reducing methane

Approach	Transaction Costs	Rigidity	Preconditions
Prescriptive: Command and control specific actions or procedures	**Low** - Simple to administer for both regulators and firms	**High** - Only prescribed changes will take place	**Moderate** - knowledge of facilities' emissions needed
Performance-based: Establish standards and targets, but not a technical pathway	**Moderate** - Monitoring and follow-up are needed	**Low** - Encourages different solutions	**High** - Requires information on baseline and overall emissions
Economic: Induce action with penalties or financial incentives	**High** - Requires robust verification systems	**Low** - Enables company specific abatement strategies	**Moderate** - Requires knowledge of baseline emissions
Information-based: improve understanding of emissions with data reporting requirements	**High** - Demands collecting and analysing information	**Moderate** - Allows for different solutions in some cases	**Low** - No need of previous information

Source: IEA, Driving Down Methane Leaks from the Oil and Gas Industry, 2021.

2.2 What comprehensive methane abatement policy needs to achieve – how should these approaches interact?

As prescriptive, performance-based, economic, and information-based approaches each bring unique strengths and face different challenges, an effective methane abatement policy must draw on all four, ensuring that they are mutually reinforcing. This strategy should ensure that three key objectives are met:

- **Leverage the tested, near-term certainty of prescriptive measures:** Equipment standards and LDAR requirements are straightforward to implement. These approaches ensure good practices, such as replacing venting devices and fixing leaks are adopted without waiting for more precise measurement and data systems to be implemented.
- **Incorporate performance-based standards where and when feasible:** It is critical to acknowledge the challenges in implementing performance standards in regulations. Performance standards will take some time to implement and in turn to drive emissions down because of the implementation challenges for operators that they present, since they require strong measurement, data reporting, and validation programmes to ensure compliance. They also need to be layered with equipment-based provisions and practices.
- **Reinforce compliance through economic incentives:** Regulations are only as effective as their enforcement, and methane fees and penalties for non-compliance help create financial incentives to cut emissions. These can be phased in over multiple years, which can help motivate early action to avoid higher fees in the future.

A comprehensive regulatory approach should incorporate a layered approach that leverages all methane abatement tools available. While performance standards hold promise and potential for deep emissions reductions in the coming years, the challenges of implementing quality measurement and reporting programmes inhibit them from being a viable *sole* policy option for now, and they must be complemented with equipment-based standards and best practices such as LDAR. This will ensure that all potential emissions reductions are maximised now, while still building the data foundation needed to secure even greater reductions in the future.

Section III

Recommendations for prescriptive methane regulations

A successful prescriptive regulatory approach should cover all the major sources of methane emissions. These sources fall into three main categories: 1) fugitive emissions and equipment leaks, 2) venting and flaring, and 3) equipment venting. The regulatory approach for each of these types of emissions varies. The below sets out the current state of play, important regulatory considerations, and a regulatory framework for each.

An essential part of implementing these equipment and work practice standards is a monitoring and reporting system, in which companies report on the actions they are taking to comply with the standards, including details on leak detection and repair surveys and repairs, equipment retrofits with lower- or zero-emissions equipment, installation of vapour recovery units, etc. Such reporting will allow the regulator to ensure that companies are in compliance with requirements. Verification can be done primarily through desk audits, supplemented by site audits as capacity allows.

Such reporting is distinct from the MMRV system that is required to implement a performance-based methane standard (and to comply with reporting requirements of the EU import standard (see section IV). However, these distinct reporting systems can be integrated into one comprehensive reporting system once the regulation is fully implemented.

3.1 Fugitive emissions and equipment leaks

Regulatory considerations: What does LDAR policy need to achieve?

A huge portion of emissions from oil and gas arise from leaks — a broad category that includes what is typically thought of as a "leak" (for example, gas escaping past a seal that is failing, through a crack or corroded material on a vessel, etc.), in addition to other improper operations and "mistakes" such as valves that are stuck open, hatches that are left open, flares that are unlit, and other problems on site that lead to emissions.

Leaks are widespread, and there is no single cause for these leaks. Thermal or mechanical stresses can degrade seals, valves, flanges, etc. They can be caused by human error (such as improper installation, operation, or maintenance) as well as normal operations and exposure to weather conditions that can wear out equipment over time. Leaks will eventually occur at all oil and gas facilities; failing to fix them in a timely matter is a wasteful and harmful practice that could lead to so called "super-emitters". Super emitters are large and uncommon emissions that cannot be predicted and can occur at any site due to malfunctions and improper operations.

