CLIMATE ANALYTICS

Assessing the emissions reduction potential of methane import standards

Technical report

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Background

The EU methane regulation, which entered into force in 2024, introduces binding rules to measure, report, verify, and reduce methane emissions across the European Union (EU)'s oil, gas and coal supply chains. It also proposes methane performance standards for fossil fuel imports by committing to set maximum methane intensity thresholds post-2030—though the details for these import standards are still under negotiation. The regulation clearly applies to upstream, midstream and downstream oil and gas activities within the EU. However, the 2030 methane performance standard for imports are expected to apply only to upstream emissions.

Under proposed rules, importers will be required to provide a methane performance profile that is added to a central methane transparency database and ensure that supply contracts include measurement, reporting, and verification (MRV) measures equivalent to EU operator standards. This means that by 2030, importers will be required to demonstrate the methane intensity of production is below maximum values set by the commission. A 0.2% methane intensity (methane leaked as a share of gas produced or marketed) has emerged as an international "good practice" benchmark and could be adopted as the standard. This standard is based on the Oil and Gas Climate Initiative target of well below 0.2% for upstream methane intensity. An intensity of 0.2% represents a leakage rate relative to production. For every cubic metre (m^3) of natural gas produced, there is an upstream leakage of 0.002 m^3 of natural gas — which is then converted to methane (~90% conversion). For other products, including crude oil and coal, the same approach is applied on an energy-equivalent basis. So for every Terajoule (TJ) of coal produced there is an equivalent upstream leakage of 0.002 TJ of natural gas which is also then converted to methane (~90% conversion).

This standard implies leakage rate and is generally understood to cover all upstream methane emissions from operating oil and gas assets divided by the volume or energy content of oil and/or gas produced. This includes all fugitive leaks from wells, gathering lines, tanks and other equipment, as well as intentional venting and incomplete combustion from flares.

It may not include downstream segments such as transmission, storage, LNG shipping and distribution, which could be addressed with other instruments. Conceptually, the emission intensity standard could be conceived as applying from the "well head to point of sale at the border," excluding midstream and downstream activities.

The text of the regulation (EU 2024/1787) suggests the following scope for the import standard

By 5 August 2030 and every year thereafter, Union producers and importers placing crude oil, natural gas and coal on the Union market under supply contracts concluded or renewed after 5 August 2030 shall demonstrate to the competent authorities of the Member State in which they are established that the methane intensity of the production of crude oil, natural gas and coal placed by them on the Union market, calculated in accordance with the methodology set out pursuant to paragraph 4, is below the maximum methane intensity values established in accordance with paragraph 6 to promote the global methane emissions reductions for those products.

The choice of how to define the scope of the emissions and volume of product would likely be made at the company level — for example, on the basis of all operations within a country or all assets that a company owns, potentially across multiple countries. Because methane emissions intensity is company-specific, applying a country-average compliance intensity would likely overstate the actual emissions reduction potential of individual reporting companies. Individual companies operating within the same country may hold different assets, operate in different basins or fields, and exhibit significant variation in methane emission intensities.

Production with the lowest emission intensity in a country would have a competitive advantage in exporting to jurisdictions with a methane emission intensity standard. Higher-emission production, by contrast, would more likely be used for domestic consumption and exported to countries without emission intensity standards where there is no incentive to reduce emissions.

A particular challenge in applying company-level and asset-level methane emission intensity standards is that the purchase of natural gas, liquid natural gas and crude oil are typically made through long-term contracts on a spot market from an operating unit within a company or a third-party consolidator, rather than directly from the producer. As a result, coordination of a tariff with the upstream emission intensity of a specific shipment may be difficult. A given shipment may draw on multiple sources and tracing it back to its upstream emissions profile could require significant verification procedures.

Objective

The aim of the modelling exercise is to develop a broad understanding of the potential impact of a methane emission intensity standard on different oil, gas, and coal products, including natural gas, LNG, crude oil, and coal.

The first step was to identify a specific set of countries that could potentially be interested in employing a methane emission intensity standard to imports (e.g., EU, UK, China, South Korea, Japan, Canada, India) as well as the potential scope of methane emissions that could be covered. The second step was to assess the potential impact of a selected upstream emission intensity standard across different products.

