March 2026

EU Methane Emissions Regulation – Analysis of Market Impacts

prepared for Concawe and IOGP Europe

Contents

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Wood Mackenzie has worked with clients to support their decision-making in the energy and natural resources industry for over 50 years. As the trusted source of commercial intelligence in the industry, we empower clients to make better strategic decisions by arming them with independent and objective analysis. Wood Mackenzie's consulting teams provide bespoke advisory services leveraging the expertise, data and models of Wood Mackenzie's broader research business.

1. Executive Summary

1.1 Context for the scenario analysis

Wood Mackenzie conducted a scenario-based analysis to assess the potential impact of the EU MER on natural gas/LNG and crude oil supply and costs. The study used Wood Mackenzie's proprietary modelling tools—the Global Gas Model (GGM) for gas/LNG and the Refinery Supply Model (RSM) for crude oil and refining—both industry-leading linear optimisation models that simulate least-cost supply allocation under complex market and policy constraints.

The analysis began with a **Base Case**, representing a business-as-usual outlook without MER, based on Wood Mackenzie's published base case for global gas, LNG, crude oil and refining markets. Against this baseline, two hypothetical scenarios were developed to illustrate a range of possible outcomes under different approaches to enforcing MER importer requirements:

- **Default Scenario**: Assumes the EU enforces the regulation as written.
- **Adaptive Scenario**: Assumes modifications are made to the regulation to enable a more flexible approach to granting MRV country-level equivalence, prioritizing security of supply.

Scenario constraints were informed by three key factors: (1) country-level equivalence based on current methane policies in exporting nations, (2) producer-level equivalence based on achievement of OGMP 2.0 Level 5 reporting, and (3) assumptions around traceability of supply chains.

While MER does not ban non-compliant gas/LNG or crude oil, the modelling assumes that penalties imposed by EU Member States on non-compliant imports would be dissuasive – effectively excluding such volumes from the market. This conservative assumption simplifies the interpretation of the scenario modelling results.

The purpose of this analysis is to highlight the potential market impacts of contrasting regulatory approaches—not to predict specific enforcement decisions by the EU or EU member states. All modelling assumptions reflect hypothetical policy outcomes and carry inherent uncertainty.

1.2 Results of the scenario analysis

The modelled results show that the implementation of MER under the **Default Scenario** poses significant risks to the EU's energy security and industrial competitiveness. Our review (in mid-2025) of methane reporting regulations in countries exporting gas/LNG or crude oil to the EU found that no countries meet MER's country-level equivalence requirements. The Default Scenario assumes that, since no exporters achieve country-level equivalence requirements, the volume of compliant product is determined by producer-level equivalence and the ability of importers to identify the upstream producers. In the Default Scenario, MER's importer requirements could effectively deter or divert large volumes of non-compliant natural gas and crude oil from the EU market.

Our analysis indicates that by 2027, approximately 43% of the natural gas (114 billion cubic meters or bcm) and 87% of the crude oil (9.8 million barrels per day or mb/d) imported into the EU in 2024 could be non-compliant with MER. (The prevalence of long-term gas contracts signed before August 2024 may slightly reduce the impact on gas compared to crude oil, which was included in the analysis.) Even Norway, one of the EU's most reliable suppliers, could see 17% of its gas and 29% of its crude oil exports considered non-compliant and potentially at risk of facing penalties. Most imports from other key suppliers, including the United States, the United Kingdom, Algeria, and Canada, could also fail to meet compliance standards.

This creates a major reshuffling of global trade flows of gas/LNG and crude oil. Not enough compliant crude oil is available globally for EU refineries to maintain normal operating levels, requiring them to buy crudes that are not typically processed in Europe and leaving non-compliant crudes available to refineries in other regions of the world. EU refinery throughput could collapse by around 50% between 2027 and 2030 due to a shortage of compliant crude oils, forcing widespread refinery closures. This would reverse the EU's position as a major exporter of refined products such as gasoline and bring imports of jet fuel and diesel to record highs. The resulting supply shortfall could drive energy prices to historically high and unsustainable levels, triggering demand destruction and structural changes across the EU economy. Gas prices could increase sharply[1], prompting a shift toward coal for power generation—an unintended consequence that could increase carbon emissions. Gasoline and diesel prices could rise by 24% and 16%[2], respectively, compared to a no-MER Base Case. Record-high imports of gasoline and diesel could add more than $17 billion in annual fuel import costs for EU consumers. A large increase in fuel imports to replace domestic refinery production could create severe logistical bottlenecks and disruptions. In addition, feedstock supply from EU refiners to the chemical industry would be severely impacted. These dynamics could weaken the competitiveness of the EU's energy-intensive industries (e.g., refining, chemicals, power generation, manufacturing) due to higher energy costs, which could accelerate deindustrialization in the EU.

The **Adaptive Scenario** assumes modifications to MER allowing greater flexibility in granting country-level MRV equivalence. This reduces the impacts seen in the Default Scenario, but the risks remain material. Under this scenario, approximately 20% of the natural gas and 38% of the crude oil imported into the EU in 2024 could be non-compliant with MER in 2027. The TTF gas spot price in Europe could climb to an annual average of $19/mmbtu in 2027-28, more than twice as high as the level forecast in a no-MER Base Case, damaging the competitiveness of the EU's industries. The fuel price impact is more moderate, with gasoline and diesel prices both around 1% higher than they would be in a Base Case forecast. Even with adaptive measures like the modification of country equivalency requirements, the EU faces persistent exposure to supply constraints and elevated costs.

1.3 Implementation challenges and policy considerations

While MER sets ambitious objectives for reducing methane emissions, its practical implementation faces significant hurdles that could affect compliance and market stability. The most pressing challenges occur at the producer level. Despite progress under OGMP 2.0, the availability of fully verified Level 5 supply remains far below what is needed to meet EU demand. In addition, importers identifying the original producer of natural gas or crude oil is often problematic due to commingling, blending, and portfolio trading, which obscure supply chain transparency—even when upstream operators have met MRV requirements. In addition, the process for producers to obtain independent verification that they have met MRV requirements is currently not entirely clear; work on this is ongoing.

Beyond these logistical and verification issues, data quality presents another layer of complexity. Upstream methane intensity estimates vary widely across methodologies and sources, creating uncertainty in establishing credible benchmarks. Developing a realistic and enforceable methane-intensity threshold under MER will require improved, standardized emissions reporting at the producer level, covering a substantial share of global production. While work toward this standardization is underway, achieving consistency and transparency across diverse jurisdictions will take time and coordinated effort.

[1] While increases in gas prices would also drive wholesale electricity prices higher, this effect has not been evaluated as part of this study.

[2] For oil products, the model assumed a fixed demand outlook in each scenario, but in reality the initial price increase could generate a reduction in demand, which could in turn reduce the magnitude of the price spike.

2. Introduction

The European Union’s Methane Emissions Reduction Regulation (MER) (EU 2024/1787), which entered into force on 4 August 2024, establishes a comprehensive framework to reduce methane emissions across the energy sector. The regulation applies to crude oil, natural gas, and coal activities throughout the EU supply chain—from production and processing to transmission and storage—and extends to imported volumes at the point of production. MER introduces stringent requirements for measurement, reporting, and verification (MRV) of emissions, alongside mandatory leak detection and repair (LDAR) programs and restrictions on venting and flaring. Importantly, the regulation has an extraterritorial dimension, obligating EU importers to ensure that non-EU producers meet standards equivalent to those enforced within the EU.

In this context, Wood Mackenzie was commissioned by Concawe and IOGP Europe to conduct an independent assessment of the potential implications of MER’s importer requirements for the EU’s crude oil and natural gas supply and pricing, and the impact on the EU refining industry. The study focuses on Article 28 of the regulation, which governs MRV equivalence and directly influences market access. Specifically, the analysis evaluates the potential impact on supply security and price formation for natural gas/LNG, crude oil, and refined products in EU markets, based on illustrative assumptions regarding producer and importer compliance with Article 28.

The bottom-up assessment draws on Wood Mackenzie’s proprietary research, global energy market expertise, and advanced scenario modelling capabilities. The Base Case used in this analysis reflects Wood Mackenzie’s published outlooks for production, trade flows, and demand trajectories. This baseline serves as the foundation for two alternative scenarios designed to illustrate the range of possible market outcomes under different approaches to enforcing MER’s importer requirements.

3. Key milestones in the regulation

MER's importer rules create a three-step compliance ramp-up: starting with reporting, then full MRV equivalence, and finally an intensity limit for methane emissions

- **2025**: Article 27 – Early importer reporting (importer obligations). From 5 May 2025, companies that import crude oil, natural gas or coal into the EU must submit to their national competent authority (and thereafter each year) qualitative information about the origin of the product, transit countries, and the monitoring, reporting and verification (MRV) arrangements applied at source level. This first step is designed to build transparency while more rigorous requirements phase in.

- **2027**: Article 28 – MRV equivalence for importers. From 1 January 2027, importers placing crude oil, natural gas or coal on the EU market must demonstrate that the producer from which the product originates is subject to or has been verified to apply MRV rules deemed "equivalent" to those applied within the EU. Equivalence can be met via two pathways:

    - **Country-level equivalence**: The non -EU producer country has MRV rules for methane emissions that are equivalent to the EU rules.

    - **Producer-level equivalence**: Even if the country lacks equivalent regulation, the specific producer can demonstrate equivalence via either:

        - **Article 12 pathway**: The producer has monitoring, reporting and verification which meets EU MER's rules per Articles 8, 9, and 12.

        - **OGMP 2.0 Level 5 pathway**: The producer reports at the most rigorous level (Level 5: reconciliation of source - and site - level measurements) with third-party verification in addition.

          The scenario analysis in this report leverages the annual *OGMP 2.0 Company Factsheet 2024*, which indicates that about 3% of gas and 3% of crude oil production globally was reported at Level 5. Our subsequent analysis of the *OGMP 2.0 Company Factsheet 2025*, which was released after our scenario analysis was completed, indicated that about 6% of gas and 7% of crude oil production globally was reported at Level 5.

    - Article 8 – **Third-party verification**. Underpins Article 28 by requiring that all data used to demonstrate equivalence are verified by an accredited independent third party. Without Article 8 verification, importers cannot claim MRV equivalence (Article 28) at the producer level

- **2028**: Article 29 – Methane intensity threshold. Starting 5 August 2028, importers must report the methane intensity (kg CH_4 per unit of production) of the fossil fuel placed on the EU market under contracts concluded or renewed after 4 August 2024, or for existing contracts using "all reasonable efforts".

- **2030**: Article 29 – Methane intensity threshold. By 5 August 2030, for contracts concluded or renewed after that date, importers must demonstrate that the product's upstream methane intensity is below a maximum value to be defined by the Commission via delegated act before this date.[3]

This study includes scenario modelling of the impacts of Article 28 requirements only. With these compliance milestones established, the next step is to understand their potential market implications.

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[3] This study includes a high-level literature review of methane intensity estimates for key oil and gas producing countries but does not model the impact of setting different methane intensity thresholds.

4. MER impact assessment and scenario modelling

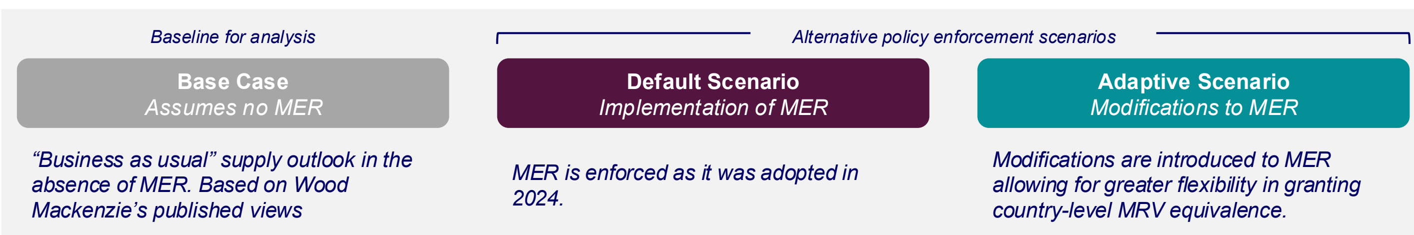
Wood Mackenzie conducted a scenario analysis to assess the potential impact of MER on the EU's supply and prices for natural gas/LNG, crude oil and refined products. Our proprietary modelling tools were the engine for this analysis. Both the Global Gas Model (GGM) for gas/LNG and the Refinery Supply Model (RSM) for crude oil are industry-leading linear optimisation tools that simulate least-cost supply allocation under a range of bespoke market and policy constraints.[4]

4.1 Structure of the scenario analysis

This analysis begins with a **Base Case** that represents a "business as usual" outlook in the absence of MER. The Base Case leverages Wood Mackenzie's published outlook for global gas, LNG, crude oil and refined product markets, incorporating our latest forecasts for production, trade flows, prices, and demand trajectories.

Against this baseline, the study evaluates two hypothetical policy enforcement scenarios to illustrate a range of possible market outcomes. These two scenarios are designed as illustrative bookends for how the EU might enforce the regulation's importer requirements under different approaches: The **Default Scenario** illustrates the impacts if the EU enforces the importer requirements as written. The **Adaptive Scenario** illustrates the impacts if the EU modifies MER to enable a more flexible and pragmatic approach prioritizing supply security, which leads to country-level MRV equivalence being granted to some exporting countries. This is just one potential option for MER modification, chosen because it could remove compliance barriers for a large quantity of supply.

Figure 1: Structure of scenario modelling approach



The primary purpose of this analysis is to evaluate the potential market impacts of different regulatory approaches, not to anticipate specific equivalence or enforcement decisions by the European Commission or EU Member States. The modelling assumptions are based on a set of hypothetical policy outcomes that carry considerable uncertainty.

As such, the market impacts are illustrative and should not be viewed as a forecast – the scenarios rely on assumptions about countries' policies and producers' progress related to methane emissions. The severity of actual market impacts will depend on political and environmental priorities and on how the EU and Member States choose to enforce the equivalency requirements (Article 28).

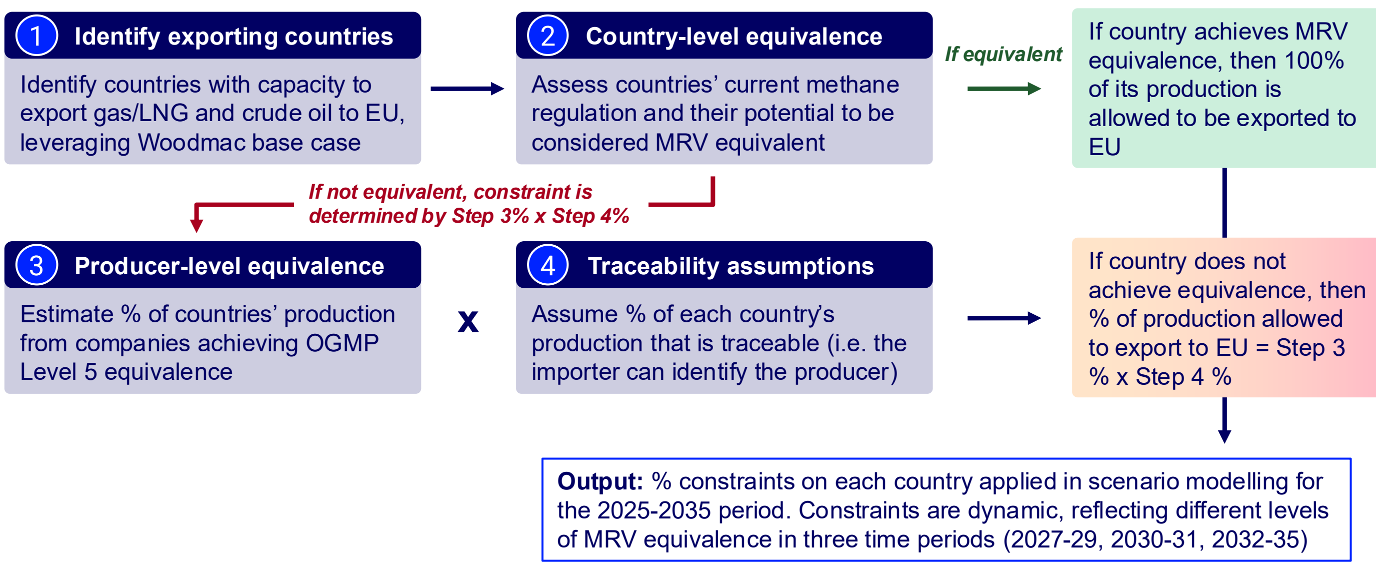
4.2 Process for defining the scenarios

To develop the constraints for the alternative compliance scenarios which were then applied to the GGM and RSM linear optimisation models, we estimated the expected percentage of production from each producing country that would achieve MRV equivalence in each scenario. We then applied constraints in the GGM and RSM models to simulate the impact on global gas/LNG and crude oil markets.

[4] See appendix for detail on Wood Mackenzie tools and methodologies

We used a four-step process to define the percentage of each exporting country's production that is allowed to be exported to the EU (i.e. the constraint) in each scenario, as shown in the figure below.

Figure 2: Summary of process followed to develop scenario drivers



In the following pages we describe in more detail the four-step methodology used to develop the constraints applied to each exporting/producing country in the scenario models.

4.2.1 Identify exporting countries

We leveraged Wood Mackenzie's published outlooks of gas/LNG and crude oil production, trade flows, and supporting infrastructure development (for example, liquefaction facilities, pipelines, marine infrastructure) to identify which countries have the capacity to export gas/LNG or crude oil to the EU.

4.2.2 Country-level equivalence

As part of the analysis, we conducted a high-level review of methane-related policies in key producing countries, applying a structured framework to assess alignment with the six core pillars of MRV equivalence under MER. These pillars include:

1. Measurement Methodology
2. Facility-Level Granularity
3. Verification and Auditing
4. Reporting Frequency
5. Transparency and Public Access
6. Legal Force and Enforcement

This approach allowed us to evaluate the robustness of existing national frameworks and identify gaps that could affect equivalency determinations.

A key outcome of this review is that no major exporting countries currently meet (or are expected to meet, based on current policy) the full set of MRV-equivalence requirements outlined in Article 28 of MER – this forms the basis of the assumptions used in the Default Scenario. Under the Adaptive Scenario, granting equivalency status to certain key countries would require the EU to modify the criteria specified in Article 28. Without such adjustments, adherence to the existing MER requirements would effectively preclude equivalency recognition for any exporting country.

As shown in the figure below, our findings indicate that Norway is the country most closely aligned with MER requirements. Norway demonstrates strong performance across several critical pillars—particularly in facility-level granularity, reporting frequency, transparency and public access, and legal force and enforcement. These strengths reflect Norway's mature regulatory architecture and commitment to emissions accountability. However, even Norway exhibits minor gaps in measurement methodology and verification and auditing, suggesting that full equivalency would require targeted enhancements in these areas.

Other countries assessed—including Canada, the United Kingdom, and the United States—also show meaningful progress toward MRV equivalence but present more significant gaps compared to Norway. While these jurisdictions have advanced policies in place, deficiencies in certain pillars, such as standardized measurement protocols and independent verification mechanisms, remain notable. Addressing these gaps would be essential for these countries to achieve equivalency under the current MER framework.

The analysis on country-level equivalence was conducted using policies in place as of July 2025. This review was designed as a high-level assessment to inform reasonable boundary assumptions for the scenario modeling, rather than to serve as a definitive policy position. It is important to note that national and producer-level policies remain dynamic – for example, recent indications that the United States may pause elements of its Greenhouse Gas Reporting Program (GHGRP) highlight the evolving nature of these frameworks. As such, the findings should be interpreted as illustrative guidance rather than definitive conclusions on the policies.

Figure 3: Our analysis identified 4 countries that are closest to equivalence with MER

Country / Key Policy or Framework	Measurement Methodology	Facility-Level Granularity	Verification & Auditing	Reporting Frequency	Transparency & Public Access	Legal Force / Enforcement	MRV Equivalence to MER
EU – Methane Emissions Regulation (2024)	Quantification of source-level emissions required for all segments; complemented by site-level measurements and reconciliation.	Required at facility level; data reported to central EU registry.	Third-party verification and competent authority audits.	Annual; updates required after changes.	Fully public EU registry.	Legally binding; penalties and market restrictions for non-compliance.	Baseline.
Norway – Climate Reporting Regulations + Petroleum Act (Environment Agency)	🟧 **Measurement of source-level emissions** required for all offshore production and onshore gas processing facilities. **Gap**: Site-level measurements and reconciliation not required.	🟩 **Facility-level data required** under national law for all segments.	🟧 **Verified by national regulator**. **Gap**: No third-party verifier required, but state-led audit regime is robust.	🟩 **Annual reporting required** under emissions inventory and climate reporting law.	🟩 **Public access** through industry and authority websites and EEA portals.	🟩 **Legally binding under national environmental law**, including penalties.	Likely closest to being considered equivalent, but still some minor gaps.
Canada – Federal Methane Regulations (SOR/2018-66) + Provincial Frameworks (e.g., Alberta TIER)	🟩 **Direct source-level measurement** for key sources (vents, compressors, pneumatics) under federal and provincial rules.	🟩 **Facility-level reporting required** federally and in major provinces.	🟧 **Federal and provincial audits**. **Gap**: third-party verification is not mandatory.	🟩 **Annual reporting + LDAR inspections** required.	🟧 **Partial transparency** through NPRI and provincial databases. **Gap**: No unified methane database.	🟩 **Legally binding federally and provincially**, with enforcement mechanisms.	Some elements equivalent but significant gaps remaining.
United Kingdom – Environmental Permitting Regulations + NSTA Guidance	🟥 **Often relies on emission factors** and LDAR; direct and site-level measurement not uniformly required. **Gap**: Does not meet MER site/source measurement or reconciliation requirements.	🟩 **Facility-level data required** under Environmental Permitting Regulations.	🟧 **Verified by regulators** (NSTA, Environment Agency). **Gap**: No mandatory third-party verification.	🟩 **Annual or more frequent** reporting required under permits.	🟧 **Some data made public. Gap**: no centralized methane registry.	🟩 **Legally binding permitting regime**, with penalties. **Gap**: Less methane-specific enforcement than MER.	More gaps, less likely to be equivalent.
United States – EPA Methane Rule (2024) + GHGRP Subpart W	🟧 **Direct measurement required** for priority sources (compressors, flares, storage) under EPA Methane Rule. **Gap**: Not yet universal.	🟥 **Facility-level reporting required** under GHGRP (Subpart W). **Gap:** in 2025 EPA proposed suspension until 2034.	🟧 **Audits and enforcement by EPA**. **Gap**: Does not require third-party certification.	🟥 **Annual reporting via GHGRP**. **Gap**: in 2025 EPA proposed suspension until 2034.	🟧 **Public access** via EPA FLIGHT. **Gap**: data formats may be different than the ultimate EU registry.	🟩 **Legally binding under Clean Air Act**, with penalties for non-compliance.	More gaps, less likely to be equivalent if GHGRP is suspended.