Evidence shows that monthly LDAR inspections can reduce emissions from leaks by 90%, and quarterly LDAR inspections can reduce emissions from leaks by 80%. These LDAR programs can also be extremely cost effective and are easy to start.

During LDAR surveys, operators should be required to address any emissions visible to optical gas imaging (OGI) cameras or other instruments approved by the regulatory body that demonstrate to have similar or higher effectiveness to detect emissions leaks.

Regulatory framework: What should a policy framework include?

Integrating rules and regulations on methane emissions in the oil and gas industry, particularly in the area of reducing fugitive emissions, will be a critical component to the UK's methane regulatory landscape. Currently, operators are not required to meet any specific LDAR standards, or search for leaks at any specific frequency.[33] These fugitive emissions are not regulated, and data on leaks is entered into the UK's Environmental and Emissions Monitoring System (EEMS) database voluntarily.[34]

While LDAR programmes should be flexible to adapt and capitalise on new technologies, the UK should mandate quarterly LDAR inspections on upstream oil and gas installations, using optical gas imaging or a technology shown to be equally as effective. For downstream distribution and transmission pipelines, remote sensing technologies mounted in vehicles or airborne platforms (such as drones, helicopters) for aerial LDAR surveys can be used. Repairs should be completed in no more than five days after the discovery of the leak, except for repairs that require facility shutdown or other safety issues. Differentiated LDAR frequencies for transmission and distribution pipelines should also be included, with minimum frequencies depending on the composition of material.

Summary of best practices

The UK should consider best practices to develop its own LDAR regulation for the oil and gas industry. The below summarises best practices from across the three segments of the oil and gas industry (i.e., upstream, midstream and downstream), as well as onshore and offshore installations.

Onshore LDAR for upstream and midstream

LDAR surveys at onshore upstream and midstream facilities include but are not limited to well sites, compressor stations, tank batteries, gas processing plants, and any oil or gas facility with a hydrocarbon liquids storage tank.

LDAR surveys should comprise all components in each facility and should be conducted quarterly using an optical gas imaging device or using an alternative approved device that is equally or more effective at detecting leaks.[35] Additionally, audio, visual, or olfactory inspections should be conducted monthly.

Repair or replacement of all components found to be leaking must be done immediately or as soon as possible and no later than five days after detection, unless the component is a critical component that cannot be repaired without shutdown.[36] In such case, operators shall minimise the leak within one day of detection and repair the leak by the end of the next process shutdown or within one year, whichever is sooner.[37] Each repaired or replaced component must be resurveyed with OGI or a "sniffer" as soon as practicable to ensure there is no leak, no later than 15 days of the leak discovery.[38]

Operators must submit an annual report with information on the facilities inspected, identified leaks and components, details on repair and reinspection, and any leaks where repair has been delayed due to process or safety reasons.

Offshore sites

At manned offshore platforms, LDAR frequency should be the same as for onshore facilities. For unmanned offshore platforms, operators should conduct LDAR inspections whenever on-site maintenance activities are planned, up to required frequencies for manned facilities.

Downstream

For distribution and transmission pipelines, approved remote sensing technologies mounted in vehicles or airborne platforms (such as drones, helicopters, planes) can be used for aerial LDAR surveys. The minimum frequency of LDAR surveys can be differentiated depending on the pipeline material following the frequencies established in Annex I of the EU Methane Regulation.[39]

3.2 Venting and flaring

Regulatory considerations: What does venting and flaring policy need to achieve?

Venting and flaring are the two most important emission sources in the UK's oil and gas system accounting for nearly 80% of methane emissions from the industry.[40] Oil operators often vent or flare the associated natural gas. Oil operators simply dispose of the gas from producing oil wells instead of building infrastructure (such as pipelines) to capture the gas as soon as production begins. In some cases, pipelines are never built and all the gas the well produces over its lifetime is wasted in this way.

When gas is flared, the majority of methane is combusted, but some methane emissions remain. Methane slip from flares can be as low as 1-2% for highly efficient flares, and up to 10% or more for inefficient flares. In addition, malfunctions leading to periods of unlit flares can result in significant methane emissions. Venting (whether from an unlit flare or intentional venting) is even more harmful than flaring, since methane has over 80 times the near-term warming potential of CO2, and volatile organic compounds (VOC) and toxic pollutants are released unabated. Policies need to strictly limit flaring but also ensure that gas is flared instead of vented whenever it is technically feasible to flare.