The analysis addresses three main questions: What are the existing emission intensities of production, imports and exports from relevant countries? How do they compare against proposed standards? What do methane emission reductions from the baseline look like if countries comply with methane emission standards by 2030 under various scenarios?

Methodology

Importing and exporting countries included in assessment

To capture coverage of most imports of oil, gas and coal products to significant importing region (specifically the EU, UK, China, South Korea, Japan, Canada, and India for this analysis) it is necessary to ensure that there is good coverage of these products from exporting countries. This model considers a total of 24 exporting countries and 44 importing countries, as listed in Annex A, that covers more than 80% of global trade of oil, gas and coal products.

The products HS codes that account for almost all exports of oil, gas, and coal products that can be related to upstream methane emissions include:

Table 1: Fossil energy products and relevant HS codes and proportion of imports to key countries

HS Code	*Product*
270900	Crude oil
270112, 270111, 270119	Coal (bituminous, anthracite, other)
271111	LNG
271121	Natural gas

A total of 24 countries are included in the assessment. These countries represent most of the global production of the products identified in Table 1 (>80%), as well as almost all of the current value of imports of these products into the EU, UK, China, South Korea, Japan, Canada, and India (>95%). In addition, these countries also account for more than 80% of global upstream methane emissions of these products.

The total global production of these products included in the modelling are summarised in Table 2. Production is presented in million barrels oil equivalent (BOE) for oil and natural gas products and in kilotonnes for coal. The BOE metric was used for easy comparison to trade data information, however, it can be directly converted into energy units using the conversion of 6.119 Terajoules (TJ) per million BOE in the model.

Table 2: Production in 2023 of fossil energy products (millions of BOE or kt)

	Crude oil HS Code: 270900	***LNG*** HS Code: 271111	***NG*** HS Code: 271121	***Coal*** HS Codes: 270112, 270111, 270119
	million BOE			***kt***
Saudi Arabia	4,093		713	
Canada	2,102		1,142	53,609
Iran	1,504		1,559	2,006
Iraq	1,619			
Kazakhstan	714		169	129,748
Kuwait	1,061			
Nigeria	554	112	225	
Russia	3,981	253	3,609	529,020
United Arab Emirates	1,614		328	
United States	8,023	674	6,297	577,657
Australia		648	890	488,252
Indonesia		93	345	861,191
Qatar	667	628	1,011	
China	1,920		1,408	4,808,354
Brazil	1,563			
Mexico	774			
Algeria	527		617	
Libya	454			
Angola	429			
Venezuela	296			

Turkmenistan			496	
India			207	1,067,951
Argentina			257	
Malaysia			437	
TOTAL	***31,895***	***2,408***	***19,712***	***8,517,787***
WORLD	***34,540***	***3,162***	***24,364***	***9,584,544***
Represented fraction	***92%***	***76%***	***81%***	***89%***

Source: IEA. Production of crude oil includes natural gas liquid products including propane and butane and crude oil that is ultimately processed into refined petroleum products, and production of natural gas includes production that is ultimately marketed as LNG. Blank spaces in the table do not necessarily mean that these countries produce none of the product listed. The model covers 95% of traded products, meaning that some exports are not accounted for in the analysis.

Estimates of upstream methane emissions of products

Upstream methane emissions associated with the production of oil and gas and coal products were estimated using data from the IEA Methane Tracker. The most recent 2025 IEA Global Methane Tracker database that includes 2024 estimates was downloaded. Within this database there is a breakdown of methane emissions by source for oil and gas and coal emissions.

Note that the IEA Global Methane Tracker data deviates substantially from reported national emissions under the UNFCCC. While its estimates of methane emissions from the oil and gas industry reached 77 million tonnes in 2023, reports submitted to the UNFCCC totaled 38 million tonnes, or half that. Meanwhile if the emissions reported by companies were scaled to cover all global production, they would amount to less than 10 million tonnes. The main reason that national inventories underreport methane emissions is that they often rely on bottom-up estimates based on activity and emission factors and omit or underestimate methane emission from venting, flaring and accidental leaks. These uncertainties and reasons for underreporting are discussed further in this Climate Analytics report. IEA data incorporates top-down measurements, including satellite observations and field measurements that reveal higher emissions than reported through national data collection.

