

FUTURE OF FUELS

Novi Labs Outlook for Crude Oil, Refined Products, Biofuels and EVs

SAMPLE

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Introduction

This is the 8th edition of our Future of Fuels – Crude Oil, Refined Products, Biofuels and EVs report. As with the previous seven editions (released in January/July 2023, February/July 2024, February/July 2025 and February 2026), the report's purpose is to provide decision makers an important analytical tool to navigate the turbulent markets ahead for liquid fuels – both petroleum-based and biofuels.

- Geopolitical developments over the last several months have resulted in one of the most chaotic and unstable environments for petroleum markets in the last 50 years, rivaled only by the OPEC oil embargoes of the 1970s, the global financial crisis in 2009 and the COVID lockdown years of the early 2020s.
- The changes started with the removal of Maduro in Venezuela in early January, but the major disturbance started when the U.S. began its attacks on Iran on the last day of February. While the damage to regional energy facilities has been significant, the largest impact by far has been the closure of the Strait of Hormuz, mostly stopping the flow of one-fifth of global crude oil and LNG along with millions of barrels of refined products. On-again, off-again talks to resolve the conflict have added a great deal of uncertainty.
- New developments in the continuing Russian/Ukraine war provide additional stress to markets, especially the rapidly accelerating damage Ukraine has inflicted on Russian refineries, resulting in throughputs hitting decadeslong lows and the loss of well over 2 MMb/d (and growing) of refined products. Chinese responses to these events and a variety of other global developments also continue to add uncertainties. Less immediately impactful – but perhaps among the most major long-term changes – was the exit of the UAE from OPEC in May, which we expect to have many knock-on effects in the market.
- These new developments add to the many factors and trends which will continue to impact markets over the short and long terms. Even among carryover issues, shifts are taking place. As we noted in our previous report, reality continues to change views on climate-change policies, delaying energy transition goals.

The Future of Fuels report considers all ongoing and potential developments and trends and incorporates them into a realistic analysis to provide detailed, quantitative forecasts for the direction of all key components of liquid fuel energy markets over the next 25 years.

- Included are detailed price forecasts for all relevant commodities: crude oil, refined products, biofuels, intermediates/other feedstocks and regulatory credits.
- Also included are detailed forecasts for refined product demand, petroleum refining and biofuels production capacity changes, EV penetration, biofuels demand, U.S. crude demand/refined product supply balances, and U.S./Canadian crude production.

This report will continue to be issued on a biannual basis in late January/early February and July.

- Both reports will provide a full refresh and update of all our regional and global analyses of supply, demand, prices and all other data sets included in Future of Fuels.
- In future editions we will cover additional developments related to potential new fuel sources such as hydrogen, ammonia and other “green” alternatives as they become more relevant in the global supply chain.

Near-Term Supply Shocks Recasts Our Outlook – Product Shortages More Critical Than Crude

In our February report we highlighted the potential for a major shakeup in global energy markets due to geopolitical events. We issued that report just before the U.S. initiated attacks on Iran at the end of February, so that shakeup has certainly occurred. In fact, energy markets are facing perhaps the most chaotic and unstable environment in the last 50 years, with major disruptions/changes coming from multiple hot spots – the Iran conflict, Russia/Ukraine war and government change in Venezuela, among others.

Clean-product markets are being impacted in a much greater way than crude markets. The closure of the Strait of Hormuz and the Ukrainian attacks on Russian energy infrastructure cut deeply into the supply for both crude and products. However, on a global basis, the world remains comparatively well supplied with crude due the oversupplied state of the market coming into the crisis and the continual withdraws from strategic reserves across the globe. Meanwhile, the refining environment is much tighter and can less afford to lose operable capacity.