Venting:

- In the UK, venting accounts for almost 60% of the UK's oil and gas methane emissions.[41] Venting is regulated by the North Sea Transition Authority under the Energy Act 1976 (as amended by the Energy Act 2016) and the Petroleum Act 1998. NSTA sets the vent consent, which is based on the total hydrocarbon to be vented and not directly on methane itself. The NSTA expects industry to adhere to zero routine venting and flaring by 2030.[42]
- The UK government has introduced secondary legislation to ensure that CO2 released through venting in the upstream oil and gas sector is incorporated into the scope of the UK Emissions Trading Scheme (ETS), but this does not include methane.[43]
- Venting in decommissioned wells is regulated by OPRED; however, methane emissions are not included in decommissioning plans and currently there is no mechanism for reporting.[44]

Flaring:

- In the UK, flaring makes up 21% of methane emissions in the oil and gas sector.[45] Like with venting, the NSTA sets the flare consent, which limits the quantity of hydrocarbon gas that can be flared. Hydrocarbon gas may be made up of other gases besides methane.[46] The NSTA expects industry to adhere to zero routine venting and flaring by 2030.[47]
- As flaring produces CO2 emissions through the combustion of the hydrocarbons, these emissions are regulated under the UK ETS by OPRED. While OPRED does not set any limits for flare activity, it does track and manage independently verified flare activity data.[48]

Regulatory framework: What should a policy framework include?

Numerous oil and gas producing jurisdictions have banned venting and flaring – Norway has had a ban in place since 1971. A number of jurisdictions have put in place standards and other policies that significantly limit or penalise venting and flaring; the great majority of these rules have taken effect within periods of one to two years. Regulation on venting and flaring should include:

- **Clearly prohibiting venting in all situations where flaring is technically feasible.**
- **Setting penalties on flaring to reduce the net cost of flare reduction:** Whilst the NSTA does issue fines for breaches of flare consents, these are applied inconsistently. Regulators should set penalties for all flaring, or for exceeding flare volume or intensity limits, creating an immediate financial incentive to reduce flaring. Financial penalties can effectively reduce the net cost of flare reduction, but they must be consistently applied to be considered in a cost-benefit analysis of a potential project.
- **Requiring gas-capture plans for new operations:** For new operations, careful planning can eliminate the risk of routine flaring in the future. Regulators should make these plans' development a prerequisite for any license for new operations. The NSTA expects that all new developments should be planned on the basis of zero routine flaring and venting, but this is not mandatory.[49]
- **Defining and prohibiting routine flaring, and precisely defining exceptions for allowed, non-routine flaring:** Regulations can play an important role by defining what flaring events qualify as 'routine,' and delineating what exceptions should qualify as 'emergency' or 'non-routine' flaring. The NSTA defines flaring in line with the World Bank Zero Routine Flaring Initiative.[50] Whilst the World Bank's definitions for routine, non-routine, and safety flaring are useful, the latter two categories permit broad interpretation to re-classify events that should be considered routine flaring.[51]

Summary of best practices

Best practice for venting and flaring regulations can be seen in jurisdictions such as the European Union, and the States of Colorado and New Mexico. These jurisdictions ban venting and flaring except in specifically and narrowly defined circumstances, and clearly prohibit venting whenever flaring is technically feasible.

As the UK develops mandatory regulations for venting and flaring, it should include consideration of the following:

- Regulators should leverage satellite data to verify reported data, where appropriate.
- Operators should notify competent authorities of venting and flaring events caused by an emergency or malfunction or lasting more than 8 hours within a 24-hour period.
- Venting and flaring should be prohibited except in case of an emergency or during:
  - An emergency or malfunction.
  - Wellbore liquids unloading.
  - The first 12 months of production for an exploratory well.
  - Well tests, tank sampling.

- Normal operation of pneumatic controllers, pump, storage tanks, dehydration units, amine treatment units, and compressors.[52] This type of venting is called ”equipment venting” and should be subject to emissions standards, as described in section 3.3.

- Venting should be prohibited whenever flaring is technically feasible.