To conform with the concept of an upstream-only emission intensity standard, some methane emission sources associated with oil and gas in the methane emissions tracker may need to be excluded. Only sources that were identified as upstream methane emissions were included to remain consistent with the proposed methane regulation as identified in Table 3.

Table 3: IEA Global Methane Emissions Tracker (2024 emissions by type)

Stream	*Product*	*Emission type*	*Mt CH_4*	*Included in assessment*
Upstream	Oil, natural gas and coal	Abandoned oil and gas wells and coal	7,677	NO – not specifically related to current company product emission intensity
	Natural gas	Satellite – detected	1,738	YES (split between oil and natural gas)
		Fugitive – Onshore	5,147	YES
		Vented – Onshore	11,607	YES
		Fugitive – Offshore	1,234	YES
		Vented – Offshore	2,783	YES
	Oil	Satellite – detected	1,704	YES (split between oil and natural gas)
	Oil	Flared – Onshore	8,128	YES
		Fugitive – Onshore	4,795	YES
		Vented - Onshore	19,181	YES
		Flared – Offshore	1,470	YES
		Fugitive – Offshore	1,624	YES
		Vented - Offshore	6,496	YES
Downstream	Oil and natural gas	Satellite - detected	1,147	No

	Oil and natural gas	Other from oil and gas	3,488	No (Note that some of these emissions are included in relevant emissions related to refining and RPP products)
	Gas	Fugitive – pipeline and LNG Facilities	3,817	No (Note that some of these emissions are included in relevant emissions related to liquefaction and processing at LNG plants for LNG product)
		Vented - pipelines and LNG Facilities	5,436	No
Upstream	Coal	Coking	9,703	YES
		Steam	25,904	YES
		Other	1,307	YES
TOTAL	***Included (oil, natural gas, coal)***		***102,820***	***YES***
	Not included		***24,207***	***NO***
	All		***127,027***	

Source: IEA Global Methane Emissions Tracker 2025

Estimates of upstream emission intensities

Upstream emission intensities for crude oil, natural gas, and coal are calculated nationally for each of the 24 countries by dividing total relevant national upstream methane emissions by the national net market production of product.

$$EI = \frac{Upstream\ Emissions\ (ktCH4)}{Net\ Market\ Production\ (boe)}$$

These emission intensities can also be converted to a percentage leakage rate by assuming that methane has an energy content of 55 MJ per kg.

For liquid natural gas, adjustments are made to estimate emission intensity. Table 4 identifies these adjustments.

Table 4: Estimating emissions intensity by product

Product	*Estimate of emission intensity*
LNG	Use national emission intensity for Natural Gas Production on an equivalent energy basis but multiply upstream intensity by 105% and add an additional 0.075 kg CH_4/BOE to account for additional emissions associated with processing at LNG plants and liquefaction of natural gas to LNG that should be included as part of the well to border standard. Methane emissions associated with shipping and regasification are considered downstream and not included. These additional emissions are estimated to be on average in the order of 0.12 kgCO2e/BOE globally. The adjustment between exports of natural gas and for exports for LNG for the six countries included ranges from 0.10 to 0.14 kgCO2e/BOE.

Source: (IEA, 2025)

Estimate of trade emission intensities

Global trade data for 2023 on bilateral trade flows in target HS6 commodities was collected from BACI. Fossil fuel exports from 19 countries were tracked to 44 importing countries (Annex A). Given data issues with BACI trade volumes and physical units, we focused on trade flows expressed in US dollars. To convert physical unit emission intensities (kgCH_4/BOE) into trade emission intensities (tCH_4/$million) prices for products need to be identified. Average prices in 2023 were identified in the literature.