Near-Term, Geopolitical-Driven Supply Impacts

- At the peak of the Strait of Hormuz closure, roughly 9 MMb/d of Middle East crude supply was removed from the market. The largest losses were medium- and heavy-sour barrels from countries with limited bypass capacity. Helping to alleviate the losses were the Hormuz bypass-capable portions of Saudi and UAE exports and strong production growth in other regions, including the U.S., Guyana, Argentina, Venezuela (which is already benefiting from the removal of Maduro).
- The product impact from the Iran conflict (both the Hormuz closure and refinery damage) has been perhaps even more consequential). More than 2 MMb/d of Gulf product exports were lost during the closure, while damage at several refineries (BAPCO, SATORP, Ruwais, Mina al-Ahmadi and others) constrains the recovery in clean-product output into 2027.
- Russian refining operations have rapidly declined in the last few months as Ukraine has significantly increased the volume, reach and effectiveness of its drone strikes. Refinery outages have moved from temporary and limited to widespread and long-lasting, with almost all of the major Russian refineries having been hit, many multiple times. Estimated crude runs have fallen from averaging about 5 MMb/d in 2025 to an estimated 3.4 MMb/d in July 2026, a multi-decade low and only 50% of capacity. Targeted damage to key units – CDUs, FCCs, hydrocrackers, reformers, hydrotreaters, storage and export logistics – has degraded clean-product yields even more than overall throughput.
- We believe the crude-price shock peaks (perhaps it already has) before the refining-market shock. As Gulf crude flows return (we assume an eventual end to the Iran conflict), the crude balance moves back toward surplus, but product cracks remain supported by damaged refineries, slow repair schedules, limited spare upgrading capacity and a relatively limited outlook for new capacity additions.
- The principal risks to crude and refining product supply are an extended interruption of Hormuz traffic, new disruptions of flow out through the Bab el-Mandeb Strait due to Houthi attacks, slower refinery repairs, stronger sanctions enforcement against Russia and/or Iran, and further attacks on refining or export infrastructure.

Long-Term Liquids Demand Peaks in the Mid-2040s as Growth Shifts to Developing Economies

The near-term demand shock is temporary, while the long-term outlook is modestly higher than it was in February. Total liquids demand falls by about 0.56 MMb/d in 2026, rebounds by roughly 1.28 MMb/d in 2027 and ultimately peaks in the mid-2040s at about 114.5 MMb/d.

- From 2025-35, global liquids demand grows by about 5.3 MMb/d. Growth then slows to roughly 2.5 MMb/d from 2035-45 before declining by about 0.4 MMb/d through 2050.
- India is the largest source of incremental demand, adding about 6.24 MMb/d by 2050. Africa adds roughly 3.5 MMb/d, Other Asia/Pacific about 2.9 MMb/d and the Middle East about 2.4 MMb/d as population, urbanization and upward mobility outweigh the pace of substitution.
- Developed economies move in the opposite direction. European demand falls by almost 4 MMb/d from 2025-50, Japan declines by about 1.24 MMb/d, and U.S. demand falls to roughly 17.9 MMb/d by 2050 after remaining above 20 MMb/d through the mid-2030s.
- China remains a special case. Demand grows only about 450 Mb/d to a mid-2030s plateau near 17.9 MMb/d, then declines to about 17.2 MMb/d in 2050 as demographics, efficiency and policy offset continued income growth.
- The slower EV path and somewhat higher U.S., Chinese and European demand raise the long-term total-liquids forecast versus February. Even so, EV displacement reaches ~10.6 MMb/d and the implied biofuels wedge reaches about 6.1 MMb/d by 2050.
- Total liquids growth overstates the call on refineries. Ethane, LPG and other non-crude liquids provide a large share of growth, leaving crude- and condensate-derived product demand much flatter than the headline total. As a result, total liquids demand peaks around 114.5 MMb/d in 2045 (vs. 106.7 MMb/d in 2025), total petroleum demand (excluding biofuels) peaks between 2040 and 2045 at around 108.8 MMb/d (vs. 103.3 MMb/d in 2025), and crude + condensate demand peaks in the late 2030s at around 86.2 MMb/d (vs. 85.1 MMb/d in 2025).

Gasoline Softens After 2030; Distillates and Petchem Feedstocks Outperform

The energy transition affects gasoline more directly than freight, aviation and petrochemical feedstocks. The 2026 disruption briefly reverses some normal relationships, but the long-term product hierarchy remains intact.