Figure 4: We identified 11 other countries with some form of methane policy, but nowhere near full equivalence to MER

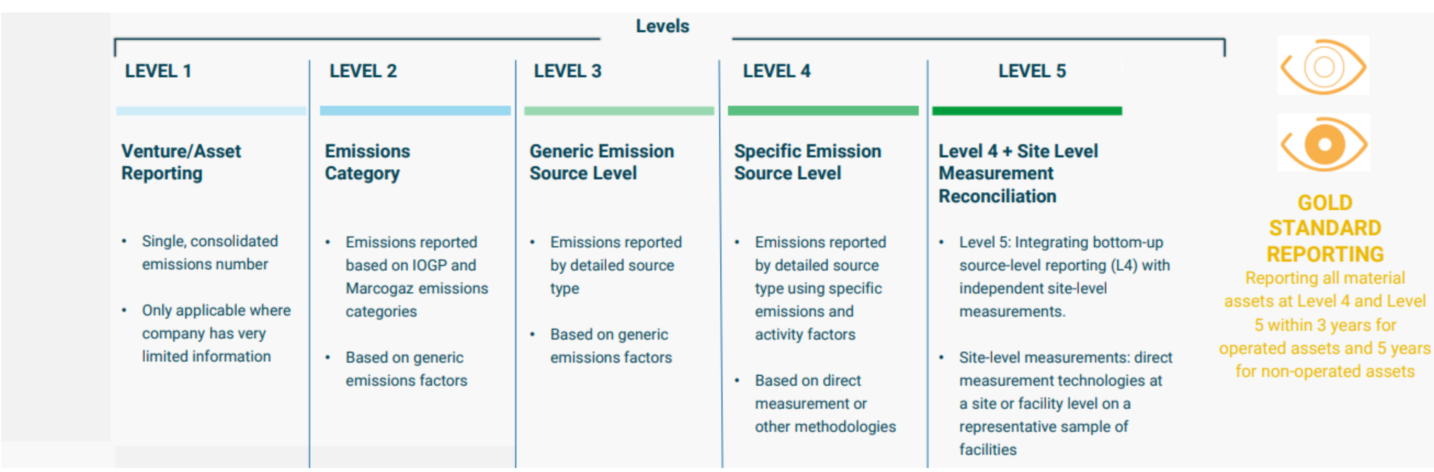
Country	Relevant Policy or Framework	Key Features	MRV Equivalence to MER
Australia	National Greenhouse and Energy Reporting (NGER) Act	Facility-level GHG reporting (including methane); regulated by Clean Energy Regulator	Partial – includes methane but lacks mandated direct measurement
Brazil	ANP Resolution No. 806/2020 (Regulation for flaring/venting)	Requires reporting of gas losses, including methane; lacks site-level granularity and transparency	Partial – some coverage, weak verification
Indonesia	MEMR Regulation No. 13/2018 on Oil & Gas Flaring and Venting	Limits flaring and venting; requires reporting to ministry; no direct methane quantification required	Partial – targeted controls but lacks MRV structure
Kazakhstan	Environmental Code (2021)	National inventory includes methane; facility-level granularity under development	Partial – intent is present but MRV not yet complete
Mexico	SENER / ASEA Methane Guidelines (2018)	Mandatory LDAR; reporting required; enforcement challenges exist	Partial – policy exists but inconsistent enforcement
Nigeria	Department of Petroleum Resources Guidelines for Flare Reduction	Methane emissions reduction targeted; lacks facility-level reporting or national enforcement mechanisms	Partial – policy direction present, execution limited
Oman	Ministerial Decrees on flaring; Environmental Impact Assessment Guidelines	Reporting of gas losses required; limited methane-specific measurement or enforcement	Partial – progress underway but lacking full MRV scope
Qatar	Ministry of Municipality and Environment (MME) Regulations	Some venting/flaring controls; no structured MRV or verification	Partial – high-level policy exists but lacks granularity
Trinidad & Tobago	Ministry of Energy Guidelines on Emissions	Emissions reporting program under development; lacks legal enforcement and public transparency	Partial – early stage MRV development
Ukraine	Draft MRV Development Roadmap (2023); National Environmental Strategy	Undergoing capacity building; policy commitment made; partial implementation	Partial – not yet fully implemented
United Arab Emirates	Environmental regulations under MOCCAE	GHG reporting requirements; methane not mandated specifically; flaring reduction enforced via permitting	Partial – lacks full methane MRV coverage

For all other major producers of gas/LNG and crude oil (beyond the 19 countries listed in the figures above), we found no evidence of an enforceable MRV regime for methane.

4.2.3 Producer-level equivalence

Article 28 of MER establishes OGMP 2.0 Level 5 reporting as a recognized pathway for demonstrating compliance with EU MRV-equivalence requirements. The Oil and Gas Methane Partnership (OGMP) 2.0 is a voluntary reporting framework developed under the United Nations Environment Programme (UNEP) to improve the accuracy and transparency of methane emissions reporting in the oil and gas sector. It establishes a tiered system of reporting levels, from Level 1 (basic, company-wide estimates) to Level 5 (asset-level, source-level measurements verified through rigorous methodologies). Level 5 represents the highest standard, requiring detailed measurement, reporting, and verification (MRV) at the facility level. The framework aims to drive continuous improvement in emissions quantification and supports global efforts to reduce methane emissions through standardized, credible data.

Figure 5: OGMP 2.0 reporting levels



Source: OGMP (see References)

To evaluate producer-level equivalence under MER, we applied a structured, multi-step methodology to estimate the share of production reported at **OGMP 2.0 Level 5** for key exporting countries over the period 2027–2035. This approach integrates upstream production data with company reporting profiles to provide an indicative view of future compliance potential.

Methodological Approach

The producer-level analysis proceeded through five sequential steps:

1. **Identification of Exporting Countries:** We began by identifying countries with potential to export natural gas, LNG, and crude oil to the EU, drawing on Wood Mackenzie's *H1 2025 Strategic Planning Outlooks*. This established the geographic scope for subsequent producer-level assessments.

2. **Mapping Producer Portfolios:** Using Wood Mackenzie's *Lens Upstream* field-level database, we identified key producer companies operating within each exporting country. For each company, we quantified gross-operated production at the field level and calculated its share of national output. This step provided a granular view of production ownership and operational control.

3. **Assessment of OGMP 2.0 Reporting Profiles:** We then examined each company's methane reporting practices using the *OGMP 2.0 Company Factsheet 2024*. This resource details the global distribution of reporting levels (Levels 1–5) across company portfolios. Because the factsheet aggregates data globally, we assumed that the percentage split of reporting levels applies uniformly across each company's operated assets globally.

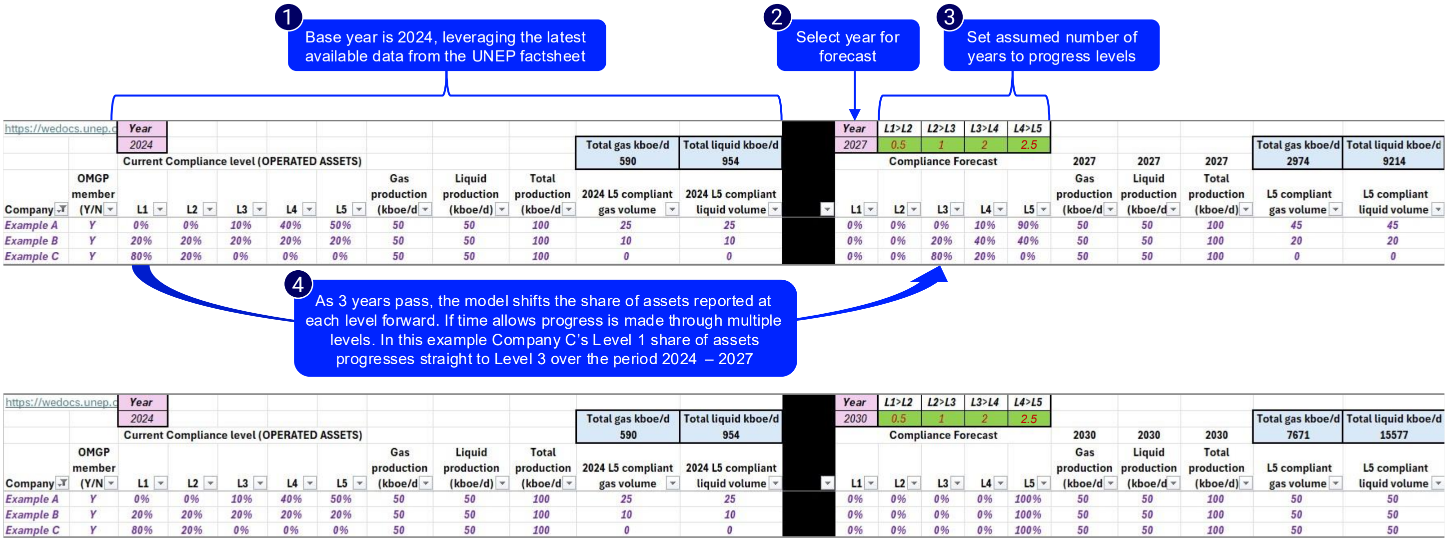
   The scenario modelling assumptions are based on data from the 2024 OGMP 2.0 report. A comparison of the 2024 and 2025 releases indicated that uptake of Level 5 reporting did not materially increase. Further detail on this comparison is provided in the section *"Comparison of 2025 vs. 2024 OGMP 2.0 Data Release."*

4. **Linking Production Shares to Reporting Levels:** By combining company-level production shares (Step 2) with OGMP reporting profiles (Step 3), we estimated the proportion of national production currently reported at Level 5. This provided a baseline for each country as of 2024.

5. **Forecasting Future Uptake:** Finally, we developed a forecast of Level 5 reporting shares for 2027–2035. This projection leveraged Wood Mackenzie's field-level production forecasts and incorporated assumptions regarding the time required for companies to progress through OGMP reporting levels, reflecting the capital, time and resources required. We assume **0.5 years** for companies to move from Level 1 to Level 2, **1 year** to move from Level 2 to Level 3, **2 years** to move from Level 3 to Level 4, and **2.5 years** to move from Level 4 to Level 5.

The analysis did not assess producers' ability to comply with the additional requirement for third-party verification of Level 5 reporting, as no standardized verification protocol currently exists. For modelling purposes, we assumed that verification would occur concurrently with self-reported Level 5 achievement, with an additional six-month lag. However, these assumptions may not reflect practical realities given current challenges with reporting practices, verification capacity, and resource constraints.

Figure 6: Illustrative example of forecasted of L5-reported production



https://wedocs.unep.c		Year										Year	L1>L2	L2>L3	L3>L4	L4>L5					
		2024								Total gas kboe/d 590	Total liquid kboe/d 954	2027	0.5	1	2	2.5				Total gas kboe/d 2974	Total liquid kboe/d 9214
		Current Compliance level (OPERATED ASSETS)										Compliance Forecast					2027	2027	2027		
Company	OMGP member (Y/N	L1	L2	L3	L4	L5	Gas production (kboe/d	Liquid production (kboe/d)	Total production (kboe/d	2024 L5 compliant gas volume	2024 L5 compliant liquid volume	L1	L2	L3	L4	L5	Gas production (kboe/d	Liquid production (kboe/d	Total production (kboe/d)	L5 compliant gas volume	L5 compliant liquid volume
Example A	Y	0%	0%	10%	40%	50%	50	50	100	25	25	0%	0%	0%	10%	90%	50	50	100	45	45
Example B	Y	20%	20%	20%	20%	20%	50	50	100	10	10	0%	0%	20%	40%	40%	50	50	100	20	20
Example C	Y	80%	20%	0%	0%	0%	50	50	100	0	0	0%	0%	80%	20%	0%	50	50	100	0	0

https://wedocs.unep.c		Year										Year	L1>L2	L2>L3	L3>L4	L4>L5					
		2024								Total gas kboe/d 590	Total liquid kboe/d 954	2030	0.5	1	2	2.5				Total gas kboe/d 7671	Total liquid kboe/d 15577
		Current Compliance level (OPERATED ASSETS)										Compliance Forecast					2030	2030	2030		
Company	OMGP member (Y/N	L1	L2	L3	L4	L5	Gas production (kboe/d	Liquid production (kboe/d)	Total production (kboe/d	2024 L5 compliant gas volume	2024 L5 compliant liquid volume	L1	L2	L3	L4	L5	Gas production (kboe/d	Liquid production (kboe/d	Total production (kboe/d)	L5 compliant gas volume	L5 compliant liquid volume
Example A	Y	0%	0%	10%	40%	50%	50	50	100	25	25	0%	0%	0%	0%	100%	50	50	100	50	50
Example B	Y	20%	20%	20%	20%	20%	50	50	100	10	10	0%	0%	0%	0%	100%	50	50	100	50	50
Example C	Y	80%	20%	0%	0%	0%	50	50	100	0	0	0%	0%	0%	0%	100%	50	50	100	50	50

4.2.4 Traceability assumptions

We also incorporated traceability assumptions into the constraints applied to the scenario models.

Traceability plays a critical role in determining whether a country's exports can comply with MER, particularly for jurisdictions that may not achieve full national MRV equivalence. Our approach to developing traceability assumptions reflects both the complexity of global supply chains and the practical challenges of implementing robust certification systems.

1. To develop these assumptions, we combined two key elements:

    a. A high-level assessment of each country's gas and oil system complexity, focusing on the degree of commingling of production streams.

    b. An evaluation of when a reliable, verified certification scheme—capable of tracking volumes injected and transiting through different networks—could realistically be established.

2. Based on system complexity, we set initial traceability values for 2027 to represent the share of "simple" value chains where importers can directly identify the producer.

3. We then assumed these values would increase over time as contractual and communication arrangements improve along the supply chain—by approximately 20% between 2027 and 2030, and again between 2030 and 2032.

4. Once a robust, accredited certification scheme is operational and certificates can credibly survive transit to the EU, we assume full traceability (100%) for all production from that country. We projected that five countries would achieve this milestone by 2030 (Norway, United States, Canada, Qatar, United Arab Emirates) and thirteen by 2032 (adding United Kingdom, Brazil, Mexico, Angola, Equatorial Guinea, Peru, Saudi Arabia, Tunisia). For some countries, we adopted a conservative assumption that such systems would not be in place by 2032.

5. For countries assumed to have MRV equivalence under the Adaptive Scenario, exports are exempted from a requirement to identify the producer per MER Article 28.7. For other countries, traceability was set to 100% from the point at which a viable "tracing solution," such as tradeable certificates, was assumed to become available.

The resulting traceability figures represent the assumed percentage of a country's production for which EU importers can establish a direct link to the producer or rely on credible certificates. The assumptions for certificates are grounded in the anticipated development and rollout of certification schemes like constrained book-and-claim systems starting in key export countries. The assessment considers various practical constraints that would limit or delay the development and implementation of certification schemes including:

- the practical setup of organisations, rules and controls to reliably issue certificates specific for crude and/or gas in the relevant country,
- the development of criteria and processes that ultimately allows the formal recognition and acceptance of such schemes by EU authorities
- the practical setup of organisations, rules and controls to transfer certificates from the relevant country to interested buyers,
- the accreditation, capacity-building and training of independent verifiers as required, and, ultimately,
- the time needed for importers and other market participants to review and decide on the use of available options.

These constraints can materially limit the speed and scale at which credible certificates can be deployed across exporting countries, for both crude oil and natural gas.

4.2.5 Summary of scenario drivers

The resulting scenario drivers (country-level equivalence, producer-level equivalence, traceability assumptions) are summarized in the figure below. These drivers were combined to develop the constraints applied to the optimization models in the next section. The Adaptive Scenario, which assumes modifications to MER allowing greater flexibility in granting country-level MRV equivalence, leads to exports from 10 countries (Norway, United States, Canada, United Kingdom, Brazil, Kazakhstan, Mexico, Nigeria, Qatar, United Arab Emirates) deemed to be compliant.

Figure 7: Summary of scenario drivers used to develop constraints applied to optimization models

① Identify exporters	② Country-level equivalence			③ Producer-level equivalence						④ Traceability assumptions		
Based on Base Case	*Equivalence assumed in each scenario* →	Default Scenario	Adaptive Scenario	*OGMP L5 % of production, forecast for gas / LNG*			*OGMP L5 % of production, forecast for crude oil*			*Traceable % of production, based on qualitative assessment*		
Major exporter to EU	**Current MRV equivalence**	**Country policy achieves MRV equivalence?**		**2027-29**	**2030-31**	**2032-35**	**2027-29**	**2030-31**	**2032-35**	**2027-29**	**2030-31**	**2032-35**
Norway	Likely equivalent	No	Yes	91%	100%	100%	89%	100%	100%	80%	100%	100%
United States	Likely equivalent	No	Yes	21%	55%	55%	19%	48%	48%	10%	100%	100%
Canada	Likely equivalent	No	Yes	N/A	N/A	N/A	5%	7%	8%	10%	100%	100%
United Kingdom	Likely equivalent	No	Yes	53%	65%	66%	62%	76%	76%	10%	30%	100%
Brazil	Partially equivalent	No	Yes	N/A	N/A	N/A	8%	90%	92%	25%	45%	100%
Kazakhstan	Partially equivalent	No	Yes	N/A	N/A	N/A	15%	47%	47%	25%	45%	65%
Mexico	Partially equivalent	No	Yes	N/A	N/A	N/A	3%	22%	25%	10%	30%	100%
Nigeria	Partially equivalent	No	Yes	15%	22%	25%	17%	40%	45%	10%	30%	50%
Qatar	Partially equivalent	No	Yes	5%	91%	93%	N/A	N/A	N/A	80%	100%	100%
United Arab Emirates	Partially equivalent	No	Yes	N/A	N/A	N/A	97%	97%	98%	80%	100%	100%
Algeria	Not equivalent	No	No	2%	3%	3%	4%	9%	11%	25%	45%	65%
Angola	Not equivalent	No	No	1%	35%	38%	43%	95%	95%	25%	45%	100%
Azerbaijan	Not equivalent	No	No	58%	79%	81%	59%	88%	88%	25%	45%	65%
Egypt	Not equivalent	No	No	32%	68%	77%	2%	4%	4%	25%	45%	65%
Equatorial Guinea	Not equivalent	No	No	64%	100%	100%	22%	31%	39%	80%	80%	100%
Iraq	Not equivalent	No	No	N/A	N/A	N/A	7%	10%	10%	25%	45%	65%
Libya	Not equivalent	No	No	0%	0%	0%	0%	0%	0%	10%	30%	50%
Peru	Not equivalent	No	No	10%	17%	12%	N/A	N/A	N/A	10%	30%	100%
Russia	Not equivalent	No	No	0%	0%	0%	0%	0%	0%	25%	45%	65%
Saudi Arabia	Not equivalent	No	No	N/A	N/A	N/A	0%	0%	0%	80%	80%	100%
Tunisia	Not equivalent	No	No	*Transit country only*			12%	20%	9%	25%	45%	100%

N/A - No forecasted imports to the EU in Base Case. Note: assumptions for steps 3 and 4 are the same in both scenarios. In step 3, some countries' (e.g. the US) OGMP L5 % of production plateaus between 2030 and 2032 because all OGMP members in these countries are assumed to have achieved L5 by 2030; remaining production is by non-members of OGMP.

4.2.6 Other assumptions in scenario definitions

Several simplifying assumptions were incorporated into the scenario modelling to enable a clear focus on compliant supply dynamics.

First, the study assumes that penalties imposed by EU Member States on non-compliant imports would be dissuasive – effectively excluding such volumes from the market. Given the high probability that most producers and therefore importers will not be able to demonstrate MER equivalency by the current deadline (January 2027), most EU importers will be hesitant to bear the risk of dissuasive penalties, which they may not be able to pass on. This assumption was adopted to streamline the modelling process, which concentrates on compliant supply rather than varying penalty levels.

MER includes a derogation allowing member states to provide exemptions for security of supply (SoS). For this study, aside from the SoS allowances assumed for Italy and Spain for Algerian pipeline gas in the Adaptive Scenario (see section 5.1), no specific SoS exemptions are assumed.

The optimization models assume non-compliant exports to the EU are either diverted to other regions or cease in 2027 due to the deterrent effect of penalties (except for long-term contracted gas supplies) and resume once compliance is achieved.

The model also assumes that destroyed EU gas demand or refinery throughput will rebound when compliant supply increases, but this is optimistic. In practice, refinery throughput lost due to closures may not return, and gas demand or industrial activity may be permanently lost if businesses fail, relocate, or invest elsewhere.

Finally, expectations regarding the timing of market impacts should be considered indicative. Actual outcomes will depend heavily on policy developments in exporting countries and the extent of voluntary action by producers and operators.

5. Scenario modelling results[5]

Building on the scenario drivers outlined in the previous section, we applied these parameters to estimate the share of compliant gas/LNG and crude oil production available to export to the EU under each scenario.

This analysis integrates assumptions on country-level MRV equivalence, producer-level equivalence, and traceability with projected production volumes to quantify the share of each country's production that is compliant with MER and could therefore be exported to the EU.