Product	*Price*	*Source*
Crude Oil	$83.00 per BOE	2023 Average Brent Price USD, WTI ~$78, WCS $60, https://www.statista.com/statistics/326017/weekly-crude-oil-prices/
Natural Gas	By region: $15.95 per BOE North and South America $79.31 per BOE Asia $65.25 per BOE Europe and ROW	2023 average prices for North and South America using Henry Hub index. https://www.eia.gov/dnav/ng/hist/rngwhhdd.htm 2023 average prices for Asia using Japan Korea Marker. https://tradingeconomics.com/commodity/eu-natural-gas 2023 average prices for Europe and ROW using Title Transfer Facility Index. https://tradingeconomics.com/commodity/eu-natural-gas
LNG	By region: $90 per BOE Asia $78.30 per BOE ROW	2023 average global price of LNG for Northeast Asia from International Monetary Fund Primary Commodity Prices. 2023 average global price of Netherlands TTF with adjustment for LNG https://www.imf.org/en/research/commodity-prices
Coal	$185 to $248 per tonne	IEA global average 2023 prices distinguished for each country based on production of metallurgical coal ($283) and other coals; anthracite, bituminous, subbituminous and lignite ($184).

Results

Based on the export trade flows of the 24 countries to 61 import countries, this dataset captures almost all the global trade in these products.

Table 5: Trade value included in the model for import regions (USD$2023 1000's)

	Trade value			
	Product name			
Importer region	*Crude oil*	*NG*	*Coal*	*LNG*
Asia	592,475,915	21,117,524	135,260,352	92,584,312
North America	191,938,989	24,002,130	1,276,088	829,036
EU	186,440,737	25,974,654	12,314,810	32,832,630
South America	12,365,771	11	7,285,745	1,997,180
United Kingdom	15,666,521	0	342,751	5,356,001
Other	9,622,004	414,082	5,513,569	1,713,780
TOTAL	***1,008,509,93***	***89,016,980***	***161,993,315***	***135,312,938***

These exports account for a significant percentage of total upstream global methane emissions from the oil and gas sector, but a smaller percentage of the coal sector.

Table 6: Contribution of model exports to total global upstream methane emissions

Category	Estimate of total global upstream methane emissions	Upstream methane Emissions included in model exports	% of total global upstream methane emissions
Oil and gas	69,391	22,994	33.1%
Coal	36,914	3,583	3.4%
Total	***106,305***	***26,577***	***15.1%***

Average national export emission intensities estimated for different sectors are significantly above a potential standard of a 0.2% leakage rate.

Table 7: Average estimated leakage rates of imports by major region

Region	Crude oil	Natural gas	Coal	LNG
Asia	0.84%	1.82%	0.87%	0.59%
North America	0.91%	0.90%	0.65%	1.21%
EU	1.21%	0.88%	0.78%	0.95%
South America	1.27%	1.00%	0.77%	1.12%
United Kingdom	1.30%	-	0.71%	1.00%
Other	1.21%	1.90%	1.27%	1.18%

Assuming a single national average export emission intensity for each exporting country, including all upstream methane emissions, current compliance appears to be very low. Even at the country level, no imports from any country for any product are estimated to meet the 0.2% leakage-rate threshold. However, exports are likely to show a distribution of emission intensities across individual companies. Many company-level emission intensities would likely comply, even if all national average emission intensities fail to do so in 2023.

A future case can also be considered in which all imports meet a potential 0.2% leakage-rate standard applied across different oil, gas, and coal products, relative to a baseline case. Estimated emission reductions are based on 2023 trade volumes, assuming no change in global trade patterns, and reflect the difference between baseline 2024 export emission intensities and a scenario in which all exports meet the 0.2% leakage-rate standard exactly.

Table 8: Total compliance gap: Priority countries and products (importers), assuming a 0.2% intensity standard (kt CH_4)

	Crude Oil	*Natural Gas*	*Coal*	*LNG*	*Total*
EU, South Korea, Japan, UK	3,217.77	312.02	683.66	155.74	4,369.19
China	2,494.59	512.88	547.43	91.81	3,646.72
EU	2,531.63	312.02	148.62	97.86	3,090.12
India	1,454.91	0.000004	453.65	67.21	1,975.78
Japan	316.81	0.000778	416.13	23.53	756.48
United Kingdom	230.12	-	3.71	32.32	266.15
South Korea	139.21	-	115.20	2.04	256.45
Canada	157.12	125.61	9.80	1.48	294.00

Sensitivity scenarios with more or less stringent standards were also examined (0.15% and 0.25%, respectively).