- Petroleum gasoline/naphtha demand falls by about 105 Mb/d in 2026, then rebounds by roughly 504 Mb/d in 2027. The combined category grows by about 1 MMb/d from 2025-30, supported by naphtha, before growth slows and turns negative after 2040.
- Petroleum diesel is weaker: demand declines by about 272 Mb/d from 2025-30 as European de-dieselization, Chinese fuel substitution and rising RD/BD blending outweigh growth in developing economies.
- Jet fuel is the principal source of middle-distillate growth. Jet demand rises by about 213 Mb/d from 2025-27 and continues to grow over the long term because aviation is harder and more expensive to decarbonize than light-duty transport.
- From 2025-50, total distillate demand increases by roughly 3.6 MMb/d and ethane/LPG demand by about 4.9 MMb/d. Gasoline/naphtha is nearly flat over the full period, while resid and other products decline materially.
- India and Africa dominate long-term gasoline growth, while the U.S., Europe, Japan and eventually China decline. Regional refinery systems must therefore rebalance toward exports, closures or product-yield shifts.
- The near-term distillate premium remains high because of refinery outages, but new capacity is itself distillate-weighted. The USGC ULSD-RBOB regular differential falls from about \$23/bbl in H2 2026 to below \$15/bbl in 2028 before strengthening again longer term.

Net Global Refinery Capacity Growth Remains Near Multi-Decade Lows – Projects Vary by Region and Product Focus

As with the most recent previous tight product market environment in the post-COVID period (2022-23), the current situation is not generating a significant investment response. Net global refinery capacity additions total just over 2.3 MMb/d from 2026-30 — roughly 470 Mb/d per year — despite very strong current margins.

- This is due to the long lead times, high costs, and worries about stagnating demand due to energy transition policies.
- Gross additions on our Probable List through 2030 amount to about 2.8 MMb/d and identified shutdowns about 0.45 MMb/d. While shutdown announcements have dropped after a spate of closures in 2025, additional unannounced closures are likely by 2030.
- India and Africa account for about 60% of net growth. India adds about 900 Mb/d through eight mostly state-sponsored projects; Africa adds about 500 Mb/d (including 175 Mb/d we have allocated to the final ramp up of the 700-Mb/d Dangote refinery in Nigeria). While one of the Indian projects, the IOCL/CPCL 180-Mb/d Nagapattinam plant could be pushed back from 2030 to sometime in the early 2030s, the other Indian projects are pretty firm, with most starting up in the next two years. On the other hand, other than Dangote, the African capacity additions carry significant execution risk, most notably the 200-Mb/d Sonangol-sponsored Lobito refinery, which still requires additional financing.
- The two projects which have perhaps the greatest potential impact on U.S. and Atlantic Basin markets, Dangote and the 340-Mb/d Dos Bocas refinery in Mexico, are experiencing differential success. While the Dangote refinery has had delays and startup issues, crude runs are exceeding 600 Mb/d routinely and the plant is making progress on the operating issues it has experienced at its key RFCC unit. This has allowed Dangote to make a very positive impact on product tight markets in H1 2026. Dos Bocas, on the other hand, while hitting 260 Mb/d in December 2025, has fallen back to operating rates below 150 Mb/d in recent months and is 1-2 years from achieving sustained operations near design, in our opinion, and long-term reliable and consistent operations remain uncertain.
- The product mix matters as much as nameplate capacity. Our estimates for capacity to produce middle distillate and “other” products — much of it petrochemical feedstock — makes up the bulk of the total additions at about 1.9 MMb/d, compared with only about 0.8 MMb/d for gasoline, while fuel oil production declines as downstream upgrading units continue to be added. The most gasoline-focused additions — Dangote and Dos Bocas in particular — also have the greatest risk to long-term reliability. (We’ll also note here that we don’t expect either of Dangote’s proposed new 700-Mb/d refineries to make progress to startup by 2030, with the East African project very unlikely to ever progress.)
- As we’ve noted in previous reports, the Middle East and China have been moving away from fuels-focused greenfield projects toward petrochemicals, upgrading and overseas joint ventures.
- U.S. investment remains concentrated in the USGC and often focused on reliability, cost reduction, crude flexibility and similar projects, not adding capacity. Projects shifting product yields from gasoline to higher netback products (XOM’s Baytown Reconfiguration and Chevron’s Pascagoula upgrade) are also gaining favor, while capacity is being added mostly through relatively low cost “creep” additions (H1 2026 increases at Citgo Lake Charles and Valero Port Arthur).
- While a spate of closures in 2025 and current high margins are likely to limit closures in the short term, competitive disadvantages and declining demand will result in more shutdowns longer term in Europe.
- Russian nameplate capacity is not treated as permanently closed, but war damage has removed well over 2 MMb/d of effective capacity (and growing). Repairs, sanctions, loss of Western technology and “talent bleed” imply a long-term, slow deterioration of Russian refining capacity even after hostilities ease.