Monitoring of vented and flared gas shall be done by measuring the volume of gas vented or flared regardless of the reason or authorisation using equipment that conform to an industry standard. The operator shall make and keep records of the measurements and estimates, including records showing how it calculated the estimates, for no less than five years and make such records available for inspection upon request.[53] The operator must submit monthly reports of gas vented and flared.[54]

The UK should adopt requirements for flare efficiency and flare monitoring to minimise periods of unlit flares. Flare stacks must be properly sized and designed to ensure a design destruction efficiency of 98%-99%, including automatic ignition or continuous pilot, or technology that alerts the operator that a flare may have malfunctioned.[55] Flares should be monitored (using visual, camera, thermocouple, or other monitoring techniques) to ensure that the operator is notified immediately of unlit flare condition. There should be a requirement to perform an annual LDAR inspection and test of the auto-igniter or continuous pilot light to ensure the flare is meeting destruction efficiency requirements.

For each new or recompleted well the operator must file a gas management plan detailing the actions it will take to connect the well to a gathering system with sufficient capacity to transport 100% of the anticipated gas production volume starting on the first day of production or otherwise, submit a venting and flaring plan that utilises an alternative beneficial use of gas (i.e., power generation on lease or for grid, compression on lease, liquids removal on lease, reinjection) until the gas gathering system is available.

3.3 Equipment venting

Regulatory considerations: What does equipment venting policy need to achieve?

Much of the common equipment in use in the upstream and midstream oil and natural gas industry is designed to release some amount of natural gas during normal operation. This includes several types of compressors with seals which are not designed to be hermetic; pneumatic equipment that uses pressurised natural gas to operate pumps or open and shut valves; tanks storing, at atmospheric pressure, liquids that contain significant amounts of natural gas, which vaporises during storage; and other equipment.

This equipment is responsible for a significant portion of methane pollution from the oil and gas industry, and all jurisdictions which have put in place policies to reduce emissions from the industry have included policies to reduce emissions from these types of equipment. In some important cases, the policies generally prohibit any emissions from some types of equipment, because all emissions can readily be captured, or it is feasible to use inherently non-emitting equipment in place of the emitting version.

Effective regulation for these standards requires a gradual replacement of high-emitting equipment over time, combined with obligations that any new or repaired sites only use equipment that meets these standards.

Regulatory framework: What should a policy framework include?

Prescriptive regulations for equipment venting must include specific requirements for each of the major types of equipment that vent as well as a requirement for the use of zero-emitting equipment in any new or repaired site. The latter is in line with the EU Methane Regulation requirements for equipment venting.

For equipment designed to vent, in general, the older the equipment, the larger the emissions vented; therefore, requirements for maintenance and quantitative emissions standards are an essential part of any regulatory framework. The best rules are those that set low emissions standards, while also allowing flexibility for the use of mitigation approaches that work best for each facility.

Summary of best practices

The UK should require for all new or repaired sites, the installation and use only of commercially available zero-emitting pneumatic devices and pumps and protective quantitative emissions standards and/or gas capture systems at compressors and storage tanks, as described in more detail below.

Existing sites should be required to retrofit / replace higher emitting equipment with low / zero emitting equipment, over a prescribed timeline. Operators must monitor as part of instrumental LDAR all equipment to ensure that it is operating properly and not emitting above design specification. For any vented equipment, operators must periodically measure emissions rates to ensure standards compliance. Operators should keep records for at least five years of inspections and measured natural gas emission rates.

Additionally, the UK should require the following best practices:

- **Glycol dehydrators:** Operators shall control emissions from new and existing glycol dehydrators by 98%.
- **Liquid storage tanks: flash gas, working & breathing losses:** For all tanks with the potential to emit more than two tonnes per year of volatile organic compounds, operators must route emissions, including all emissions of flash gas, and emissions due to working losses and breathing losses, either to a vapour collection system or, in some cases, to a combustion device. Venting emissions from hatches and other access points on tanks during normal operation shall be prohibited. Operators should design production separation equipment and storage tanks for maximum anticipated throughput and pressure.[56] Storage tanks should be equipped with an automatic gauging system that reduces natural gas venting.[57]

Operators should perform and retain records of monthly visual and audio, visual, olfactory (AVO) inspections of tanks and control devices to ensure emissions are being routed to control units and flares are operating as designed. Annual reports should be required, including documentation of the low emissions from tanks not subject to emissions control requirement.