By modelling these dynamics across multiple time horizons, we provide insight into how regulatory stringency and producer adaptation may influence supply availability and market stability. The following section presents the results of this modelling exercise, highlighting key differences between scenarios and their implications for EU energy security.

5.1 Gas/LNG scenario modelling results

We used the scenario drivers to estimate the share of compliant production available to the EU under the Default Scenario and Adaptive Scenario.

Figure 8: Constraints applied to Wood Mackenzie's Global Gas Model (a least-cost supply allocation model) for gas/LNG

			Default Scenario			Adaptive Scenario		
	Production	*EU export*	% of production allowed to flow to EU			% of production allowed to flow to EU		
Major exporter to EU	*2024 (kboed)*		**2027-29**	**2030-31**	**2032-35**	**2027-29**	**2030-31**	**2032-35**
Norway	1,864	1,566	73%	100%	100%	100%	100%	100%
Russia	14,065	888	0%	0%	0%	0%	0%	0%
United States	16,192	854	2%	55%	55%	100%	100%	100%
Algeria	1,704	494	1%	1%	2%	1%	1%	2%
Qatar	3,134	228	4%	91%	93%	100%	100%	100%
Azerbaijan	663	126	14%	35%	53%	14%	35%	53%
United Kingdom	566	105	5%	19%	66%	100%	100%	100%
Nigeria	936	84	2%	7%	12%	100%	100%	100%
Trinidad and Tobago	500	36	1%	27%	62%	1%	27%	62%
Peru	243	25	1%	5%	12%	1%	5%	12%
Libya	257	22	0%	0%	0%	0%	0%	0%
Angola	139	15	0%	16%	38%	0%	16%	38%
Equatorial Guinea	103	5	51%	80%	100%	51%	80%	100%
Egypt	1,102	5	8%	31%	50%	8%	31%	50%
Argentina	724	0	6%	9%	19%	6%	9%	19%
Oman	808	0	9%	21%	48%	9%	21%	48%
Australia	2,558	0	5%	32%	72%	5%	32%	72%
Brunei	184	0	0%	0%	0%	0%	0%	0%
Cameroon	41	0	0%	0%	0%	0%	0%	0%
Congo	15	0	15%	45%	100%	15%	45%	100%
Indonesia	1,125	0	13%	35%	64%	13%	35%	64%
Malaysia	1,125	0	15%	41%	94%	15%	41%	94%
Mauritania	34	0	20%	45%	100%	20%	45%	100%
Mozambique	181	0	0%	24%	46%	0%	24%	46%
Papua New Guinea	213	0	5%	45%	100%	5%	45%	100%
Senegal	34	0	20%	45%	100%	20%	45%	100%
Total (wt. avg. % of 2024 EU imports)			**27%**	**53%**	**55%**	**64%**	**65%**	**66%**
Total (after accounting for pre-Aug 2024 contracts)			**57%**	**66%**	**64%**	**80%**	**75%**	**73%**

5.1.1 Summary of Gas/LNG scenario modelling results – Default Scenario

Under the **Default Scenario**, which assumes full implementation of the Methane Emissions Regulation as adopted, the EU could face a severe shortage of natural gas from both pipeline and LNG imports.

[5] The scenario analysis (Default and Adaptive Scenarios) was done in the summer of 2025 and uses Wood Mackenzie's April 2025 outlook as the Base Case. It was prepared before the publication of RePowerEU legislation by the European Commission in June 2025, and as a consequence the phase-out of Russian natural gas is not included in the report. The study includes Russian natural gas and crude oil in the Base Case, but this does not affect the Default or Adaptive scenarios, as Russian volumes do not meet MER compliance in any case.

By 2027, available gas supplies could decline by approximately 114 billion cubic meters—equivalent to around 43% of total EU imports in 2024. The most significant constraint arises from the exclusion of most U.S. LNG and Algerian pipe flows during the 2027–2029 period, leaving the EU unable to meet demand even after increasing imports from the Middle East. Although supply conditions improve after 2030 as U.S. producers achieve OGMP Level 5 compliance and verification systems mature, the initial disruption could be profound.

This supply shortfall drives extreme market imbalances and price volatility. Throughout 2027–2035, the model cannot generate a TTF spot price because supply is insufficient to meet demand, implying prices could rise to historically unsustainable levels. Demand destruction becomes the primary balancing mechanism, with widespread switching from gas to coal for power generation—an unintended consequence that increases carbon emissions due to the higher carbon emissions intensity of coal combustion compared to gas combustion. (Note: coal imports may also face constraints under MER, but coal market impacts were outside the scope of this study.) Additional LNG import capacity in Northwest and Eastern Europe offers only limited relief, as the early exclusion of U.S. LNG remains the dominant driver of imbalance.

The global repercussions are equally significant. LNG volumes shut out of the EU market during 2027–2029 flood Asia, temporarily depressing prices there relative to the Base Case. However, this dynamic reverses after 2030, when new U.S. LNG capacity comes online and is largely redirected to Europe to compensate for lost pipeline gas. Asian demand continues to grow but goes unmet, causing regional prices to surge to historic highs from 2030 onward.

These findings underscore the systemic risks posed by enforcement of MER and highlight the need for adaptive measures to avoid severe disruptions in both European and global gas markets.

5.1.2 Summary of Gas/LNG scenario modelling results – Adaptive Scenario

Under the **Adaptive Scenario**, which assumes modifications to MER allowing greater flexibility in granting country-level MRV equivalence, leading to all exports from 5 countries (Norway, US, Canada, UK, Qatar and Nigeria) deemed to be compliant, the impact on EU gas supply is significantly moderated compared to the Default Scenario.

In this case, available compliant natural gas supplies in 2024 would decline by around 53 billion cubic meters in 2027—equivalent to around 20% of total EU imports in 2024—rather than the 43% reduction seen under the Default Scenario. This improvement reflects the assumption that LNG from the United States and other key suppliers is fully compliant, enabling the EU to offset much of the lost pipeline supply. While pipeline imports from Libya, Azerbaijan, and Russia still fall to contracted minimum levels, increased LNG flows help maintain market balance. The assumption of security-of-supply allowances (SoS) for limited volumes of non-compliant Algerian gas further ease constraints during the critical early years, allowing supply to meet demand. (These SoS Allowances are not made in the Default Scenario because the market would not balance unless very large SoS Allowances are made.)

Despite these measures, the market still experiences notable price pressures. TTF spot prices more than double relative to the Base Case, reaching approximately $19 per MMBtu in 2028. Although this is far below the extreme levels implied under the Default Scenario, it remains a substantial increase that drives some demand switching from gas to coal in the power sector—an unintended consequence that risks higher carbon emissions. The greater availability of LNG and targeted allowances prevent widespread demand destruction, but structural vulnerabilities persist, leaving the EU exposed to elevated costs and supply risks. This would substantially increase the price of gas and power in EU versus the rest of the world, and could therefore have a significant negative impact on EU industry competitiveness.

Globally, the Adaptive Scenario produces a more balanced outcome than default compliance, but price impacts remain significant. Asian gas prices rise in tandem with European prices, reflecting tighter global supply conditions as compliant LNG is redirected to the EU. While the scenario avoids the severe disruptions of the Default case, it underscores that even with regulatory flexibility, the EU cannot fully escape the economic and environmental consequences of MER requirements. Long-term resilience will depend on accelerated progress in methane performance standards, verification systems, and traceability frameworks across global supply chains.

Since the market impacts are most severe when compliance is lowest in the first 3 years of Article 28 being in force, a delay of Article 28 requirements by 3-4 years may help avoid the most disruptive outcomes. While such a delay could avoid market disruption almost entirely in the Adaptive Scenario, in the Default Scenario a disruption is still to be expected after the delay, as the disruptions persist throughout the entire modelling period.

The following pages provide a more comprehensive explanation of the results of the scenario analysis for gas/LNG.

5.1.3 Detailed results from Gas/LNG scenario modelling

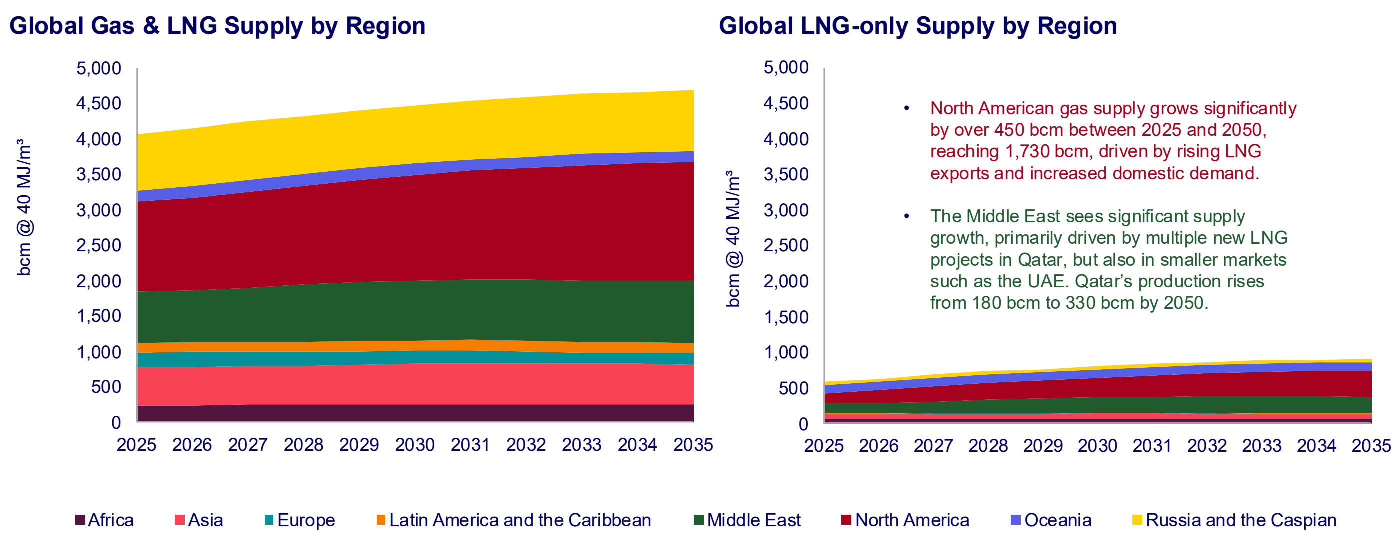
5.1.3.1 Base Case

As described in earlier sections, the scenario analysis begins with a **Base Case** that represents a "business as usual" outlook in the absence of MER. The Base Case described below leverages Wood Mackenzie's published outlook for global gas/LNG markets from April 2025.

In our Base Case, long-term global gas and LNG supply growth is expected to be driven predominantly by new liquefaction projects in the United States and Qatar, supported by both countries' substantial resource bases. These additions offset stagnation or decline elsewhere, enabling overall global supply to rise steadily through the 2030s.

In contrast, Europe and Asia face sustained declines in domestic gas production, resulting in increased structural dependence on LNG imports to meet demand. This reinforces the role of internationally traded LNG in global energy security.

Figure 9: Base Case global gas and LNG supply (published in April 2025)



In our April 2025 Base Case, Europe's gas balance through 2035 is expected to become increasingly dependent on imported LNG, which remains the single largest source of supply as regional production continues its long-term decline. Indigenous output—particularly from the North Sea—falls steadily over the period, while low-carbon gases grow only modestly and remain a relatively small contributor to total supply.

From 2026 onward, new LNG volumes from US and Qatari liquefaction projects enter the global market, effectively backfilling Europe's declining domestic production. Only marginal growth in European gas demand is expected during 2025–2029, reflecting slow recovery in industrial activity and subdued consumer confidence.

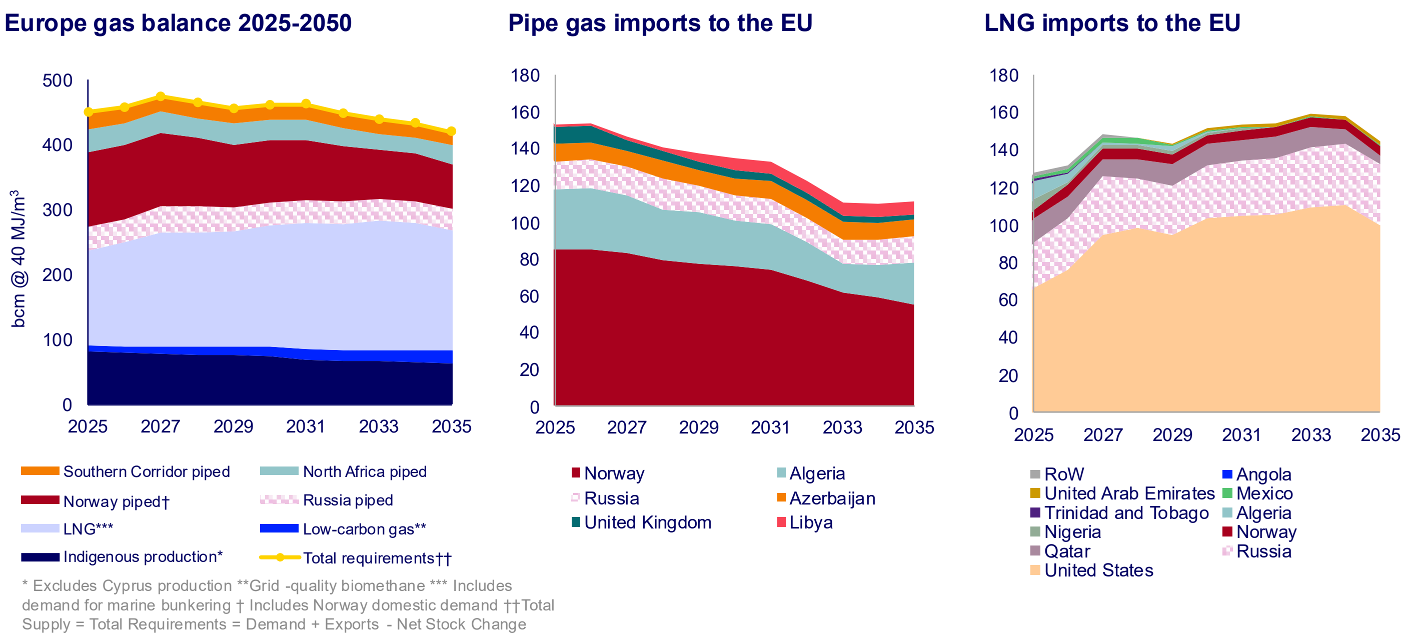
Russian pipeline deliveries remain sharply reduced, though some Central and Eastern European states continue to receive limited Russian gas via the TurkStream corridor. At the same time, pipeline supplies from traditional partners such as Norway begin to trend downward toward the end of the decade.

In the early 2030s, a combination of slowing global LNG demand growth and increasing LNG availability places downward pressure on LNG prices, reinforcing Europe's position as a major sink for LNG. Imports peak at around 186 bcm in 2033, helping offset the decline in Norwegian production.

Toward 2030–2035, European gas demand begins to fall as energy transition policies take hold, although this shift could be delayed by periods of lower gas prices. Even with declining total demand, Europe's reliance on LNG intensifies, with LNG expected to exceed 50% of total supply by 2035 as pipeline imports from multiple sources diminish.

Overall, the results indicate a structurally tighter European gas supply landscape in which imported LNG plays an increasingly central and stabilizing role.

Figure 10: Base Case Europe gas balance (i.e. supply required to meet demand) and EU imports (published in April 2025). See footnote at beginning of Section 5 for explanation of role of Russian product volumes.



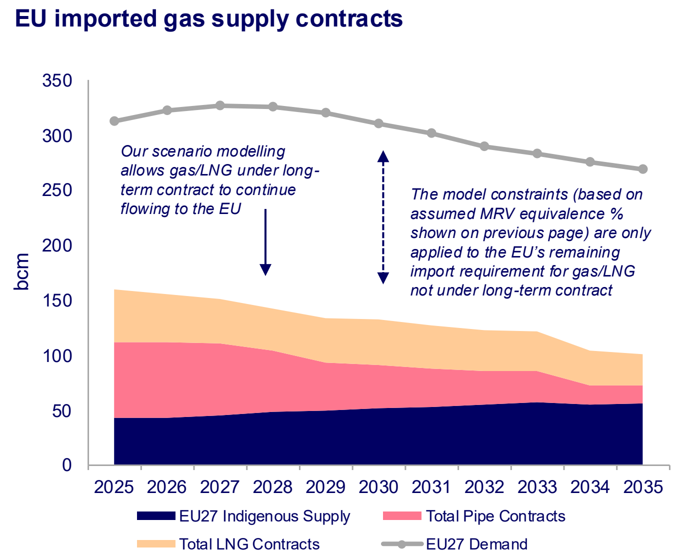
5.1.3.1 Default Scenario

When MER importer requirements come into force in 2027, the EU faces a sharp reduction in compliant gas supply. Under the Default Scenario, only 57% of imported gas remains compliant, leaving 43% excluded from the market. This constraint persists through the forecast period, with compliance improving slightly to 66% by 2030–31 before slipping to 64% by 2032–35 as long-term contracts decline. In contrast, the Adaptive Scenario offers significant relief: 80% of imports are compliant in 2027, falling modestly to 73% by 2032–35. These figures highlight the critical role of regulatory flexibility in mitigating supply risk.

Our modelling assumes that volumes under contracts signed before 4th August 2024 will continue to flow based on lower requirements to demonstrate equivalency (reasonable efforts).[6] However, even with these contracts supplying gas, the Default Scenario results in severe supply constraints, forcing demand destruction and price escalation. The Adaptive Scenario reduces these pressures but does not eliminate them, signalling that structural challenges will persist without further modifications to MER.

[6] Wood Mackenzie tracks long-term contracts for gas/LNG including volume, duration, and counterparties to each contract. Sources include company announcements, industry interactions and market intelligence. Pre-August 2024 contracts are important for gas, but are not material for crude oil because term contracts for oil tend to be "annual evergreen" and renewed annually

Figure 11: Role of long-term gas contracts in availability of MER-compliant volumes



MER-compliant EU gas/LNG imports, as a share of 2024 total imports

	Default Scenario			Adaptive Scenario		
	2027-29	2030-31	2032-35	2027-29	2030-31	2032-35
MER-compliant	57%	66%	64%*	80%	75%	73%*
Not MER-compliant	43%	34%	36%	20%	25%	27%

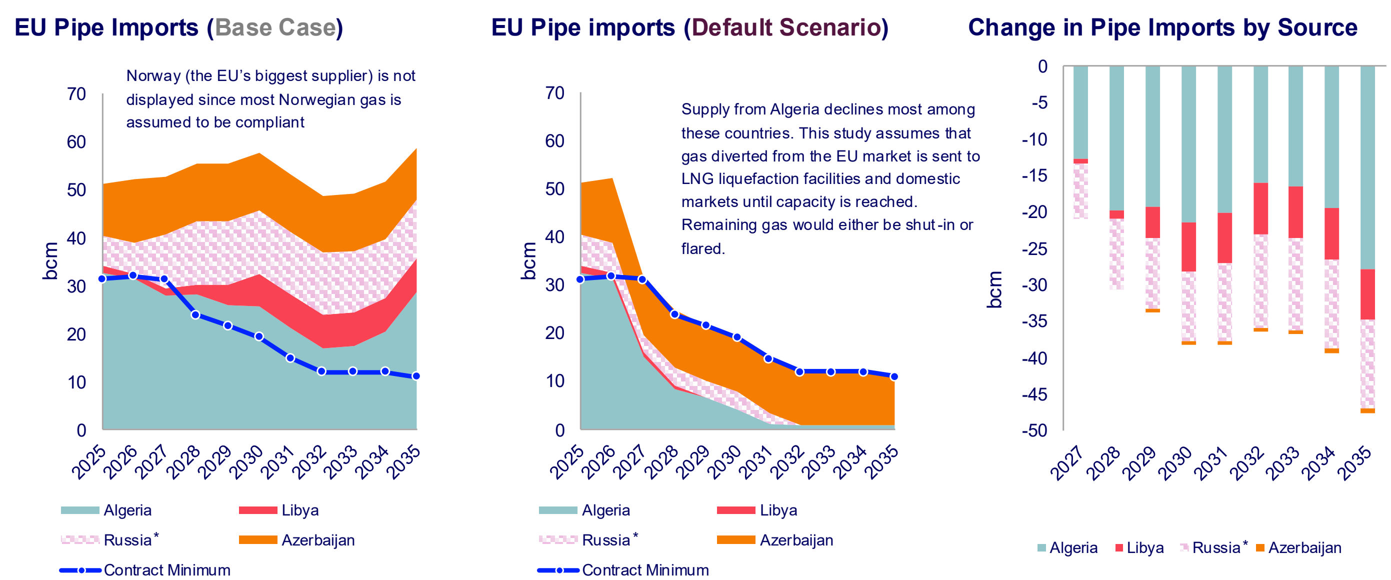
LNG imports under long-term contract total 40 bcm in 2027, 41 bcm in 2030, and 36 bcm in 2032. The largest suppliers are the United States, Qatar, and Nigeria.

Pipe imports under long-term contract total 66 bcm in 2027, 39 bcm in 2030, and 31 bcm in 2032. The largest suppliers are Norway, Algeria, and Azerbaijan.

*MER-compliant share is a function of both producers' OGMP Level 5 achievement and the quantity of EU gas imports under long-term contract signed before August 2024. OGMP Level 5 achievement gradually increases over time, while gas under long-term contract gradually decreases. The net effect of this causes a drop in MER-compliant supply between 2030 and 2032.

The sharp decline in compliant supply starting in 2027 is reflected in a significant reduction in pipeline imports. Under the Default Scenario, flows from Libya, Azerbaijan, and Russia fall to contracted minimum levels, representing a loss of up to 45 bcm—or 85%—compared to the Base Case. These reductions reflect the inability of these countries to meet MRV equivalence standards, forcing the EU to rely almost exclusively on long-term contracted volumes. The removal of large volumes of pipeline supply, particularly from Algeria, increases dependence on LNG, amplifying exposure to global competition for compliant cargoes.