Table 9: Total compliance gap: priority countries and products (importers), assuming a 0.15% intensity standard (kt CH_4)

	Crude oil	Natural gas	Coal	LNG	Total
EU, South Korea, Japan, UK	3,417.94	334.92	746.94	170.58	4,670.37
China	2,682.28	527.81	579.63	96.26	3,885.98
EU	2,656.58	334.91	161.49	106.60	3,259.59
India	1,544.00	0.000008	490.85	70.56	2,105.42
Japan	368.58	0.000826	454.65	25.98	849.21
United Kingdom	240.62	-	4.08	35.78	280.47
South Korea	152.16	-	126.72	2.22	281.10
Canada	166.97	133.44	10.83	1.63	312.86

Table 10: Total compliance gap: priority countries and products (importers), assuming a 0.25% intensity standard (kt CH_4)

	Crude Oil	Natural gas	Coal	LNG	Total
EU, South Korea, Japan, UK	3,017.61	289.12	620.39	140.91	4,068.02
China	2,306.89	497.96	515.24	87.37	3,407.46
EU	2,406.68	289.12	135.74	89.11	2,920.64
India	1,365.83	0.000000	416.45	63.86	1,846.14
Japan	265.05	0.000729	377.61	21.08	663.75
United Kingdom	219.62	-	3.35	28.86	251.83
South Korea	126.26	-	103.68	1.86	231.80
Canada	147.26	117.79	8.77	1.32	275.15

There are many reasons why actual emission reductions in 2030 with an effective performance leakage rate standard would be different. The factors that could influence these outcomes, and their potential effects, are reviewed below.

Table 11: Factors impacting emission reductions due to the performance standard

Factors impacting emissions reductions	*Description of likely impact*
Company-level methane emission intensities for exports	Company-level reported methane emission intensities of exports to countries requiring compliance are likely to be significantly less than national average emission intensities due to the incentive of the regulation to export the lowest emission intensity of production that is in compliance with the performance standard. Non-compliance exports would be directed to countries without a performance standard or penalty. ↓ ***Decrease estimated emission reductions***
Choice of non-compliance by exporters	Many exporters will weigh the cost between compliance and non-compliance, and may continue to export if the costs of compliance are acceptable ↓ ***Decrease estimated emission reductions***
Monitoring, Verification and Reporting (MRV) of emission intensities for compliance	Much depends on the rigorousness of MRV of emission intensities for compliance. The analysis assumes that there a no future gaps in MRV. For example, the analysis includes current large-scale methane emissions detected by satellite that are in most cases not measured or reported by individual companies responsible. Other loopholes such as reporting methane emissions related to other products or sectors and not to the exported product are also possible. ↓ ***Decrease estimated emission reductions***
Impact of performance standard on domestic production and	The performance standard would likely improve the emission intensity of domestic production and exports to non-compliance countries, even though there is not

consumption and exports to non-compliance countries	a direct compliance obligation to do so. This is because, emission reductions may be implemented at a field, basin or regional level that also includes this production. ↓ ***Increase estimated emission reductions***
Over-compliance	Many companies may implement emission reduction measures that over-comply with the performance standard. ↓ ***Increase estimated emission reductions***
Future changes in emission intensity not related to baseline and emission performance standard	Many future changes in production, technology and fields that impact upstream methane emission intensity will not be related to the emission performance standard. For example, new oil and gas resources may be less accessible and require more energy to extract and upstream methane emission intensities could increase as a result. Or many new baseline control technologies that effectively reduce methane emissions and result in savings could be implemented regardless of the performance standard. ↓ ↓ ***Potential to both increase and decrease estimated emission reductions***

Crude oil spillover case study

A potential spillover effect was also examined through a case study looking specifically at potential impacts on exporters of crude oil to the EU, UK, Japan, and South Korea. For the EU, UK, Japan and South Korea, the crude oil compliance gap at 0.2% standard is 3,218 $ktCH_4$. The estimated spillover effect using specific assumptions is 2,578 $ktCH_4$ or ~80% of the "direct" effect if imports.