Section IV

Recommendations for measurement, monitoring, reporting, and verification regulations

4.1 Measurement, monitoring, reporting and verification framework

Measurement, monitoring, reporting, and verification (MMRV) regulations are an essential component of methane regulations for oil and gas. MMRV regulations serve a number of key purposes:

- Demonstrating compliance with prescriptive regulations;
- Assessing emissions levels for developing and refining inventories;
- Developing and demonstrating compliance with measurement-based overall emissions performance standards, including import standards (see Section V).

The discussion in this section focuses on development of MMRV regulations supporting the first two purposes listed above; measurements for overall performance standards are discussed in Section V.

In addition to the purposes described above, comprehensive MMRV is required to best integrate UK oil and gas production into European markets, and likely into world markets, if current trends continue. Notably, an obligatory MMRV framework was recently agreed in the EU's Methane Regulation, both for domestic operations and for imports. By January 2027, importers of oil, gas, and coal into the EU will be required to demonstrate and report that the producers of the fossil fuels they import carry out monitoring, reporting and verification measures that are equivalent to those required by the EU regulation for domestic production. In the future, UK producers could be exempted from individually needing to demonstrate MMRV compliance if the UK is able to demonstrate that UK MMRV regulations are granted "equivalence" by the EU Commission. This would be allowed if the

UK's MMRV reporting obligations are similar to those set out in the EU's Methane Regulation or OGMP 2.0 level 5, including third-party verification.

The UK does not currently have a compulsory legal MMRV framework in the energy sector; emissions are voluntarily reported into the Environmental and Emissions Monitoring System (EEMS), which records upstream emissions from oil and gas operations.[58] The NSTA have their own hydrocarbon petroleum production reporting system (PPRS) which collects monthly data from the reporting of hydrocarbon production from both onshore and offshore fields and terminals in the UK Continental Shelf (UKCS). This data is submitted by operators to PPRS via the Energy Portal and then placed in the public domain on the OGA's website after two months. As part of an MMRV framework, requirements for methane emissions reporting can be expanded and improved within this existing reporting system.

Timeline

We recommend that the UK build on the current system with phased-in requirements to move, over the period of a few years, to require all UK operators to adopt MMRV programs equivalent to OGMP 2.0, Level 5. In addition to providing the best information about emissions levels, these rules would allow UK oil and gas producers to fully integrate into global markets.

The UK could set forth MMRV legislation that accomplishes this in a three-step approach. The first step would be to quickly require emissions reporting that relies on a comprehensive, granular survey of equipment and practices and application of the most up-to-date emissions factors for the whole UK oil and gas supply chain. Operators should be required to begin collecting this information (equivalent to OGMP Level 3 reporting) immediately after rules are put in place and should be required to report emissions for the initial period (which could be a year, but ideally reporting would be more frequent) shortly after that period ends. Collecting this detailed and granular equipment information is essential. The detailed rules in U.S. EPA's Greenhouse Gas Reporting Program (GHGRP) for emissions reporting for oil and gas sources and corresponding materials (e.g. spreadsheet forms) provide good templates for this step.[59] In addition, as noted in Section III, this initial MMRV system should also include reporting on compliance with equipment and work-practice standards.

Within a year, the UK should issue rules that move as much as possible towards OGMP Level 4 reporting. For all sources for which it is feasible, operators should be required to measure emissions from individual sources, such as measuring the flow of methane/gas to any flare and measuring the methane concentration in compressor exhausts. Operators should also conduct measurement programmes to create operator-specific emissions factors for sources such as valve leaks where measuring the rate of individual emissions streams is not feasible. This can be achieved at limited cost with the scientific tools and methods already available, so operators should be required to measure emissions in accordance with these rules within a few months of rule adoption. This approach would improve emissions factors with direct site-level measurement upon a foundation of excellent OGMP Level 3 activity data. Again, U.S. EPA's GHGRP provides useful precedent and materials, although the program (as of the beginning of 2025) only incorporates measurement in accordance with OGMP Level 4 for a limited number of equipment types. As a third step, within three years of adoption, the UK should require operators to conduct site-level measurements and carry out a reconciliation process between source-level and site-level measurements, as required in the EU's Methane Regulation, and OGMP Level 5. The UK government can further strengthen MMRV requirements by requiring measurement at the site or basin level (using satellite, aerial, and other technologies), to assess and validate emissions data reported by companies.