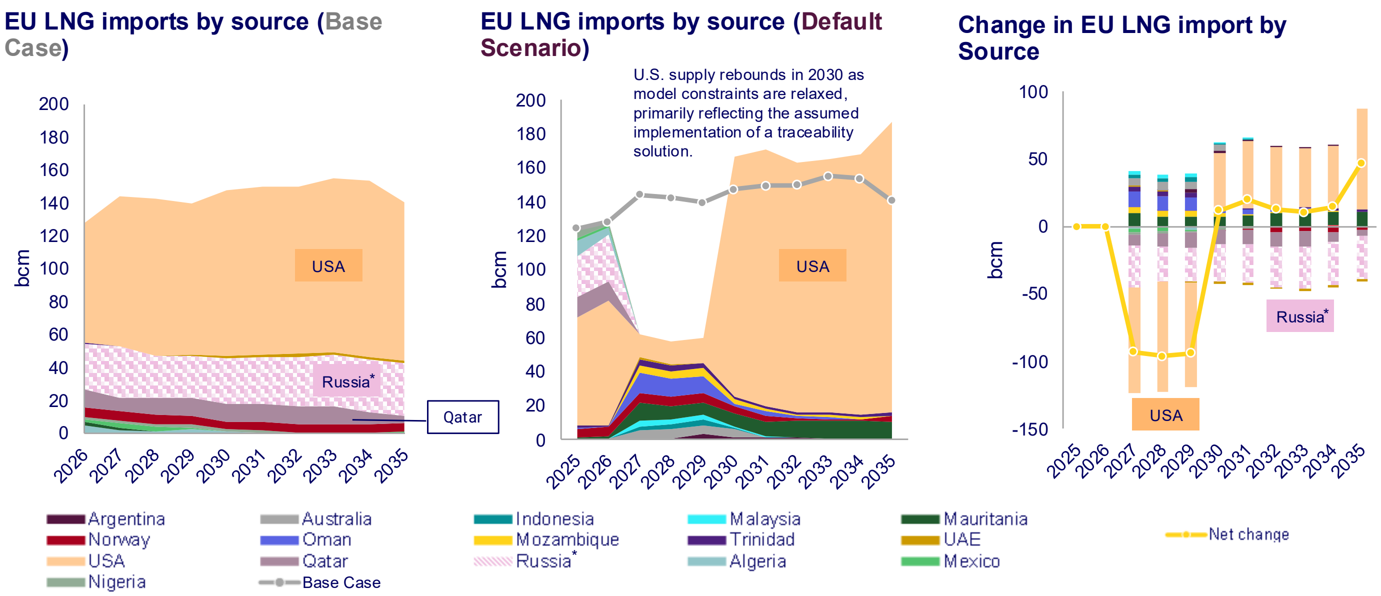
Figure 12: EU pipeline imports in Default Scenario. (Base Case was published in April 2025.)



With pipeline flows collapsing, the EU turns to LNG as a lifeline—but this strategy faces its own set of challenges. In the Default Scenario, LNG imports from major suppliers such as the United States are severely curtailed in the early years, as compliance requirements exclude most volumes from the EU market. Although imports from the Middle East rise modestly, they are insufficient to offset the loss of U.S. supply.

This imbalance persists until the early 2030s, when progress on OGMP Level 5 compliance and traceability solutions enables a rebound in U.S. LNG flows. However, the initial disruption underscores the vulnerability of the EU's LNG strategy under the Default Scenario.

Figure 13: EU LNG imports in Default Scenario. (Base Case was published in April 2025.)



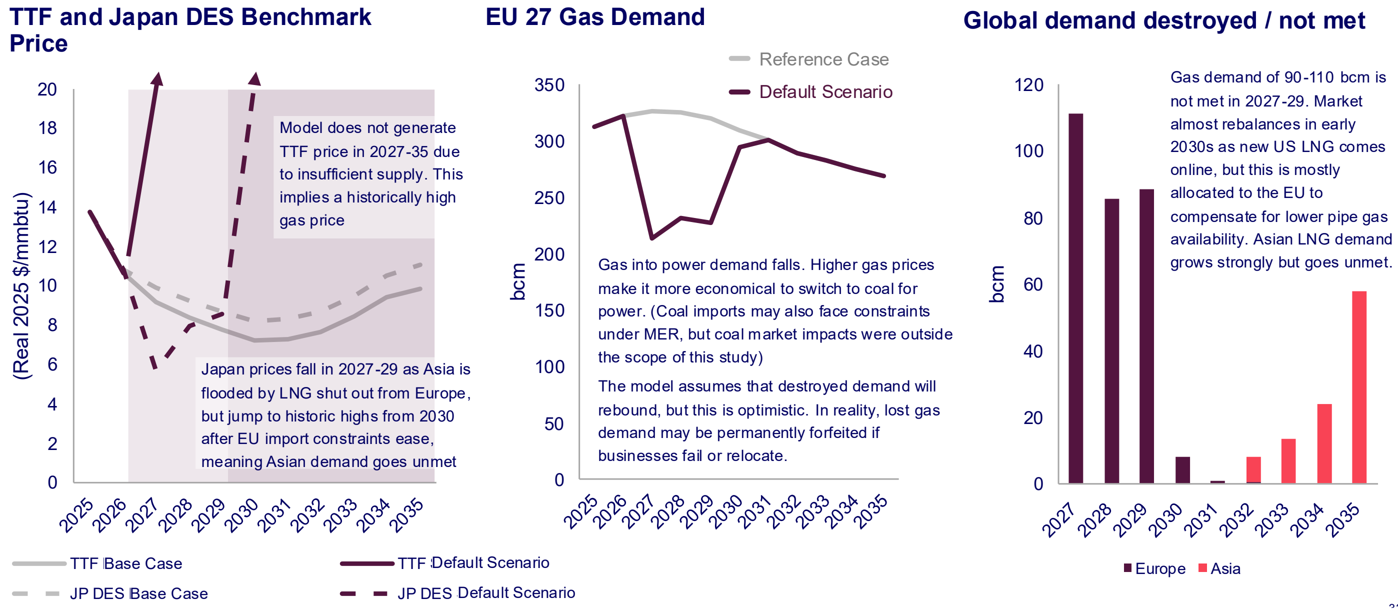
The combined effect of pipeline and LNG constraints drives European gas prices to unprecedented levels. Under the Default Scenario, the model cannot generate a TTF price for 2027–29 because supply falls so far short of demand, implying prices could spike to historically high levels. This triggers widespread demand destruction, with up to 110 bcm of EU gas demand erased during the tightest period. Coal switching becomes the primary balancing mechanism, introducing a significant increase in carbon emissions and undermining climate objectives.

During the 2027–2029 period, default enforcement of MER importer requirements effectively excludes U.S. LNG and other major suppliers from the EU market. As a result, these volumes are redirected to Asia, creating a temporary oversupply and driving regional gas prices to very low levels. U.S. LNG, in particular, has limited alternative destinations during this phase, reinforcing Asia's short-term price advantage.

After 2029, the EU begins to allow greater access for U.S. LNG and other exporters, creating a more interconnected global market. However, the model cannot fully balance global supply and demand under these conditions. The shortfall manifests primarily in Asia. Once Europe and Asia become linked through U.S. LNG flows, any inability to meet global LNG demand—exacerbated by the loss of Russian pipeline supply and restricted access for some LNG exporters—results in penalty pricing in Asia, which is closely correlated with European benchmarks.

This outcome illustrates a critical point: imposing defualt restrictions on market access under MER has far-reaching consequences, disrupting global gas trade flows and amplifying price volatility across interconnected regions.

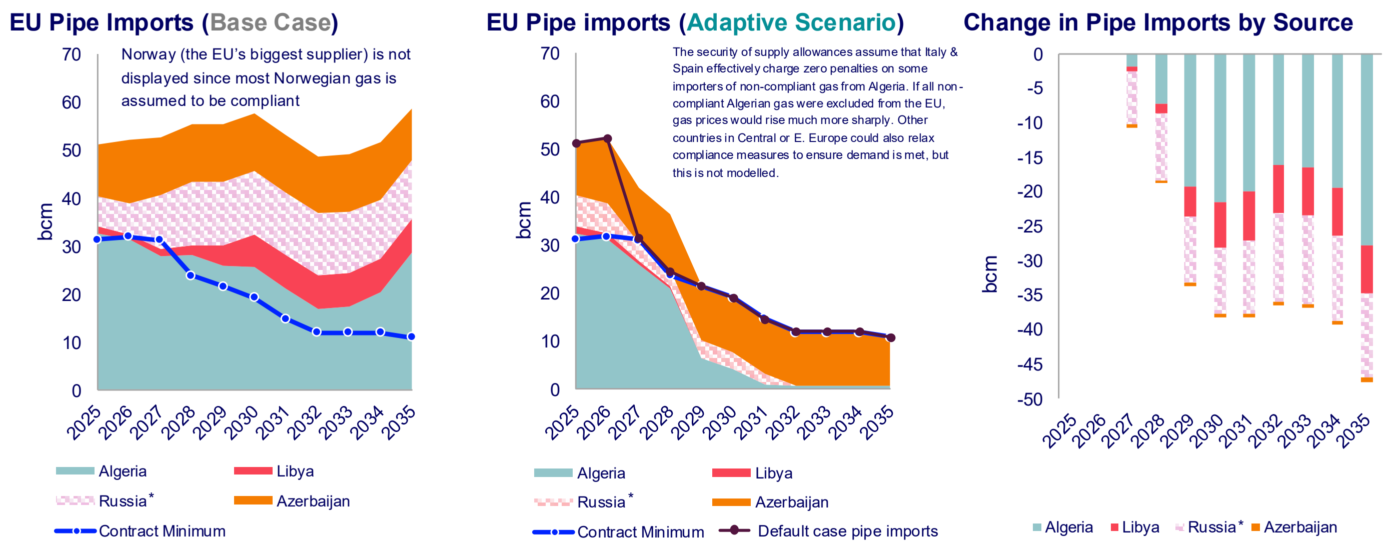
Figure 14: Gas spot price and demand impacts in Default Scenario. (Base Case was published in April 2025.)



5.1.3.1 Adaptive Scenario

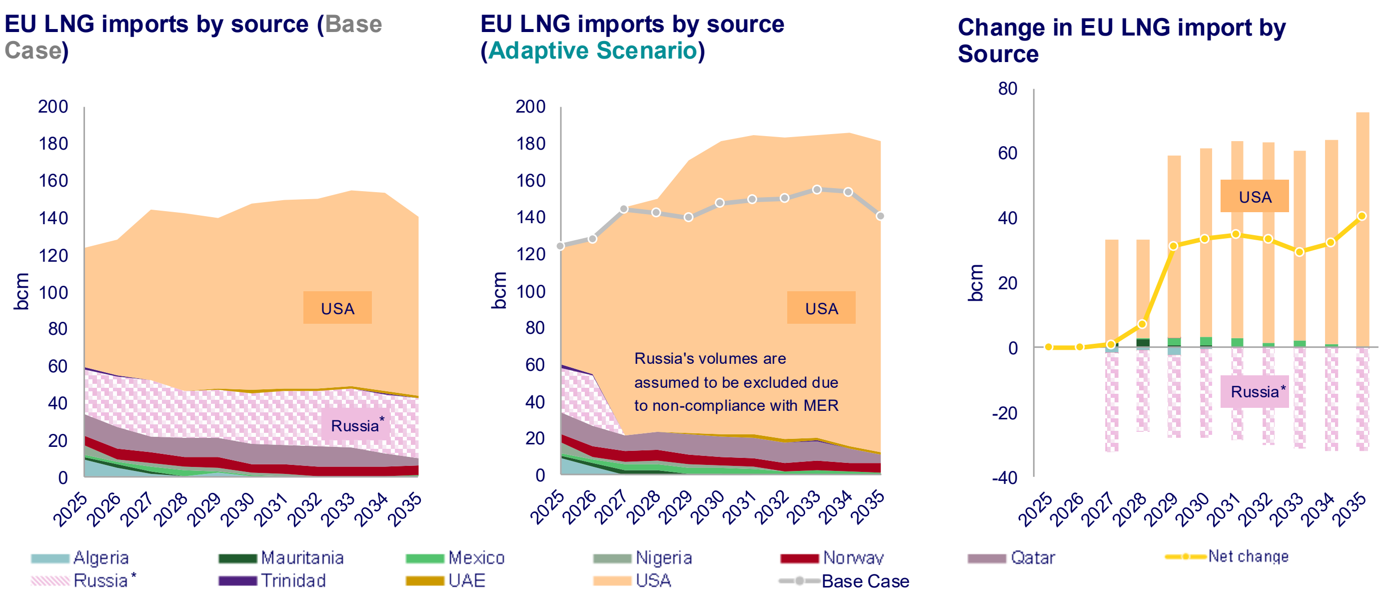
The Adaptive Scenario mitigates some of these impacts through targeted interventions. For example, we assume that Italy and Spain introduce security-of-supply allowances for limited volumes of non-compliant Algerian pipeline gas, which is necessary to avoid significant demand destruction during 2027–28. These allowances, combined with increased LNG imports from compliant suppliers, help stabilize the market and reduce the severity of price shocks.

Figure 15: EU pipeline imports in Adaptive Scenario. (Base Case was published in April 2025.)



Critical suppliers of LNG are assumed to be compliant in the Adaptive Scenario as they have some degree of methane regulation which after modification of the regulation could qualify as equivalent. This enables increased imports of U.S. LNG to make up for the fall in pipe gas imports, and restores a degree of market balance.

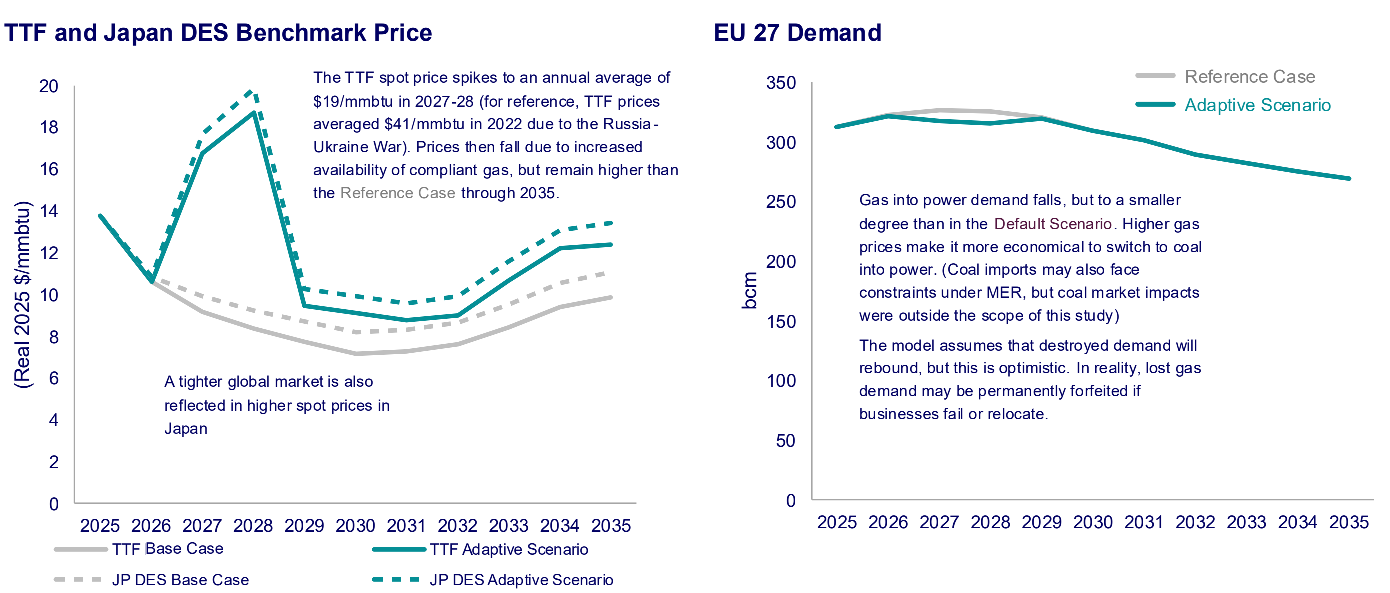
Figure 16: Figure 10: EU LNG imports in Adaptive Scenario. (Base Case was published in April 2025.)



Although the Adaptive Scenario delivers a smaller price impact than the Default Scenario, European gas prices still climb sharply, peaking at around $19/MMBtu in 2027–28—more than double the Base Case forecast, but not as high as the $41/MMBtu price seen in 2022 after the start of the Russia-Ukraine War.

Prices decline thereafter as compliant supply expands, but remain above Base Case levels through 2035. Higher prices lead to some demand switching to coal, albeit to a lesser extent than in the Default Scenario. This outcome illustrates that even with regulatory flexibility on country-level equivalency, the EU cannot fully avoid the economic and environmental consequences of MER without broader global alignment on methane standards or further modifications of MER.

Figure 17: Gas spot price and demand impacts in Adaptive Scenario. (Base Case was published in April 2025.)



Together, these findings paint a clear picture: MER compliance requirements introduce profound structural challenges for the EU's gas supply chain. Under strict enforcement, the region faces severe shortages, price shocks, and unintended increase in carbon emissions. While adaptive measures and regulatory flexibility can moderate these impacts, they cannot eliminate them entirely. The results underscore the need for a balanced approach—one that combines robust methane performance standards with practical implementation pathways to safeguard energy security and climate objectives.

5.1.4 Evolving outlook for Russian gas and LNG supplies to the EU

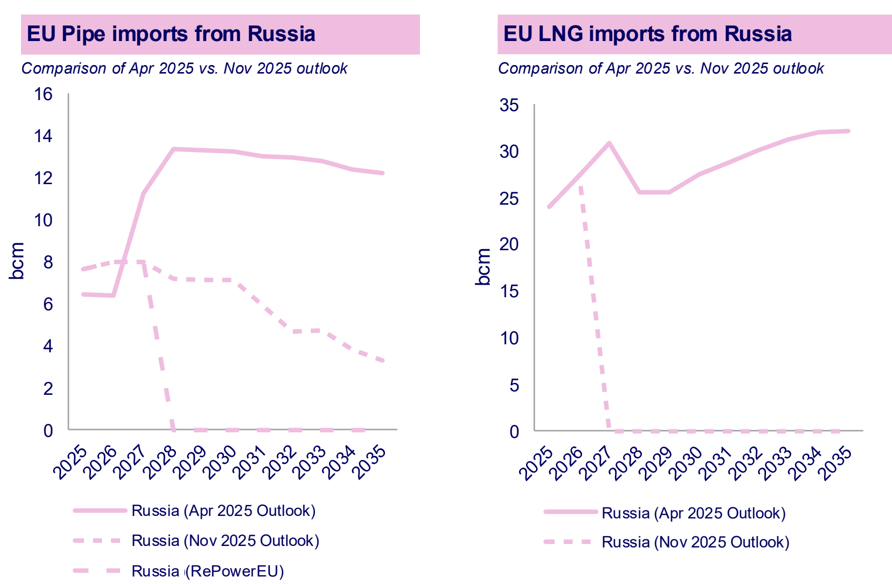
The outlook for Russian energy exports to the EU has shifted significantly due to evolving sanctions and uncertainty surrounding negotiations to end the Russia–Ukraine war. In Wood Mackenzie's April 2025 outlook (shown as the solid line in the charts below), we assumed that, despite sanctions, limited pipeline gas transit through Ukraine would continue to Hungary and Slovakia in exchange for their support in maintaining a unified EU position on Russia. For LNG, the outlook assumed the EU would maintain its transshipment ban and avoid Arctic LNG-2 cargoes, while continuing to import LNG from Russia's Yamal project.

By contrast, the November 2025 outlook (represented by the dotted line) reflects the EU's 19th sanctions package and the RePowerEU legislation, which include plans to ban Russian pipeline imports into the bloc by January 2028. In this outlook, pipeline flows to Europe decline sharply after 2028, with only Hungary and Slovakia expected to secure exemptions under existing long-term contracts via TurkStream. No resumption of pipeline volumes through Ukraine is anticipated. For LNG, the November outlook assumes a complete halt to Russian LNG imports from 2027 onward.

Given the uncertainty surrounding a potential Russia–Ukraine peace agreement, we also plot a complete exclusion case in the charts below, assuming strict enforcement of the 19th sanctions package with no exemptions for pipeline imports from Russia.

It is important to note that the scenario analysis presented in this report—covering the Default and Adaptive Scenarios—was conducted in mid-2025 using the April 2025 outlook as the Base Case. However, the differences in Russian supply assumptions have minimal impact on the scenario outcomes because all Russian volumes are excluded in both scenarios due to zero OGMP Level 5 compliance among Russian producers.

Figure 18: Evolving outlook for Russian gas and LNG supplies



5.2 Crude oil scenario modelling results

We used similar scenario drivers as explained for gas to estimate the share of compliant crude oil production available to the EU under the Default Scenario and Adaptive Scenario.