2026 Hormuz Price Spike Gives Way to a Lower Post-2026 Crude Price Deck – Change in OPEC+ Strategy Plays Major Role

The global crude shortages due to the extended closure of the Straits of Hormuz result in what we feel will be a relatively “transient” high crude price environment in 2026, well above what we expected in our February report (developed before the start of the Iran war). We assume that the conflict will be resolved within the next several months and production and trade flows normalize, returning markets to surplus in short order. Our medium-term deck is lower than in our February report, based largely on our expectation of a major change in OPEC+ strategy triggered by UAE’s withdrawal from the group, leading to an even bigger global crude surplus.

- Domestic Sweet at Cushing and Dated Brent average about \$77.50/bbl and \$85.30/bbl, respectively, in 2026, vs. about \$56/bbl and \$61/bbl in our February forecast.
- Dated Brent then falls to about \$57.80/bbl in 2027 and \$51.20/bbl in 2028 as Middle East exports recover and grow, inventories rebuild and the forecast assumes materially higher Saudi and UAE supply than in the February case.
- The withdrawal of the UAE from OPEC removes the only other major producer defending crude price through production restraint, besides Saudi Arabia. We feel the Saudis would not be willing to take the responsibility of cuts on their own, resulting in our upward forecast adjustments.
- By 2030, combined Saudi and UAE production is about 1.5 MMb/d above the previous forecast. That lower-cost supply displaces barrels that otherwise would have been supplied by U.S. shale and other higher-cost producers.
- U.S. crude production peaks at roughly 13.9 MMb/d in 2026, falls to about 12.1 MMb/d in 2030 and is 1.4 MMb/d below the February forecast in that year. The Permian remains the most resilient basin, but it does not escape the 2028-35 downshift.
- Strong production growth in some other regions, particularly in South America (Guyana, Argentina, Venezuela, Brazil) also underpins our view of an oversupplied market.
- The crude and product outlooks therefore diverge. Crude moves toward surplus after reopening, while gasoline, diesel and jet remain supported by refinery damage and limits to both clean-product export capacity and global refinery capacity growth.
- Upside price risks are substantial, especially in the short term. These include renewed or extended Hormuz closures, stronger-than-expected OPEC (primarily Saudi) production restraint, risk of additional disruptions in the Bab el-Mandeb Strait, stricter Russian sanctions enforcement, slower repairs to crude export infrastructure, and stronger-than-anticipated demand growth.
- Despite the above-named risks, the price trajectory in our Base Case of a steep 2027-28 correction followed by a gradual long-term recovery remains. Even if some of the upside price risks materialize, they would likely just push the correction further down the timeline and/or decrease its magnitude, due to what remains a fundamentally oversupplied market.

Regional Differentials Remain Logistics-Driven; Midstream Crude Capacity Is Ample – New Product Pipelines Will Change Product Flows and Regional Refining Prospects

Regional crude differentials remain governed primarily by logistics rather than basinwide scarcity. Recent pipeline additions and the lower U.S. production path keep North American takeaway capacity comfortably ahead of supply.

- The Houston-Midland differential averages about \$0.25/bbl in 2027 and stays near \$0.20/bbl through 2030. Two recent projects put fully in-service in H1 2026, Enterprise's 210-Mb/d Midland-to-ECHO 2 conversion back to crude service and Enbridge's 120-Mb/d Gray Oak expansion, have removed the need for another major Permian pipe in our Base Case.
- Western Canadian supply grows from about 5.5 MMb/d in 2025 to roughly 6.2 MMb/d in 2045 and 6.3 MMb/d in 2050. TMX and subsequent Mainline, Trans Mountain and Keystone optimization steps, along with the likely completion of the new 550-Mb/d Prairie Connector/Bridger Expansion project (sponsored by South Bow and Bridger Pipeline) maintain sufficient space capacity (average of at least 70-210 Mb/d in any given year).
- Rail optionality and relatively low-cost optimization projects limit the risk of a sustained WCSB takeaway blowout, although outages, apportionment and seasonal maintenance can still produce short-lived widening. If/when the Prairie Connector/Bridger expansion starts up (currently anticipated in 2029), the risk of these short-lived constraints goes down significantly for the remainder of our forecast timeline.