Verification

The credibility of all reported data relies on a robust verification framework that can properly assess at a detailed level, technically complex methane emissions reports. Such a verification framework is a critical component of an MMRV system.

In the EU, third-party verification is required to ensure that emissions reports prepared by operators are accurate and in compliance with the EU Methane Regulation; all verifiers must be accredited by EU accreditation bodies. This system provides independence and provides a level of expertise that may not be available to all public entities. In the case of the U.S. GHGRP, the U.S. EPA audits information submitted by operators to ensure data is consistent and follows reporting requirements. It conducts desk audits, but not direct facility inspections. In the case of OGMP 2.0 reporting, UNEP reviews all company reporting and determines whether or not the company has sufficiently met the reporting level. The UK should establish a verification system to guarantee that measurement data are based on an appropriate methodology, that the reporting methods respect the requirement, and that reported emissions match what is measured. This can be done internally by regulators, by authorised third parties, or by a combination of internal and third-party verifiers.

Guidance for third-party verifiers for assessing and confirming the emissions reported for imports into the UK will also need to be developed and can be informed by the ongoing European Committee for Standardisation / International Organization for Standardization (CEN/ISO) Standardisation processes for MMRV. These processes aim to resolve specific challenges associated with methane verification and harmonise a global approach.

A strong MMRV framework will improve confidence in UK emissions statistics and the UK National Inventory Report, making mitigation and monitoring efforts more effective. Given shifting global market and regulatory demands, a strong MMRV framework is critical to make UK exports more competitive and can also leverage the UK's role as a pioneer and innovator in measurement technology. Finally, this approach will create the quality data needed to enforce a future performance standard that rewards low-emitting operators and penalises high emitting operators, as discussed in Section V.

The OGMP 2.0 Framework is a comprehensive, measurement-based oil and gas reporting and mitigation program led by the United Nations Environment Programme (UNEP) and the Climate and the Clean Air Coalition (CCAC). OGMP 2.0 provides standardised guidelines for oil and gas companies to monitor, quantify, and report methane leaks from operated and non-operated assets across all segments of the oil and gas value chain. It contains five levels of reporting methane emissions where the first two levels rely on emissions factors applied at the facility level using broad facility type categories. The third level requires a granular equipment inventory and utilises generic source specific emissions factors. Level 4 builds on Level 3 by requiring companies to conduct source-level measurements to replace generic source level emissions factors. Level 5 requires operators to perform site-level measurements and to perform a reconciliation process between source-level and site-level measurement-based estimates. Before the UK can rely solely on a performance-based standard to achieve methane mitigation, operators must be able to implement measurement and reporting at OGMP Level 5.

4.2 Data transparency

A robust MMRV framework improves credibility and promotes transparency of reported data. The UK should enhance transparency with regards to the fossil fuel energy that it produces and consumes by creating a publicly available and free of charge database similar to those from the U.S. GHGRP[60] and what is envisioned to be available in the Methane Transparency Database from the EU Methane Regulation.

The data reported should be available to the public and contain detailed emissions information and not just the overall aggregate emissions at the company or asset level, including the following:

- Emissions estimation and methodology used (generic emissions factors, emissions factors based on source-level measurements, other source-level measurements, site-level measurements).
- Facility details, including equipment counts, throughput, and any other activity data used in inventory calculation.
- If using generic emissions factors other than defaults provided in regulation (if allowed), provide references and justification.
- Details of measurements:
  - Measurement technology/methodology.
  - Assumptions used to extrapolate from measurement sample to population.
- Details of reconciliation.
- Information on whether the reported data was verified by independent third parties.

The U.S. GHGRP is a good model for this for OGMP Level 3-type data; essentially all reported data is made publicly available, except a very small amount of data deemed "confidential business information".

Section V

Recommendations for performance-based regulations, import standards, and gas origin accounting systems

Performance-based standards can effectively reduce emissions by regulating maximum intensity levels, incentivising and allowing operators to find ways to reduce emissions at minimum cost, and potentially mitigating emissions more than has been achieved with prescriptive regulations. Additionally, performance standards can be applied to imported fuels, incentivising producers and other operators in exporting countries to reduce emissions. This approach requires robust MMRV frameworks, as described in section IV, to secure credible data that can be used to assess performance. Finally, implementing import standards also requires adoption of an appropriate methodology for tracking the origin of imported fuel.