Assumptions:

1. If crude oil imports from a given country into the EU, UK, Japan and South Korea Region crude oil imports account for more than 15% of that country's total domestic production, a spillover effect is assumed to occur.
2. For those eight countries (see table below), the remainder of production — excluding exports to the EU, UK, Japan and South Korea regions — is assumed to be in partial compliance. Specifically, the assumed emissions intensity is the average of the actual 2024 intensity and the standard. In other words, 50% of the remaining production is assumed to meet the future standard, while the other 50% remains unchanged from 2024.

Table 12: Contribution of crude oil compliance gap to EU, UK, Japan and South Korea from exporters and spillover effect, assuming a 0.2% intensity standard (kt CH_4)

Exporter country	*Compliance gap of imports*	*Potential spillover effect*	*Total*
Nigeria	487	446	933
Algeria	282	633	915
Libya	663	248	911
United Arab Emirates	220	324	544
USA	460	-	460
Angola	109	299	408
Kazakhstan	190	181	370
Brazil	100	243	343
Saudi Arabia	75	205	280
Iraq	240	-	240
Russian Federation	148	-	148
Mexico	96	-	96
Venezuela	69	-	69
Kuwait	38	-	38
Qatar	22	-	22
Canada	18	-	18
China	2	-	2
	3,218	***2,578***	***5,796***

Annex A: Countries

Country code	Country name	Region group	Country type	Country code	Country name	Region group	Country type
12	Algeria	Middle East	exporter	40	Austria	EU	importer
24	Angola	Africa	exporter	50	Bangladesh	South Asia	importer
32	Argentina	South America	exporter	56	Belgium	EU	importer
36	Australia	Australia	exporter	76	Brazil	South America	importer
76	Brazil	South America	exporter	100	Bulgaria	EU	importer
124	Canada	North America	exporter	156	China	East Asia	importer
156	China	East Asia	exporter	191	Croatia	EU	importer
699	India	South Asia	exporter	196	Cyprus	EU	importer
360	Indonesia	Southeast Asia	exporter	203	Czech Republic	EU	importer
364	Iran	Middle East	exporter	208	Denmark	EU	importer
368	Iraq	Middle East	exporter	818	Egypt	Africa	importer
398	Kazakhstan	Eastern Europe	exporter	233	Estonia	EU	importer
414	Kuwait	Middle East	exporter	246	Finland	EU	importer
434	Libya	Middle East	exporter	250	France	EU	importer
458	Malaysia	Southeast Asia	exporter	276	Germany	EU	importer
484	Mexico	North America	exporter	300	Greece	EU	importer
566	Nigeria	Africa	exporter	348	Hungary	EU	importer

Country code	Country name	Region group	Country type	Country code	Country name	Region group	Country type
634	Qatar	Middle East	exporter	356	India	South Asia	importer
643	Russian Federation	Eastern Europe	exporter	372	Ireland	EU	importer
682	Saudi Arabia	Middle East	exporter	380	Italy	EU	importer
795	Turkmenistan	Eastern Europe	exporter	392	Japan	East Asia	importer
784	United Arab Emirates	Middle East	exporter	428	Latvia	EU	importer
842	USA	North America	exporter	440	Lithuania	EU	importer
862	Venezuela	South America	exporter	442	Luxembourg	EU	importer
				458	Malaysia	Southeast Asia	importer
				470	Malta	EU	importer
				484	Mexico	North America	importer
				528	Netherlands	EU	importer
				586	Pakistan	South Asia	importer
				608	Philippines	Southeast Asia	importer
				616	Poland	EU	importer
				620	Portugal	EU	importer
				642	Romania	EU	importer
				702	Singapore	Southeast Asia	importer
				703	Slovakia	EU	importer
				705	Slovenia	EU	importer

Country code	Country name	Region group	Country type	Country code	Country name	Region group	Country type
				410	South Korea	East Asia	importer
				724	Spain	EU	importer
				752	Sweden	EU	importer
				158	Taiwan	East Asia	importer
				764	Thailand	Southeast Asia	importer
				792	Turkey	Middle East	importer
				826	United Kingdom	Europe (non-EU)	importer
				704	Vietnam	Southeast Asia	importer