Figure 19: Constraints applied to Wood Mackenzie's Refinery Supply Model (a least-cost supply allocation model) for crude oil and refined products

			Default Scenario			Adaptive Scenario		
	Production	*EU export*	% of production allowed to flow to EU			% of production allowed to flow to EU		
Major exporter to EU	*2024 (kboed)*		**2027-29**	**2030-31**	**2032-35**	**2027-29**	**2030-31**	**2032-35**
United States	11,541	1,841	2%	48%	48%	100%	100%	100%
Norway	1,909	1,574	71%	100%	100%	100%	100%	100%
Kazakhstan	1,922	1,090	4%	21%	30%	100%	100%	100%
Saudi Arabia	9,686	865	0%	0%	0%	0%	0%	0%
Nigeria	1,597	821	2%	12%	23%	100%	100%	100%
Libya	1,411	792	0%	0%	0%	0%	0%	0%
Iraq	6,215	648	2%	5%	6%	2%	5%	6%
United Kingdom	766	600	6%	23%	76%	100%	100%	100%
Azerbaijan	589	500	15%	40%	57%	15%	40%	57%
Brazil	3,938	496	2%	40%	92%	100%	100%	100%
Russia	10,901	491	0%	0%	0%	0%	0%	0%
Algeria	844	326	1%	4%	7%	1%	4%	7%
Guyana	383	325	5%	45%	100%	5%	45%	100%
Mexico	1,437	246	0%	6%	25%	100%	100%	100%
Angola	1,125	189	11%	43%	95%	11%	43%	95%
Canada	4,880	136	0%	7%	8%	100%	100%	100%
Equatorial Guinea	87	28	18%	24%	39%	18%	24%	39%
United Arab Emirates	4,094	67	77%	97%	98%	100%	100%	100%
Egypt	409	57	1%	2%	3%	1%	2%	3%
Gabon	198	38	2%	7%	20%	2%	7%	20%
Tunisia	28	28	3%	9%	9%	3%	9%	9%
Trinidad and Tobago	54	13	1%	27%	62%	1%	27%	62%
Bolivia	0	0	12%	43%	94%	12%	43%	94%
Suriname	16	0	0%	42%	72%	0%	42%	72%
Uganda	0	0	14%	27%	61%	14%	27%	61%
Sudan	31	0	0%	0%	0%	0%	0%	0%
Total (wt. avg. % of 2024 EU imports)			**13%**	**33%**	**44%**	**62%**	**65%**	**69%**

5.2.1 Summary of Crude Oil scenario modelling results – Default Scenario

Under the Default Scenario, the implementation of MER importer requirements creates an acute shortage of EU-compliant crude oil. By 2027, 87% of the crude oils imported in EU in 2024 could be non-compliant with MER, impacting the availability of crude oils allowed to be processed in Europe. This unprecedented constraint forces a sharp reduction in EU refinery throughput, which falls by around 4.6 mb/d, or 50% compared to the Base Case, during the late 2020s when restrictions are tightest. As a result, up to 40 EU refineries could be forced to suspend operations. Regional impacts vary, with some Member States hit harder due to mismatches between available crude qualities and refinery configurations. The reshuffling of trade flows causes average tanker distance travelled to increase, with crude shipping costs for EU refiners climbing to around $2.6 per barrel, well above the Base case baseline of $1.6 per barrel.

The supply shock could drive significant price escalation. In our modelled results, EU refiners compete aggressively for the limited pool of compliant crude, pushing the weighted-average cost of the EU refinery crude basket up by $9 per barrel (11%) versus the Base Case in the late 2020s. This could erode the competitiveness of EU refiners relative to other regions.

At the same time, refined product markets could tighten globally as EU refinery output collapses. Gasoline and diesel prices in Northwest Europe could rise by 24% and 16%, respectively, while crack spreads could surge across major pricing hubs. Higher fuel prices/crack spreads are required to incentivize foreign refiners—particularly in North America, Asia, and the Middle East—to increase utilization and export more products to the EU. This dynamic benefits non-EU refiners but imposes higher costs on EU consumers and increases carbon emissions, as imported fuels replace domestic production. A large increase in fuel imports to replace domestic refinery production could create severe logistical bottlenecks and disruptions. In addition, feedstock supply to the chemical industry would be severely impacted.

5.2.2 Summary of Crude Oil scenario modelling results – Adaptive Scenario

The Adaptive Scenario could reduce the severity of these impacts, as 9 key crude exporting countries (including Norway, Canada, US, UK) are deemed to be equivalent if modifications are made to MER's equivalence requirements. In this scenario, by 2027, 38% of the crude oils imported in EU in 2024 could be non-compliant with MER, impacting the availability of crude oils allowed to be processed in Europe. EU refinery throughput falls by 150,000 b/d (2%) by the early 2030s—

equivalent to the closure of a single medium-sized refinery—relative to the Base Case. This moderation reflects the ability of EU refiners to access a broader pool of compliant crudes, including U.S. Permian light-sweet grades, in the Adaptive Scenario than in the Default Scenario. Crude shipping costs still increase for EU refiners to approximately $2.0 per barrel.

Price impacts are smaller under this scenario. The average EU refinery crude cost rises by about $3 per barrel (4%) versus the Base Case. Gasoline and diesel prices increase by only 1%, and refined product imports rise modestly to compensate for lost EU throughput. While economic impacts and increased carbon emissions remain visible, they occur on a much smaller scale than in the Default Scenario. Nevertheless, the Adaptive Scenario still underscores the structural challenges of MER implementation: even with regulatory flexibility, the EU faces higher costs, reduced competitiveness, and persistent exposure to global supply risks.

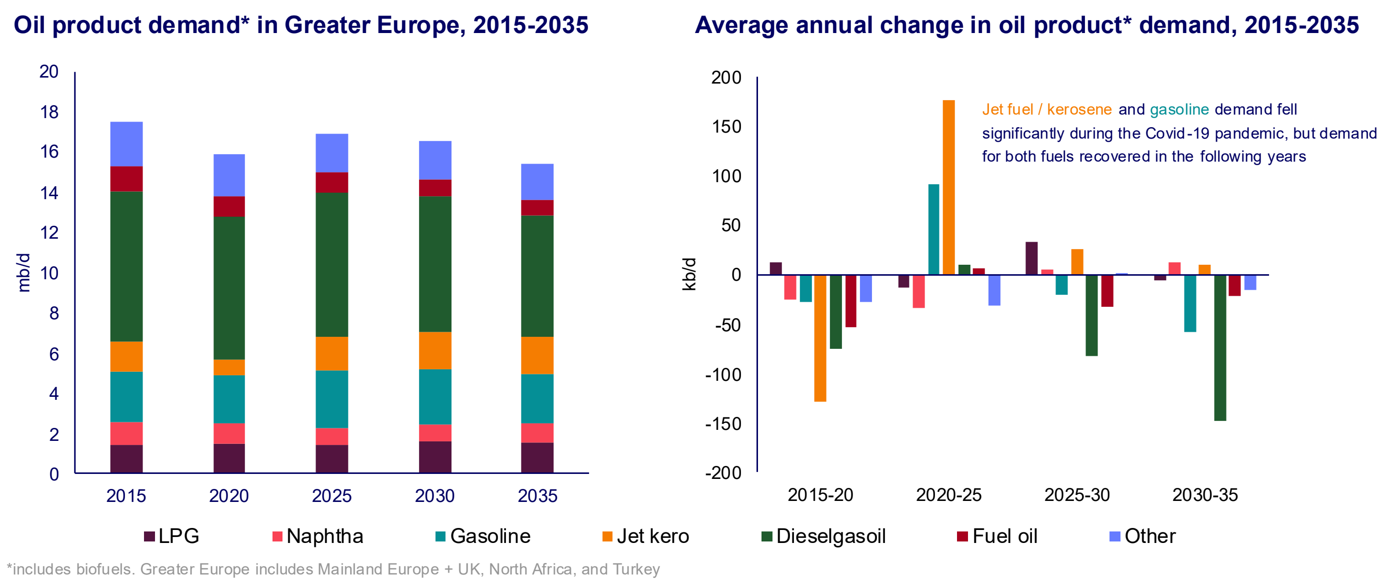
5.2.3 Detailed results from Crude Oil scenario modelling

5.2.3.1 Base Case

As described in earlier sections, the scenario analysis begins with a **Base Case** that represents a "business as usual" outlook in the absence of MER. The Base Case described below leverages Wood Mackenzie's published outlook for global crude oil and oil product markets from April 2025.

In our Base Case, oil product demand in Greater Europe is projected to decline steadily through 2035, falling by around 1.4 mb/d to just over 15 mb/d. This downward trend is driven primarily by the increasing electrification of the vehicle fleet and broader energy efficiency improvements, which reduces consumption of conventional transport fuels. Gasoline and diesel/gasoil account for much of the decline, reflecting structural shifts in road transport energy use. Meanwhile, our Base Case forecast shows selective growth in aviation and petrochemical sectors. This evolving demand profile plays an important role in shaping future refining utilization, product balances, and import requirements across the region.

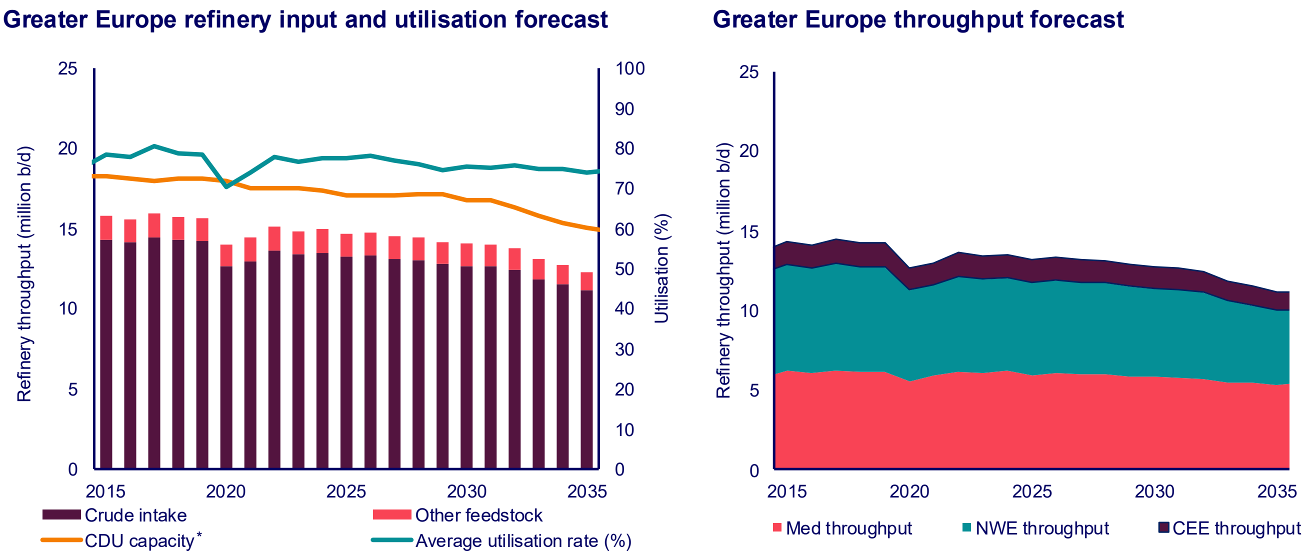
Figure 20: Greater Europe oil product demand (Greater Europe includes Mainland Europe + UK, North Africa, and Turkey). (Base Case was published in April 2025.)



Refinery rationalization across Greater Europe in our Base Case is projected to reduce crude processing capacity by around 12% by 2035, reflecting both a structural fall in regional oil demand and ongoing pressure on refining margins. The decline is most pronounced in North-West Europe, where falling demand for traditional transport fuels, increasing competition from more modern, lower-cost refineries globally, and high energy and carbon costs lead to reductions in crude runs. In contrast, throughput in the Mediterranean region remains more stable, supported by more resilient local demand.

These trends underscore a long-term shift in Europe's refining landscape, with capacity rationalization and throughput declines driven by both market fundamentals and the ongoing transition in energy demand. Our Base Case forecast shows a slightly smaller and more regionally differentiated refining sector by 2035.

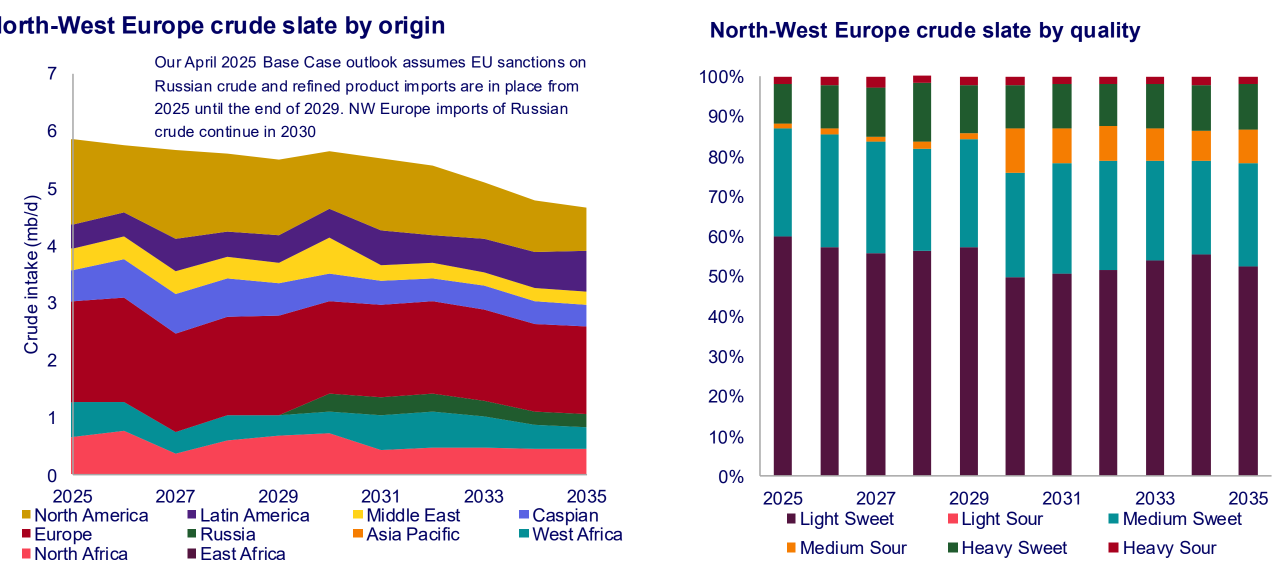
Figure 21: Base Case Greater Europe refinery throughput (in the absence of MER). CDU = Crude Distillation Capacity. (Base Case was published in April 2025.)



North-West Europe's crude slate shifts over the coming decade as the region replaces sanctioned Russian crude with lighter, sweeter alternatives sourced from North America, Europe, and West Africa. As Russian medium-sour Urals volumes are removed from the market, refiners progressively pivot toward grades that are both lighter and lower in sulphur. This change materially "sweetens" the regional crude slate, altering the quality mix processed by North-West European refineries. Heavy grades remain a minor component of the slate. These quality shifts carry operational implications, as refiners adjust product yields, blending strategies, and crude selection processes to accommodate a lighter and sweeter intake.

The Base Case leverages Wood Mackenzie's April 2025 outlook, which assumes EU sanctions on Russian crude oil end in 2030.

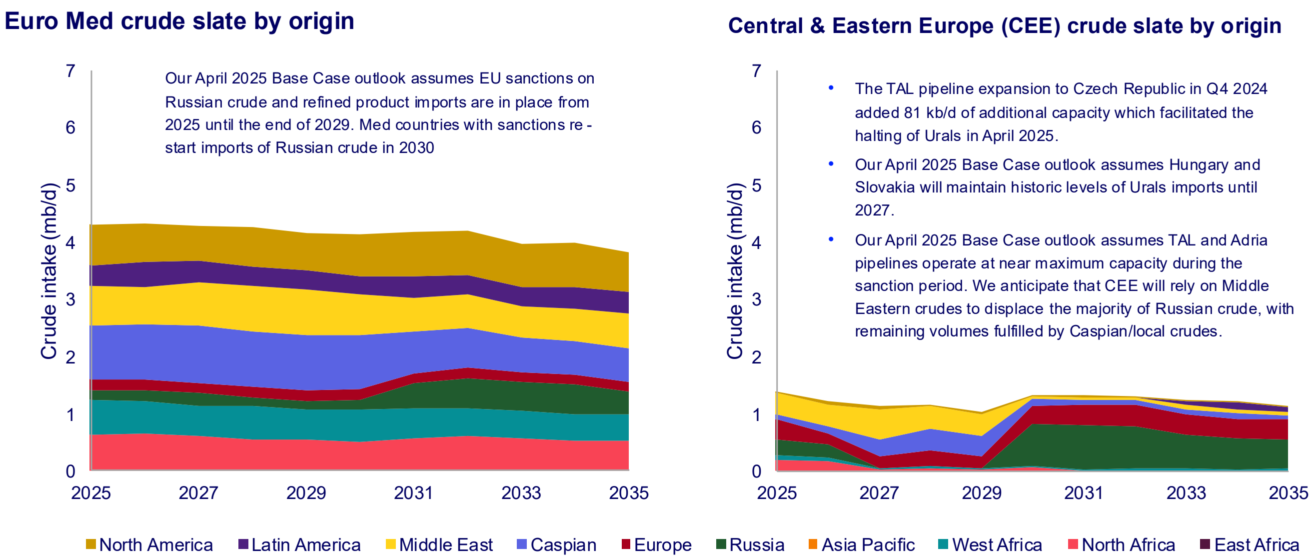
Figure 22: Base Case North-West Europe crude slate (in the absence of MER). (Base Case was published in April 2025.)



Crude sourcing patterns in the Euro-Mediterranean and Central & Eastern European (CEE) regions continue to fragment through the 2020s as sanctions on Russian crude reshape regional trade flows. In the Mediterranean, Turkish refiners maintain access to Russian barrels, while sanctioning countries progressively pivot toward alternatives from the Caspian region, Africa, and the wider Atlantic Basin. These shifts gradually diversify the supply mix, with Caspian grades playing an increasingly important role in replacing medium-sour Russian volumes once sanctions phase in.

In Central & Eastern Europe, the transition away from Russian crude is more tightly defined by infrastructure and policy developments. The expansion of the TAL pipeline in late 2024 enabled the Czech Republic to halt imports of Russian Urals in April 2025, while Hungary and Slovakia sustain legacy imports until 2027 under long-term arrangements. The result is a more heterogeneous and regionally differentiated crude supply landscape, shaped by both policy constraints and physical infrastructure capabilities.

Figure 23: Base Case Mediterranean and Central and Eastern Europe crude slate (in the absence of MER). (Base Case was published in April 2025.)



EU crude oil imports decline gradually through 2035 as refinery rationalization and falling demand reduce the region's overall crude intake. Domestic production continues to contract, particularly in Denmark and the Netherlands, where output from mature fields is expected to decline steadily. As a result, the EU remains structurally dependent on imported crude, with the United States, Norway, and Kazakhstan the largest suppliers.

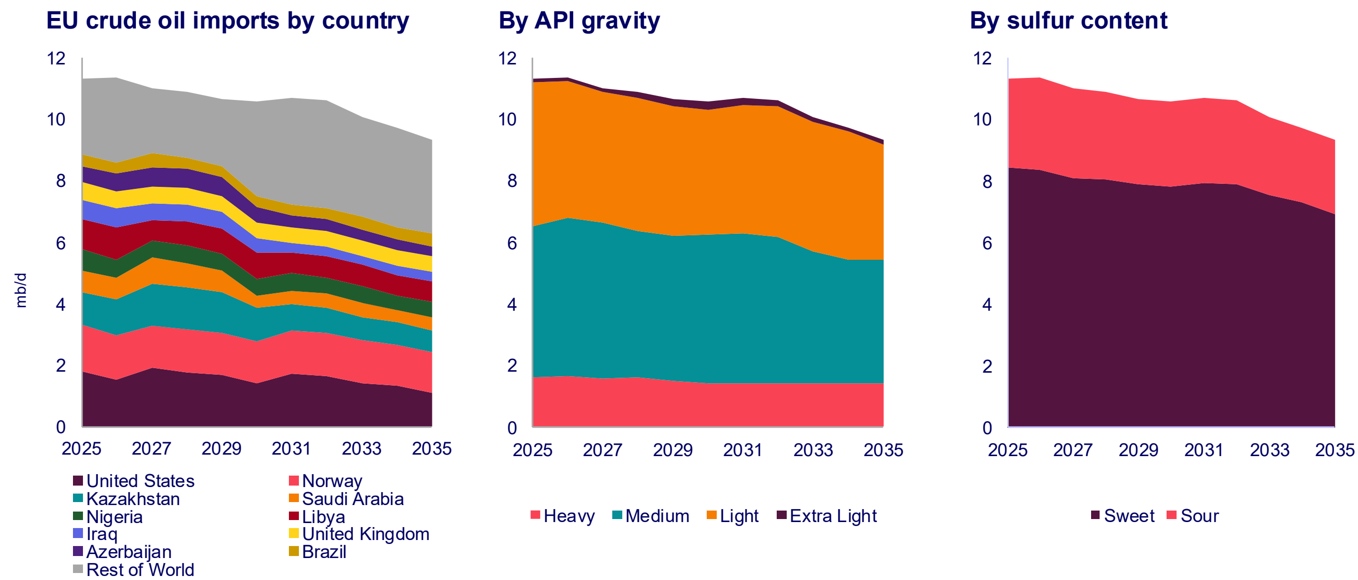
Shifts in product demand and petrochemical dynamics contribute to changes in crude sourcing patterns. The expansion of propylene and ethylene capacity in Poland increases demand for light-distillate feedstocks such as naphtha and potentially ethane/propane, strengthening the pull for lighter, sweeter crudes.

While sanctions on Russian crude are assumed to be lifted in 2030 in our April 2025 Base Case (a date which remains highly uncertain), refiners continue to seek alternatives to medium-sour grades such as Urals. Most of this replacement demand is met by increased imports from the Caspian region, North America, and West Africa. Further diversification appears in the "Rest of World" category, where imports from Guyana, Colombia, Angola, and the United Arab Emirates grow as these producers expand output.

Most EU refineries lack the deep-conversion capacity required to efficiently process heavier or higher-sulphur crudes, and this structural constraint shapes both the composition of crude imports and the region's long-term supply strategy. As overall crude demand declines, imports fall across all quality categories, but the relative dominance of light and medium grades remains unchanged.

These trends illustrate a long-term restructuring of the EU's crude supply portfolio, shaped by declining domestic production, shifts in product demand, and evolving geopolitical conditions. The result is a more diversified but increasingly light-sweet-oriented crude slate by 2035.

Figure 24: Base Case EU crude oil imports (in the absence of MER). (Base Case was published in April 2025.)