5.1 Building a performance standard, to be used both domestically and for imported fossil fuels

A performance standard is a crucial tool in a robust MMRV framework that allows regulators to objectively assess the quality of a product (oil or gas) by defining an approved threshold. An example of a performance standard is an emissions intensity, which is defined as the quantity of emissions per quantity of product used. For example, it would be the total methane emissions from different segments associated with the production, processing, and transport of a given cargo of natural gas or oil divided by the methane content of the delivered natural gas, or the energy content of either fuel.

While the UK is only obligated to establish a MMRV framework for exports to the EU under the EU's Methane Regulation, to substantially reduce emissions associated with producing and transporting the EU's fuels, the UK should take a further emissions reduction step by establishing an emissions intensity standard. This would represent the maximum level of acceptable emissions, meaning operators exceeding the standard would face some consequence, for example being required to pay a fee. Critically, setting such a standard for domestic operators would also allow the UK to set an intensity standard for imported fuels. Since the UK imports a substantial, and growing, portion of the oil and gas it consumes, it is crucial to set a standard for imports to ensure that companies producing those fuels are incentivised to reduce emissions.

The intensity target can be differentiated by segment (upstream, midstream, and downstream activities) or applicable to a full value chain. For import standards to be in line with World Trade Organisation (WTO) rules, the UK should first set an intensity standard for domestic oil and gas operations before implementing an emissions standard for imports. Standards should be developed after assessment of reported measurement-based data from domestic and foreign producers. The intensity target for imported oil and gas should be set at a level that reflects—without being stricter than—what would be applied to domestic production. The UK should consider aligning the intensity target on internationally recognised standards.

To determine the emissions intensity associated with gas in a standardised way, the UK will need to develop methodologies (or evaluate existing methodologies and adapt them to the requirements of the standard) for accounting methane emissions. This can be aligned with the European Commission, which is expected to release a methodology by 2027.

5.2 Tracking the origins and environmental attributes of fossil fuels across supply chains

An oil and gas import standard for the UK would utilise the UK's buying power to incentivise oil and gas operators to reduce emissions. Such a standard would need to differentiate volumes of fuel produced in accordance with the UK's import standard from other volumes of fuel, since the bulk of operations in many exporting countries will not be in compliance with the import standard. Therefore, in addition to the MMRV approaches described above, implementing an import standard requires adoption of a credible way to track the origin of imported cargoes.

Trace-and-claim systems can track where oil and gas is produced – and its associated emissions – by following oil and gas along commercial pathways, providing an effective solution for import standards. Utilising these systems correctly will be key to determining whether imported oil and gas meets future standards, incentivises emissions reductions, and allows buyers to prioritise lower intensity supplies, setting the foundation for the evolution of a global differentiated gas market.

In practice, tracking gas across the supply chain requires a different approach than tracking most tangible commodities. After all, the environmental attributes cannot be physically attached to gas as they can be with a product like timber.

A trace-and-claim system is one solution that would be straightforward to implement and create a link between the producer and the importer by giving every volume of gas or oil a unique digital ID, allowing the volume and its associated data to be tracked back to the producer through sale and purchase agreements.

Such a system does not attempt to 'follow the molecules' of fuel but rather 'follow the money'. This ensures that environmental attributes can only be claimed, for example when gas or oil is imported into the UK, when there is a plausible delivery path from the importing country – and it also ensures that the producers and midstream operators transporting the low-intensity fuel are the financial beneficiaries of

the value created by the low-intensity emissions data. Ensuring that *the producers who abate emissions* ultimately are the beneficiary of this value is critical to incentivise reductions.

A trace-and-claim system is built on three main components:

1. First, a robust data gathering system is necessary to produce unique digital ID profiles and certificates for specific volumes of fuel. If the volume is split up, the new batches receive a new ID that is a derivative of the original.
2. Second, a trace-and-claim system relies on a standard format to include environmental attributes in sale and purchase agreements (SPAs). This standardisation is critical to allow buyers and regulators to have frictionless access to attributes.
3. Third, the system relies on interoperable digital registries to store and track the movement of environmental attributes. In practice, these attributes would be stored on a secure registry until a subsequent SPA notifies the registry of a change and new destination. This system ultimately ensures that there is no double counting of the same volume.

Endnotes

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