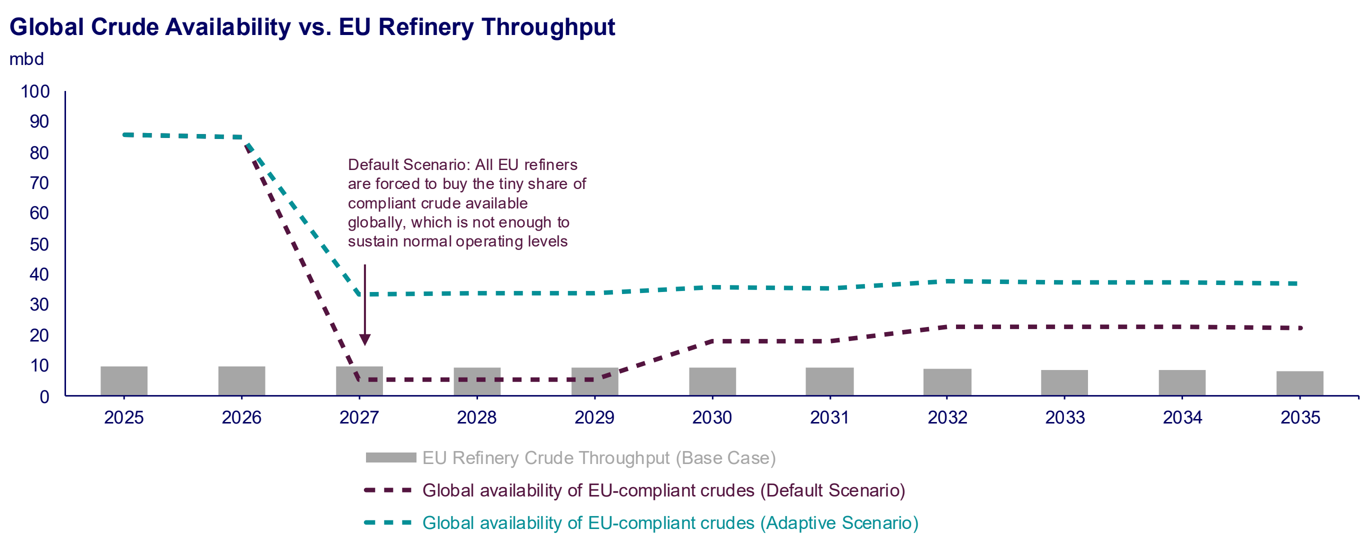


5.2.3.2 Scenario Results

Crude availability and costs

The scenario analysis highlights a critical constraint for EU refiners under MER: the limited global availability of compliant crude. In the Default Scenario, compliant crude supply falls sharply after 2027, leaving EU refiners unable to secure sufficient volumes to maintain normal operating levels. This shortage forces refiners to bid compliant crudes away from other buyers, creating intense competition and driving prices upward.

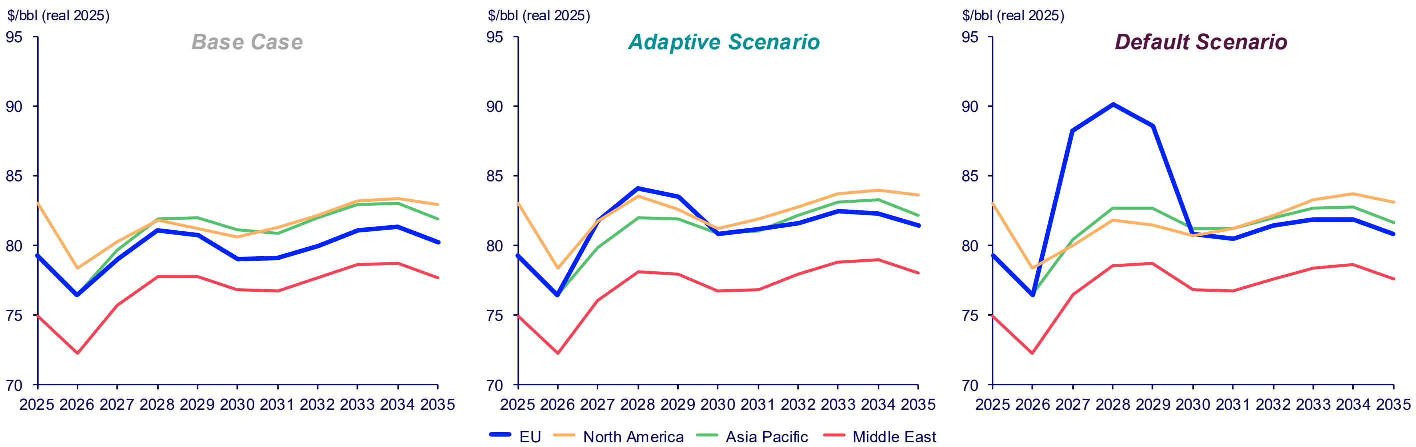
Figure 25: Impact of MER on global crude availability for EU refiners .(Base Case was published in April 2025.)



The scenario modelling illustrates how constrained availability of compliant crude in the EU drives a widening price gap between EU refiners and those in other regions, creating competitive disadvantages for the EU. As the figure below shows, under the Default Scenario, severely constrained crude availability for the EU results in a steep price increase relative to other regions, particularly during 2027–2029 when compliance constraints are most acute. This surge in costs creates a significant competitive disadvantage for EU refiners, as counterparts in North America, Asia Pacific, and the Middle East benefit from more flexible supply options and lower compliance burdens. The volume-weighted average crude price for EU refiners rises by approximately $9 per barrel (11%) above the Base Case in the late 2020s, when the MER-related supply constraints are tightest.

The Adaptive Scenario mitigates these pressures but does not eliminate them. Crude costs still increase by around $3 per barrel (4%) compared to the Base Case in the late 2020s—a smaller but still meaningful impact. While the price differential is smaller than in the Default Scenario, EU refiners still face higher costs, reflecting the added complexity of sourcing compliant volumes and the trade flow adjustments required to maintain supply.

Figure 26: Regional weighted average refinery crude oil prices. (Base Case was published in April 2025.)



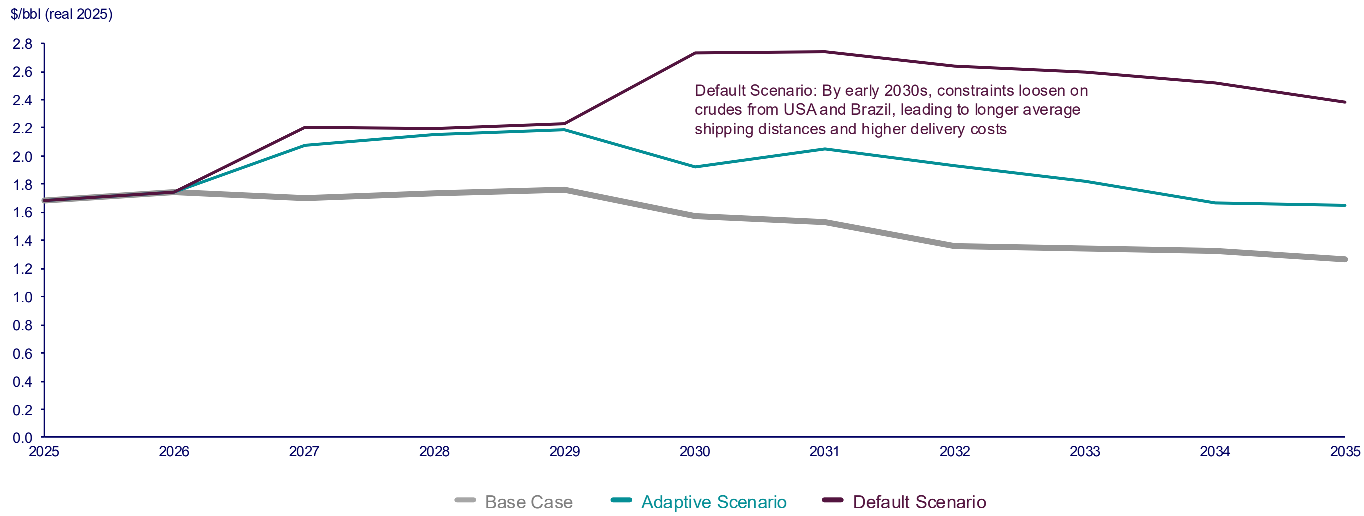
The limited availability of compliant crude under MER forces EU refiners to source barrels from a narrower set of suppliers, often located farther from traditional trade routes. This shift results in longer shipping distances and higher delivery costs, adding another layer of competitiveness challenges for EU refiners.

In the Default Scenario, shipping costs rise sharply, peaking at nearly $2.6 per barrel in the early 2030s—well above the Base Case baseline of around $1.6 per barrel. These increases reflect the need for EU refiners to draw compliant crude from more distant sources once constraints tighten. Although costs decline slightly after 2032, they remain elevated compared to historical norms.

The Adaptive Scenario moderates these impacts but does not eliminate them. Shipping costs still increase to approximately $2.0 per barrel in the late 2020s, driven by partial reliance on longer-haul supply routes. While less severe than the Default Scenario, these costs represent a meaningful burden for EU refiners operating under compliance constraints.

Beyond cost implications, longer shipping distances could inadvertently raise greenhouse gas emissions from transport, offsetting some of the climate benefits of methane reductions in the near term. This underscores the importance of considering full lifecycle emissions when implementing the policy.

Figure 27: EU crude oil shipping cost, refinery volume-weighted average. (Base Case was published in April 2025.)



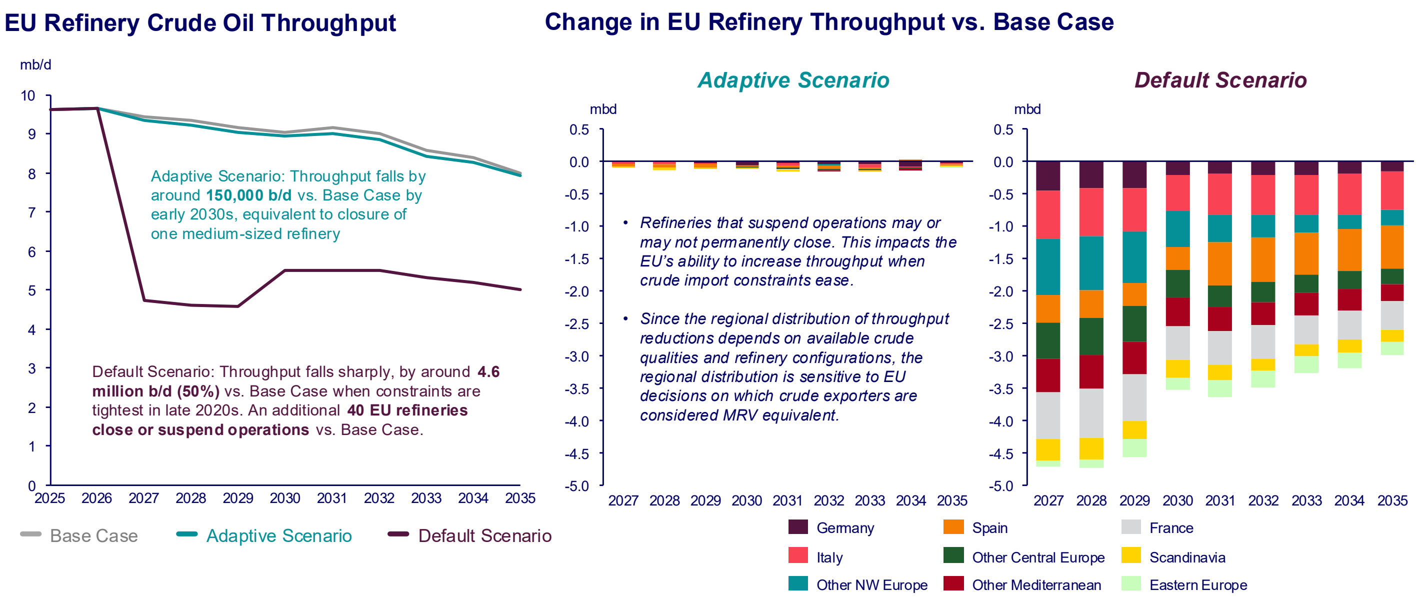
Overall, these findings underscore that compliance-driven supply constraints raise absolute and relative costs for EU refiners and erode their competitiveness against other refining regions, potentially reshaping global refining economics and trade flows. The limited availability of compliant crude and rising feedstock prices for EU refiners leads to a significant loss of competitiveness for EU refiners. This forces EU refiners to reduce throughput, with competitively weaker sites most affected.

Refinery throughput and crude quality

In the Default Scenario, throughput declines sharply by approximately 4.6 mb/d—a dramatic reduction of about 50% compared to the Base Case—by the late 2020s when compliance constraints are most severe. The Adaptive Scenario mitigates these impacts but still results in a throughput decline of around 150,000 b/d by the early 2030s, roughly equivalent to one medium-sized refinery.

Regional analysis reveals that the burden of throughput reductions is unevenly distributed. These reductions reflect the mismatch between available compliant crude qualities and existing refinery configurations, which limits the ability of EU refiners to maintain operations even when some compliant supply becomes available. These regional disparities underscore the vulnerability of simpler refinery configurations to shifts in available crude qualities, particularly the lack of available light-sweet crudes.

Figure 28: EU refinery throughput impacts. (Base Case was published in April 2025.)



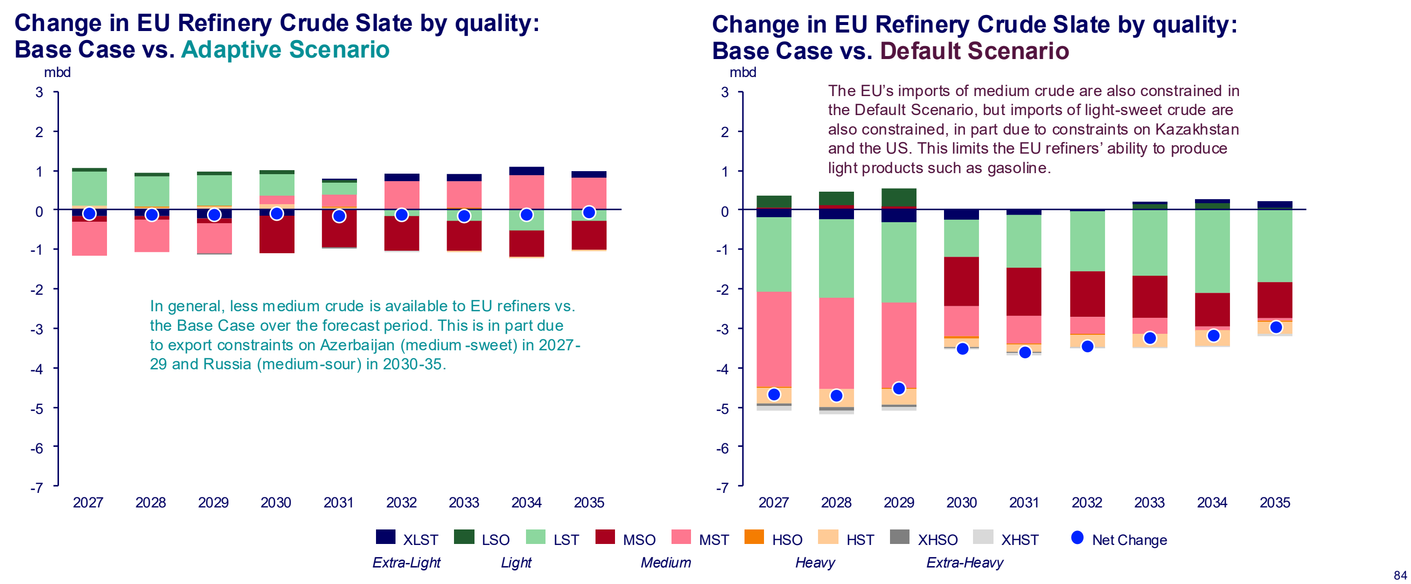
The scenario analysis reveals a significant shift in the crude slate available to EU refiners under MER, with implications for product yields—particularly gasoline and naphtha.

In the Default Scenario, imports of medium crudes are constrained, and access to light-sweet crudes—critical for producing lighter products such as gasoline and naphtha—is sharply limited due to restrictions on exports from regions such as Kazakhstan and the United States. This constraint significantly reduces the EU's ability to produce light products, contributing to tighter supply and higher crack spreads relative to other products.

By contrast, the Adaptive Scenario presents a more moderate challenge. EU refiners experience a smaller reduction in medium crudes compared to the Base Case, largely due to export constraints from regions such as Azerbaijan (medium-sweet) in 2027–2029. While these changes still require operational adjustments, they are less severe than in the Default Scenario and allow for greater flexibility in maintaining product output.

These scenario modelling results show compliance-driven supply constraints not only affect total throughput but also alter the quality mix of available crude, with downstream consequences for product markets and refinery economics.

Figure 29: Impact on EU refinery crude slate (SO=Sour, ST=Sweet). (Base Case was published in April 2025.)



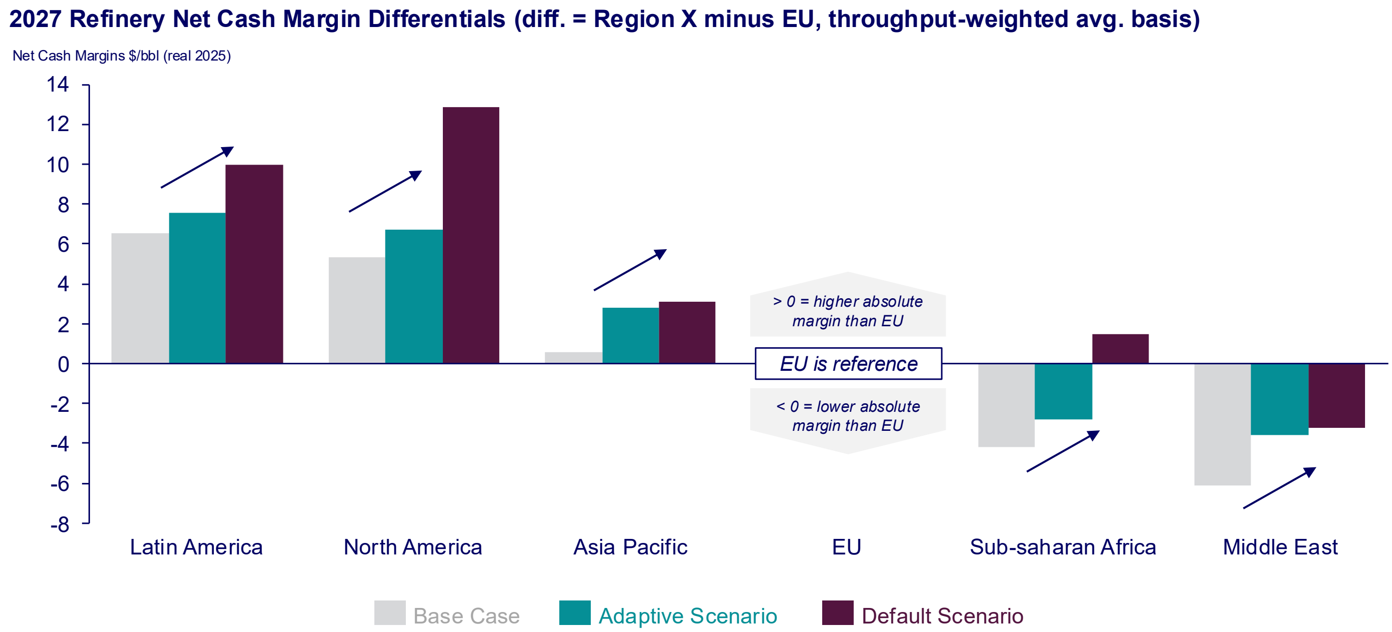
Refining margins and product prices

The analysis shows that EU refiners' margin competitiveness deteriorates significantly under MER, particularly in the Default Scenario. In the scenario modelling, North America benefits the most, as US Gulf Coast refiners expand product exports to a high-priced EU market where most products are priced on an import-parity basis. This dynamic allows North American refiners to capture higher margins relative to EU refiners. Asian and Middle Eastern refiners also gain, though to a lesser extent, as a large portion of their output continues serving regional markets with smaller price increases. Overall, the margin gap between EU refiners and their global counterparts widens substantially, eroding EU competitiveness.

The Adaptive Scenario moderates these effects but does not eliminate them. While EU refiners still face higher crude costs and compliance burdens, the relative margin disadvantage compared to other regions is smaller than in the Default Scenario. Nevertheless, regions with more flexible crude supply options continue to enjoy a competitive edge over EU refiners.

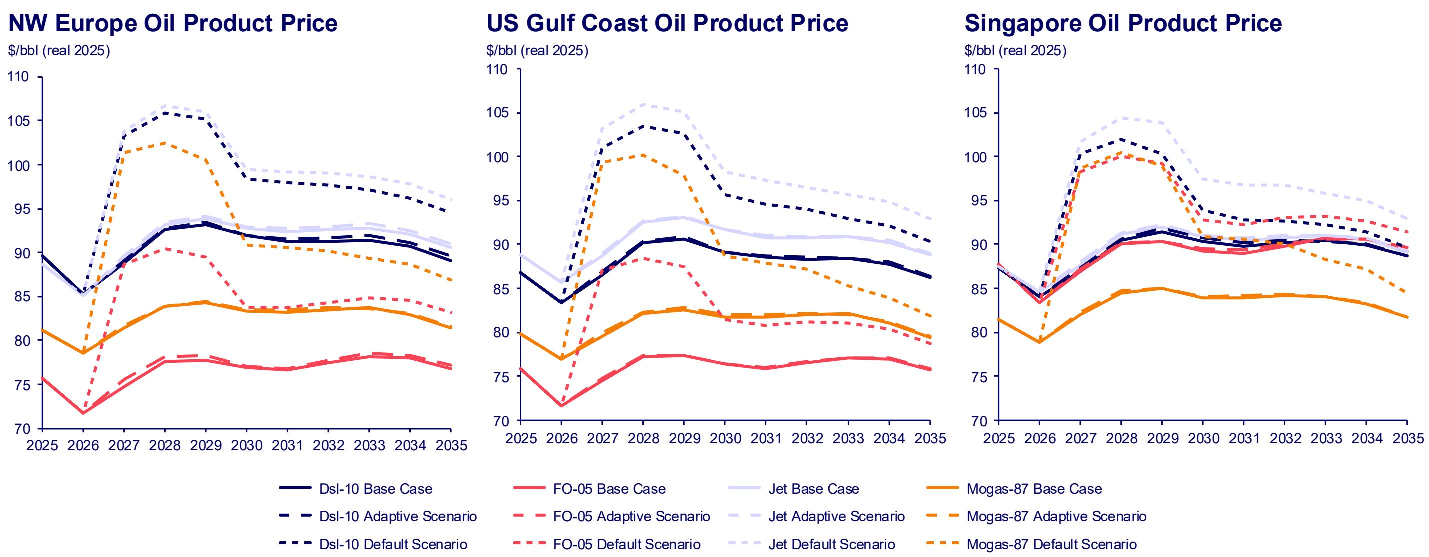
These findings underscore that compliance-driven cost pressures not only affect absolute profitability but also shift global refining economics, favoring regions with more flexible access to feedstock and less stringent regulatory requirements.

Figure 30: Relative regional refining margins vs. EU. (Base Case was published in April 2025.)



The scenario models show that MER significantly increases oil product prices in the EU, with ripple effects across global markets. In the Default Scenario, sharply reduced EU refinery throughput leads to a reduction in the quantity of EU-produced fuels. This negative supply shock, combined with higher feedstock costs, leads to significantly higher refined product prices. By the late 2020s, gasoline prices in Northwest Europe are approximately 24% higher and diesel prices about 16% higher than they could be in the absence of MER. Consumers would bear the burden of higher fuel prices if MER is implemented in this way, and feedstock supply to the chemical industry would be severely impacted. The Adaptive Scenario moderates these impacts significantly, with gasoline and diesel prices both around 1% higher compared to the Base Case.

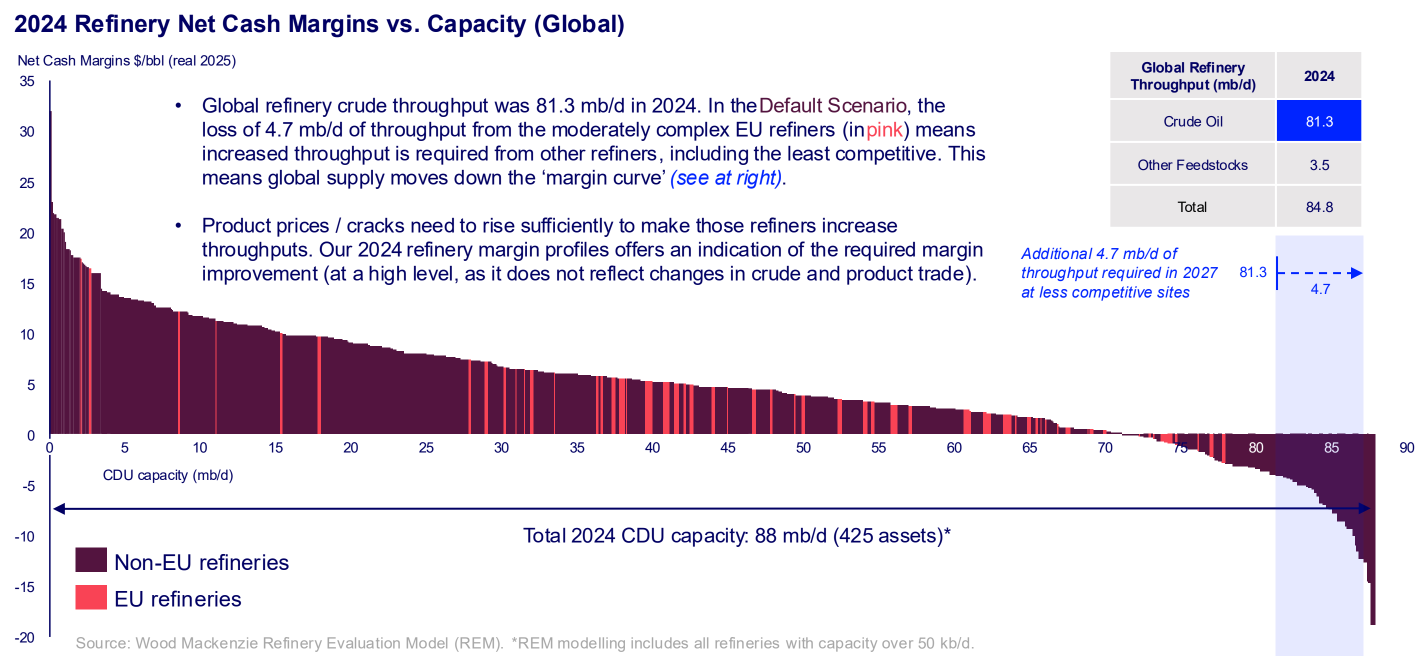
Figure 31: Oil product prices in regional pricing hubs (Dsl-10 = Diesel, FO-05 = Fuel Oil, Mogas-87 = Gasoline). (Base Case was published in April 2025.)



Importantly, developments in the EU triggered by MER do not remain isolated. Because oil products are globally traded commodities, the loss of EU refinery supply raises product prices globally, including in other refining hubs such as the US Gulf Coast and Singapore. These higher product prices are required to incentivize refiners in other regions to increase utilization rates and increase exports to the EU to compensate for the EU's supply shortfall. A significant price increase is required to create this incentive, since some of the refiners increasing utilization currently achieve relatively low margins.

The figure below illustrates this required margin improvement with the 2024 global refinery Net Cash Margin curve (at a high level, as it does not reflect changes in crude and product trade). Global refinery crude throughput was 81.3 mb/d in 2024 (only including refineries with capacity greater than 50,000 b/d). In the Default Scenario, the loss of 4.7 mb/d of throughput from the moderately complex EU refiners (in pink) means increased throughput is required from other refiners, including the least competitive. This means global supply moves down the 'margin curve', requiring higher product prices to incentivise these refineries to increase their utilisation.

Figure 32: Loss of EU throughput requires higher throughputs in other locations, often from less competitive refiners



Sensitivity of demand to initial product prices increases

The analysis indicates that refined product price outcomes are highly sensitive to assumptions about oil demand response. The crude oil scenario modelling assumes a fixed demand outlook in each scenario. When we re-ran the Default Scenario but allowed oil demand to fall in reaction to the initial crude and product price spike, the resulting equilibrium price increases are approximately 50% smaller than in the original Default Scenario.

Across all three regional pricing hubs assessed—Northwest Europe, the US Gulf Coast, and Singapore—the Demand Sensitivity Case yields substantially lower 2027 refined product prices than the Default Scenario. This reduction is consistent across major product categories (diesel, fuel oil, jet, gasoline), demonstrating that price elasticity of demand is a critical driver of refined product price formation.

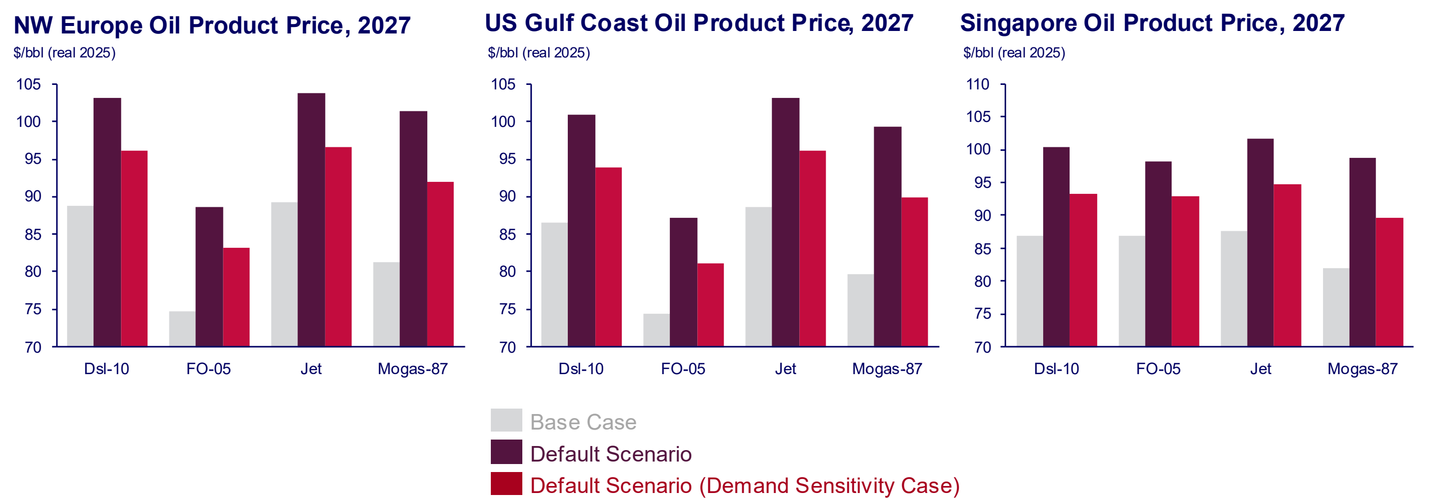
The sensitivity test applied a price-elasticity assumption whereby a $1/bbl increase in product price reduces oil demand by 100 kb/d (0.1%). Under this mechanism:

- EU oil product demand declines by 2%, reflecting the high gross product value increases (~$17–20/bbl) under the default case.

- Rest-of-world demand declines by 1.5%, consistent with gross product value increases of ~$13–15/bbl outside the EU.

These modelled reductions in demand could significantly moderate the upward pressure on global product prices, but it is critical to note that a decline in oil demand of this magnitude would typically only be observed during a broader economic recession, when macroeconomic contraction suppresses industrial activity, transportation demand, and overall energy consumption.

Figure 33: Oil product prices in regional pricing hubs (modelled Demand Sensitivity Case). (Base Case was published in April 2025.)



EU refined product trade flows

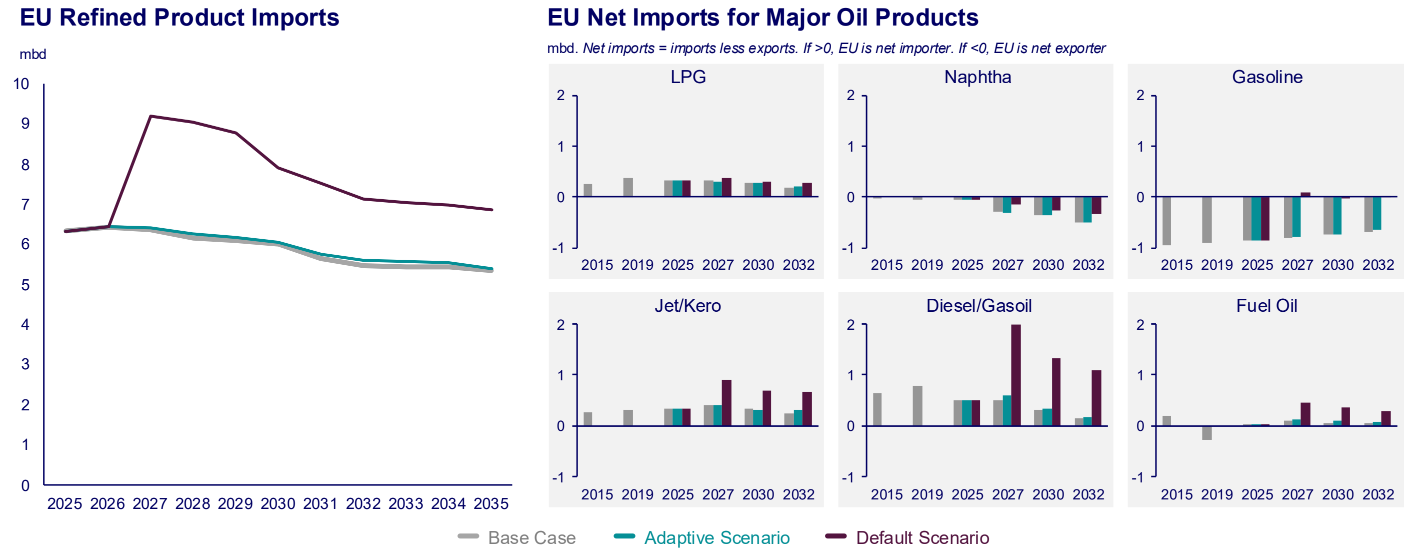
The scenario analysis shows that MER triggers a profound shift in EU fuel trade patterns, driven by reduced domestic EU refining capacity. In the Default Scenario, EU fuel exports decline while imports surge to compensate for lost throughput. In 2027 oil product imports climb from around 6.4 mb/d in the Base Case to over 9 mb/d, creating a substantial increase in import dependency. This shift translates into fuel import costs more than $17 billion higher than they would be in the absence of MER, adding significant financial pressure to EU markets.

One of the most notable changes is the EU's transition from a major exporter to a net importer of gasoline. Under the Default Scenario, gasoline prices are set on an import-parity basis, which is significantly higher than the export-parity prices that prevail in the Base Case when the EU is a net exporter. This structural change in pricing dynamics amplifies cost impacts for consumers and industry. Diesel and jet fuel net imports also climb to record highs, reflecting the inability of EU refiners to maintain output for key transport fuels.

The Adaptive Scenario exhibits similar trends but to a lesser degree. Imports rise to offset reduced domestic supply, though the magnitude of the increase and associated cost impacts are smaller than in the Default Scenario. Nevertheless, the EU remains exposed to higher import reliance and elevated fuel prices compared to the Base Case.

Overall, these developments underscore that MER-driven constraints on refining capacity not only reshape EU trade flows but also impose significant economic costs, while influencing global product markets through increased demand for imports from other refining regions.

Figure 34: Oil product trade shifts. (Base Case was published in April 2025.)



6. Comparison of 2025 vs. 2024 OGMP 2.0 data release

The original analysis modelled the impact of constraints on EU crude oil and natural gas imports based on exporters' assumed compliance with MER requirements. These constraints were derived using the 2024 OGMP 2.0 dataset as a key input.

Following completion of the analysis in mid-2025, UNEP released the 2025 OGMP 2.0 dataset in October 2025. An initial review indicated a modest increase in the number of companies reporting at Level 5—the highest standard in the OGMP framework—suggesting that equivalence with MER requirements may have improved slightly. Wood Mackenzie assessed whether this progress, along with new OGMP participants, would materially alter import constraints and the associated impacts on supply security and pricing. This review informed discussions with project sponsors on whether a full re-run of the scenario models was warranted.

Summary of Findings

The 2025 dataset showed a limited increase in Level 5 achievement, rising to an estimated 6% of gas and 7% of crude oil production globally, compared with 3% for both gas and crude oil in the previous year. Several new companies joined OGMP, notably from Bahrain and Oman, with smaller gains elsewhere. Most compliance improvements occur in the 2027–2029 period, after which impacts plateau, as the original forecast already assumed most OGMP member companies would reach 100% Level 5 by the early 2030s. However, this does not necessarily mean all production at a country level reaches 100% Level 5, since current OGMP member companies represent a limited share of production in most countries.

For both gas and crude oil, the effect of the 2025 dataset on compliant supply was marginal, after accounting for both OGMP Level 5 achievement and our existing assumptions for traceability:

- **Gas:** By 2027, around 195 bcm of compliant supply was available based on the 2024 dataset, while 237 bcm was available based on the 2025 dataset. For reference, our Reference Case forecast for EU demand is 326 bcm.
- **Crude oil:** By 2027, 5.13 million b/d of compliant supply was available based on the 2024 dataset, while 5.83 million b/d was available based on the 2025 dataset. For reference, our Reference Case forecast for EU refinery demand for crude oil (throughput) is 9.44 million b/d.

Even with these updated assumptions, compliant volumes in the Default Scenario remained well below EU Base Case demand. The incremental progress did not materially change the study's key findings: significant risk of non-compliant imports persists from 2027 onward. Consequently, the analysis concluded that re-running the scenario models was unnecessary.

The modest progress in OGMP level observed between 2024 and 2025 supports our assumption that moving to the next OGMP levels (e.g. from 3 to 4 and from 4 to 5) requires more than 1 year.

7. MER implementation challenges: traceability, certification, and methane intensity

To interpret the scenario results and their policy relevance, this chapter situates MER's technical requirements within the practical realities of measurement systems, market logistics, and data quality. It explains some of the practical hurdles importers and exporters need to overcome and where uncertainty or implementation friction is most likely to arise.

7.1 Traceability and producer identification across complex supply chains

Traceability is the operational bridge between upstream MRV and downstream compliance; without it, even high-performing producers cannot reliably translate their MRV status into market access.

Under MER, the ability of importers to demonstrate compliance depends not only on producer performance but also on importers' ability to identify producers in complex global supply chains. This is a requirement that is often technically and commercially challenging to meet.

For both natural gas and crude oil, EU importers face significant challenges in identifying the original producer and obtaining the required methane emissions data. Even where upstream operators are fully compliant with MRV and reporting requirements, the physical and commercial structure of global commodity markets can obscure origin information before the product reaches the EU. Commingling, blending, and virtual trading mean that the physical cargo received by an importer has no one-to-one correspondence with the contractual or certified origin. This complexity can result in a loss of chain of custody, preventing importers from demonstrating origin-specific compliance, even where the producer itself has met all regulatory requirements.

In crude oil, multiple ownership changes, blending in terminals or storage tanks, and aggregation from various fields make it difficult to trace a shipment to a specific producing asset. Key trading hubs such as Rotterdam and Fujairah often blend multiple cargoes into fungible grades, erasing direct links to the original source. In piped gas, transit through multiple countries and operators reduces visibility on the upstream origin, while LNG supply chains can involve blending during liquefaction, storage, or "virtual" portfolio trading by intermediaries. These portfolio transactions, including cargoes that draw from multiple countries, can make it impossible for buyers to tie the product to a single compliant field, even if it meets the highest OGMP 2.0 standards.

Because physical segregation is rarely possible at scale, the literature points to certification-based solutions to carry verified methane attributes across commingled systems—our next focus.

7.2 Emerging traceability systems and their limitations

This section explains the practical options for connecting verified upstream performance to importer claims, clarifying some of the assumptions used in our scenario drivers.

Several emerging systems are facilitating the shift toward certified low -methane supply chains. The OGMP 2.0 Framework provides the essential high -integrity MRV data required for certification. This data is used by certification schemes to issue certificates for the low -methane attribute.

However, these systems are highly nascent, and their implementation presents varied challenges:

- **Book-and-claim** is the least challenging to implement as it requires only a digital registry and contractual agreements, making it suitable for market -based claims, but it faces integrity challenges due to the decoupling of the physical product from the claim.

- **Constrained book-and-claim** is a medium -term prospect, requiring investment in platforms/registries and audit processes to allow certification of verified production and transport/transit of gas/crude. It offers a balance between feasibility and robust auditing of long/complex supply chains.

- **Full trace-and-claim** for commingled commodities like LNG or crude is a long -term, almost infeasible prospect, as it would require unprecedented, costly segregation and verification systems across complex global infrastructure involving all actors along supply chains.

Figure 35: Summary of emerging traceability solutions for certified products

Traceability System	Tracking Method	Physical Segregation	Key Use Case
Book-and-Claim	Contractual / Credit-Based	Not required	The environmental claim (credit) for a certain volume is separated from the physical product and traded/redeemed with (for example) importers.
Constrained Book-and-Claim	Credit-based with Verification	Not required	Certification of key steps in chain along commingled systems (production, transport, transit, exits etc.), tradeable certificates from specified regions.
Full Trace-and-Claim	Physical Segregation	Required	The certified product (e.g., low-methane gas molecules) is kept separate from non-certified product from source to destination.

Certification transforms MRV data into market-facing claims. The next section evaluates what certification can (and cannot) do for MER compliance.

7.3 Role of certification schemes in supporting MER compliance

To align with MER's third-party verification and transparency goals, certification acts as the vehicle that packages verified MRV data into usable compliance artifacts for importers.

These schemes can provide emissions data and assurance at a batch or portfolio level, offering a structured way for producers and traders to demonstrate compliance with methane performance standards, and potentially giving EU importers access to verified data even when direct supply chain traceability is incomplete.

MRV reporting frameworks such as OGMP 2.0 (and in future, CEN/ISO) define what to measure and how to report methane emissions. Verification protocols currently under development aim to ensure this is done in a consistent manner that allows for independent assurance by verifiers such as Bureau Veritas, DNV, or Ramboll. Certification service providers like MiQ or Project Canary then review these verified reports and apply their own scoring systems (e.g., MiQ grades A –F) or labelling criteria to produce a market -facing methane performance certification at the company or asset level.

In doing so, certification can support MER compliance or equivalence demonstration in three main ways:

- **Verification** – Providing the third -party verification of methane data required by MER.
- **Traceability** – Certification of oil or gas volumes will help importers to link verified shipments/supplies to producers.
- **Standardisation** – Applying widely recognised metrics, such as methane intensity, which can act as accepted proxies for compliance.

However, applying such schemes across both gas and crude markets presents several challenges. First, differences in methodologies, standards, and verification practices reduce comparability across schemes. Second, certification coverage remains low and uneven; it will take time before these options are available for gas and crude production in all exporting countries, and participation is likely to grow only gradually. Third, the lack of clarity on which schemes will be accepted by EU Member States continues to limit their broader adoption by market participants.

Overall, certification is an efficient option to allow importers to connect with a producer for a verified amount of gas and crude when the producer cannot be identified through the transactional supply chain. For a regulatory framework like MER to function effectively, certification systems would need minimum standards/methodologies, broad participation, and robust processes and platforms/registries capable of securely handling the transfer of methane attributes and reports.

Certification can only standardize what is measured. The next section examines methane intensity itself—its definition, variability, and what that means for compliance thresholds in the model.

7.4 Methane intensity: concepts, variability, and comparability

Because the scenarios ultimately hinge on performance thresholds and data credibility, we assess how consistent and comparable methane intensity (MI) metrics are today.

Methane intensity (MI)—emissions per unit of oil or gas production—is central to future MER requirements.

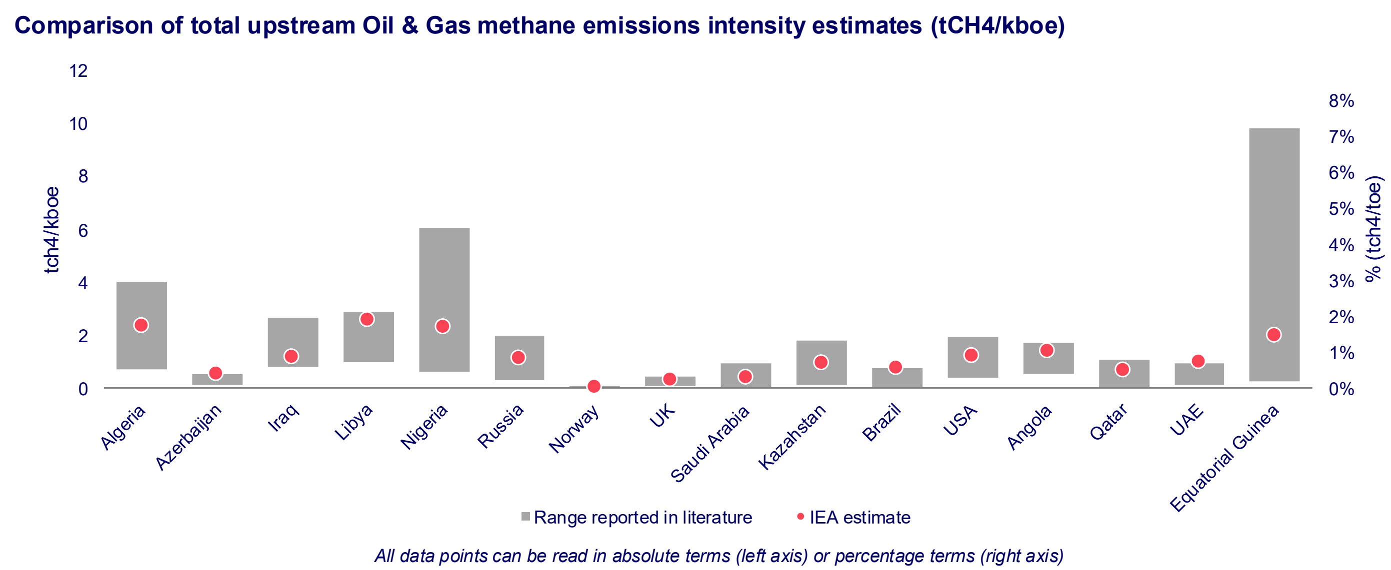
Yet there is substantial variation in reported methane intensity (MI) values across jurisdictions and data sources, reflecting differences in measurement methodologies, data granularity, reporting frequency, and the presence—or absence—of third-party verification. For example, some producers rely on engineering estimates or national inventories, while others report site-level measurements supported by independent verification. This lack of standardization extends to definitions and system boundaries (e.g., upstream-only versus full supply chain) and to allocation methods for installations producing both crude oil and natural gas, further complicating comparability.

As a result, interpreting and comparing methane intensity across producers and countries remains highly challenging. This variability has important implications for compliance with MER, particularly as importers will be required to report and eventually meet maximum MI thresholds. Establishing a transparent, consistent methodology for MI calculation—planned by the European Commission by 2027—will be essential to ensure a level playing field and support credible emissions reductions.

Current data gaps and implementation challenges mean that it remains uncertain whether MER's objective of obtaining comprehensive, country-level methane intensity data by 2030 can be achieved. Published estimates show wide variation at the country level and likely even greater dispersion at the asset level. Only once sufficiently robust and representative data are available—covering the majority of export sources and applying a standardized methodology—can meaningful MI thresholds be defined and enforced.

The chart below shows the range of MI estimates for key countries from the range reported in literature. High MI is more likely in environments featuring substantial associated-gas production, predominantly onshore operations across wide geographies, unconventional resource development, high flaring intensities, lower regulatory oversight, greater prevalence of NOCs or small independents, and ageing infrastructure. When several factors co-exist, the likelihood of elevated MI rises—even though magnitudes remain uncertain without rigorous measurement.

Figure 36: Variability in methane emissions estimates for upstream oil and gas operations



8. Conclusions

Implementation of MER under the Default Scenario could severely constrain the EU's ability to import natural gas and crude oil, creating a significant supply shortfall. This could lead to unprecedented increases in energy prices, closures of EU energy-intensive industries and loss of EU jobs and tax revenues, increases in refined fuel imports and costs to EU consumers, increases in GHG emissions, and severe logistical bottlenecks and disruptions. The ripple effects of these changes could extend beyond Europe, impacting global markets and driving up energy prices in Asia and other regions.

Meanwhile, MER introduces significant compliance challenges for importers and producers, with implications for supply security, pricing, and competitiveness of EU businesses. While robust MRV frameworks and certification schemes offer pathways to compliance, gaps in traceability and methane intensity data remain critical barriers. Current variability in reporting standards and limited adoption of OGMP 2.0 Level 5 suggest that achieving full equivalence by 2027 will be difficult without modifications to regulatory requirements, flexibility in enforcement, and accelerated industry action. Establishing rules that better reflect market readiness, standardized methodologies for methane intensity and scaling credible certification systems will be essential to meet MER objectives while minimizing market disruption. Ultimately, coordinated efforts between regulators, producers, and certification bodies will determine whether MER can deliver meaningful emissions reductions without compromising energy security.

9. Appendix

9.1 Additional detail on proprietary Wood Mackenzie tools and methodologies

Below we have provided illustrative examples and details on the proprietary Wood Mackenzie tools and methodologies used for this analysis.

Global Gas Model

Figure 37: Wood Mackenzie's Global Gas Model (GGM) lets users identify opportunities, mitigate risks and aid investment strategies by understanding global and inter-regional gas dynamics, pricing and flows under user defined scenarios

1,000 contracts

200 Regas Nodes

1,000 demand

16,000 pipeline and shipping routes

>2,000 supply

200 liquefaction

Forecasts for sectorial demand & potential supply, infrastructure, contracts & player behaviour out to: **2050**

Full training programme provided, supported with on-going access to analysts

Clear and comprehensive suite of output reports

Can be run on a monthly, quarterly, half-yearly or annual basis

Use it to:

- Input your own proprietary information to develop bespoke scenarios
- Produce market prices at which incremental demand and supply are in equilibrium
- Identify timing and markets for future supply developments
- Identify likely competitive market conditions and price linkages between markets
- Carry out sensitivity analyses to assess the key risks facing your business
- Match supply to demand globally, on a seasonal basis, via least cost linear programming (LP) optimisation

Figure 38: Wood Mackenzie's Global Gas Model (GGM) matches demand/supply through appropriate infrastructure to define equilibrium prices

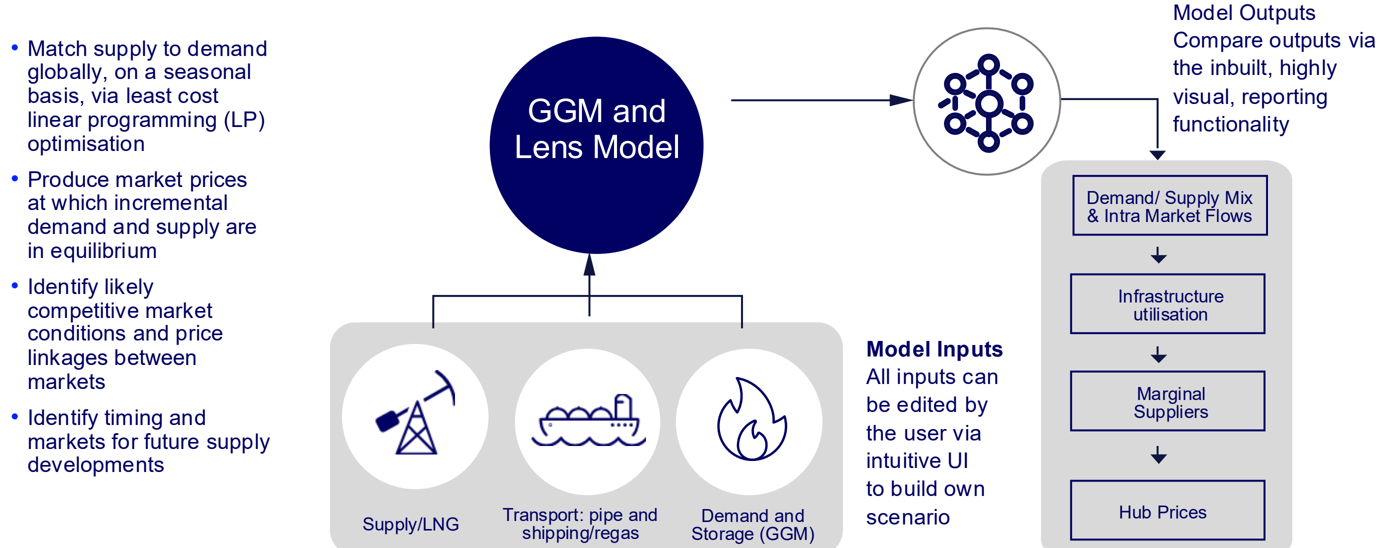
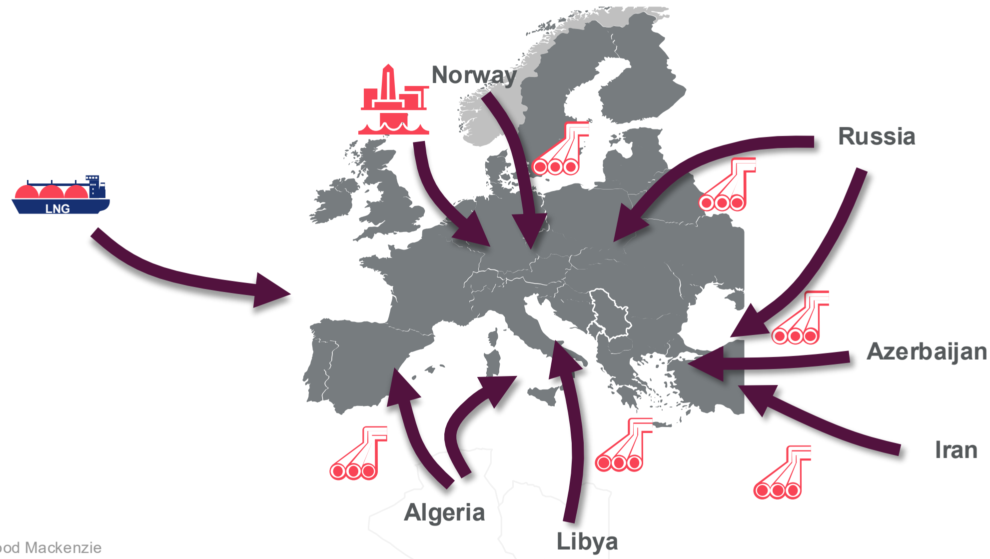


Figure 39: Wood Mackenzie's Global Gas Model (GGM) provides a detailed supply-demand balance for each gas market. The European balance in the GGM considers LNG, international piped flows and indigenous production. The model incorporates piped-flows dynamics from Algeria, Azerbaijan, Iran, Libya, Norway and Russia into Europe as well as all LNG import terminals and internal EU pipelines.



Source: Wood Mackenzie

Refinery Supply Model

Figure 40: Refinery Supply Model (RSM) with petrochemicals expansion module lets users make informed investment decisions by building your own view of global crude, refined product and petrochemicals markets with scenario modelling capability

Cloud based, linear optimisation model using a cost minimisation approach

Base case dataset provided with **fully editable inputs,** including:

- Regional **refined product** and **petrochemical demand**
- **Crude supply** by region & quality
- **Refinery and petrochemical site capacity** by individual process unit
- **Build new capacity** and **shut capacity down**
- **Trade routes** and **costs**
- **Carbon costs** by site

>600 refineries, 200 integrated sites and >1000 chemical assets sites modelled **to exact unit capacities**

Coverage of **refined products, aromatics, olefins & polyolefins**

Coverage of 300 North American pipeline and terminal connections

Use it to:

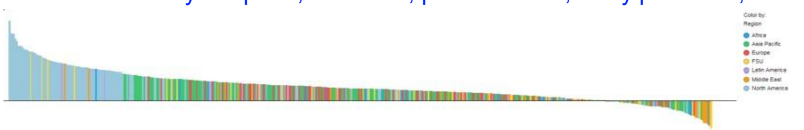
- Assess regional impacts & benchmark individual site competitiveness under a range of market scenarios
- Examine evolving trade patterns and regional product balances under various demand scenarios
- Understand the full impact of supply, demand and investments changes across the integrated refinery-petrochemical value chain
- Assess the value of petrochemical integration for refining assets and impact on refinery rationalisation
- Assess the impact of carbon legislation on trade flows and site competitiveness
- Understand North American midstream dynamics & impacts of investments on crude flows

Figure 41: Refinery Data Tool (RDT) is a Refinery stream composition tool based on our Refinery Evaluation Model and PetroPlan asset level models.

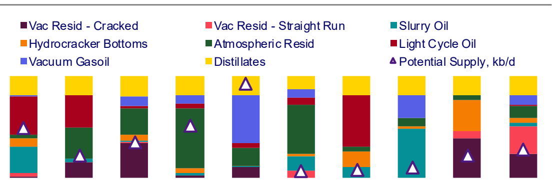
500* detailed refinery input, output, and economics

Benchmarking on 140+ metrics

Rank refineries by net profit, feed cost, product sales, utility purchase, etc…



Detailed component supply and potential regional product blends, quality and production volume



Use it to:

- Assess detailed asset level outputs from our balanced refinery models
- View detailed base year refinery input, output and financial data from our refinery simulation tool
- Analyse refinery unit output and intermediate product qualities and availability
- Evaluate global product production by asset, by grade and modelled specification and blend
- Understand component availability to estimate product supply potentials (e.g. VLSFO supply, fuel regulation change readiness)
- Understand themes and trends impacting refining economics, including utilities consumption, balance, and costs

Figure 42: The Refinery Supply Model (RSM) is a least cost optimiser solving for the most efficient possible way to meet global oil product demand

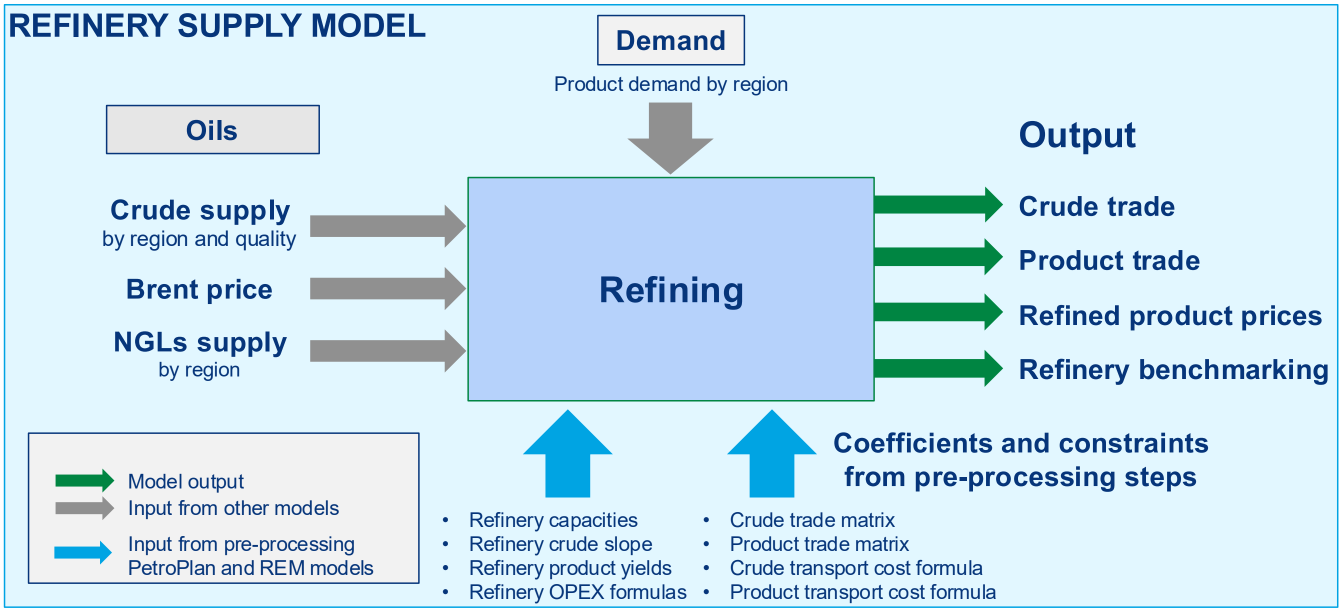


Figure 43: The Refinery Supply Model (RSM) optimises refinery asset outputs to meet global refined product demand

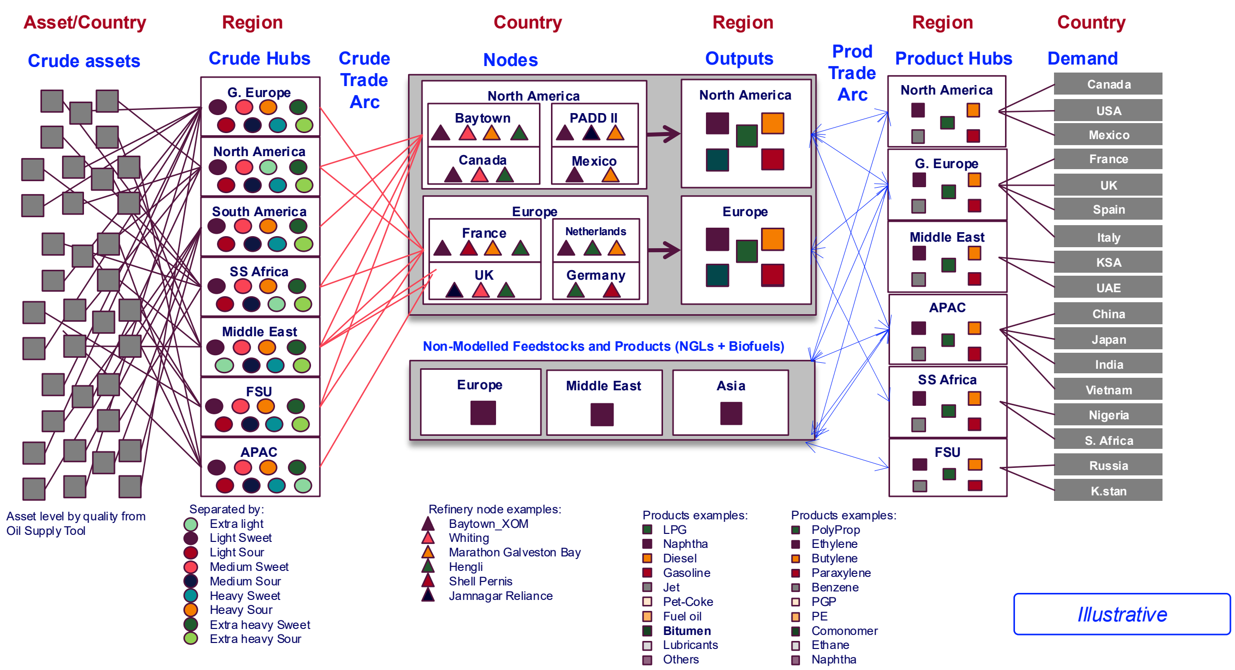


Figure 44: Crude types used in the Refinery Supply Model (RSM). RSM defines around 150 crude types based on region of origin and quality. These crude types can be mapped onto actual marketed crude streams

Property	Range	Category Codes	Descriptor
Country / region of origin			
API Gravity	< 20	XH	Extra Heavy
	20 – < 28	H	Heavy
	28 – < 38	M	Medium
	38 – < 51	L	Light
	≥ 51	XL	Extra Light
Sulfur Content	≥ 1 wt%	S / SO	Sour (High S)
	< 1 wt%	ST	Sweet (Low S)

9.2 Glossary of technical abbreviations

Units & Measurement

- **mb/d** – Million barrels per day
- **kb/d** – Thousand barrels per day
- **boe** – Barrels of oil equivalent
- **bcm** – Billion cubic metres
- **MMBtu** – Million British Thermal Units
- **tCH_4/toe** – Tonnes of methane per tonne of oil equivalent
- **tCH_4/kboe** – Tonnes of methane per thousand barrels of oil equivalent

Energy Markets & Infrastructure

- **LNG** – Liquefied Natural Gas
- **LPG** – Liquefied Petroleum Gas
- **CDU** – Crude Distillation Unit
- **TTF** – Title Transfer Facility (EU gas benchmark spot price)
- **NWE** – North-West Europe
- **CEE** – Central & Eastern Europe

Crude & Product Quality Terminology

- **LS / LST** – Light Sour / Light Sweet
- **MS / MST** – Medium Sour / Medium Sweet
- **HS / HST** – Heavy Sour / Heavy Sweet
- **EL** – Extra Light
- **EH** – Extra Heavy
- **Dsl-10** – Diesel 10 ppm sulphur
- **FO-05** – Fuel Oil 0.5% sulphur
- **Mogas-87** – Gasoline 87 octane

Regulation, Policy & Compliance

- **MER** – Methane Emissions Regulation

- **MRV** – Measurement, Reporting and Verification
- **LDAR** – Leak Detection and Repair
- **SoS** – Security of Supply

Methane Reporting Frameworks

- **OGMP 2.0** – Oil & Gas Methane Partnership methane reporting framework
- **Level 1–5** – OGMP 2.0 reporting tiers (Level 5 = highest standard)
- **L4 / L5** – Shorthand for OGMP 2.0 Level 4 or Level 5 reporting
- **MI** – Methane Intensity

Organisations / Standards Bodies

- **UNEP** – United Nations Environment Programme
- **IEA** – International Energy Agency

Wood Mackenzie Models & Proprietary Tools

- **GGM** – Global Gas Model
- **RSM** – Refinery Supply Model
- **REM / REM-Chem** – Refinery Evaluation Model / Refinery-Chemicals Evaluation Model
- **RDT** – Refinery Data Tool
- **Lens** – Wood Mackenzie Lens Upstream database

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