The most consequential new logistics projects in the U.S. are increasingly for refined products rather than crude.

- The P66/Kinder Morgan 200-Mb/d Western Gateway project, (expected startup in 2029) and a series of HF Sinclair Western Expansion projects are included in our Base Case forecast and create new product outlets from PADDs 2, 3 and 4 toward the West, improving inland refinery prospects while increasing pressure on PADD 5 refineries.
- ONEOK is also promoting its 200-Mb/d Sunbelt Connector project which would also provide additional (200 Mb/d) PADD 2 and 3 connectivity. This project is not in our current Base Case forecast and success is dependent on additional shipper support.
- From a pricing standpoint, we expect NYH product premiums to remain modestly above the USGC, while West Coast premiums (vs. the USGC) stay elevated, especially for gasoline and jet fuel, as PADD 5 remains structurally short for these products due to continued refinery closures (whose losses outweigh additional pipeline delivered product).
- Chicago gasoline premiums vs. the USGC continue to decline and flip to a discount as PADD 2 moves toward being structurally long gasoline. ULSD differentials also remain weak vs. the USGC, while jet fuel premiums are more resilient as regional supply/demand continues to be more balanced during our forecast period.

North American crude differentials therefore remain contained even as regional product differentials widen. The West Coast stays structurally short gasoline and jet. New inbound pipeline capacity provides some relief but continued regional refinery closures result in continued regional shortages of those products and the need for imports. The new product pipelines also provide additional outlets for PADD 2 and PADD 3 refineries, improving refiners' prospects in both regions.

Refining Margins Set New 2026 Highs Before Normalizing – U.S. Maintains Advantages

Full-year refining margins in 2026 will surpass the previous 2022 record in both nominal and real terms due to global product tightness as the Hormuz closure and significant loss of Russian product due to growing refinery war damage removes exportable products from an already tight and capital-constrained market.

- We expect Inflation-adjusted USGC WTI cracking margins will average over \$28/bbl for full-year 2026 while WCS coking margins are expected to average over \$32/bbl.
- The strength is concentrated in clean products, especially middle distillates. We expect full-year 2026 USGC ULSD cracks to average about \$44/bbl and jet above \$49/bbl after RVO, both above 2022 levels; RBOB regular cracks are expected to average roughly \$20/bbl.
- Of course, our forecasts for full-year 2026 are highly dependent on geopolitical developments over the next few months and how those developments impact the Middle East, Russian supply constraints and global economics.
- Margins remain strong through much of 2027 because of our expectation that Persian Gulf refinery repairs and Russian utilization recovery lags the return of crude flows. They then weaken through the late 2020s as production normalizes and some new refining capacity starts up.
- Coking margins hold up better than cracking margins for the first five to seven years of the forecast as heavy-light discounts widen from depressed levels and the product slate increasingly favors middle distillates.
- Longer term, gasoline cracks erode faster than diesel and jet as EV penetration and efficiency pressure light-duty demand. Configuration, scale, reliability and access to advantaged energy become more important than simple crude-capacity ownership.
- The U.S. maintains a natural gas advantage of several dollars per barrel vs. high-cost, LNG-dependent European and Asian refiners. Growing EU Emissions Trading System (ETS) costs, continued crude cost disadvantages, more costly labor/regulatory burdens and lower operating flexibility widen the effective competitiveness gap for U.S. refiners vs. their competitors in Europe and developed Asian countries.
- Weak-margin periods should trigger refinery closures more quickly than in prior cycles. That self-correction limits the duration of trough conditions for surviving, competitively configured refineries.

Heavy-Light Discounts Remain Narrow; Coking Advantage Improves Gradually

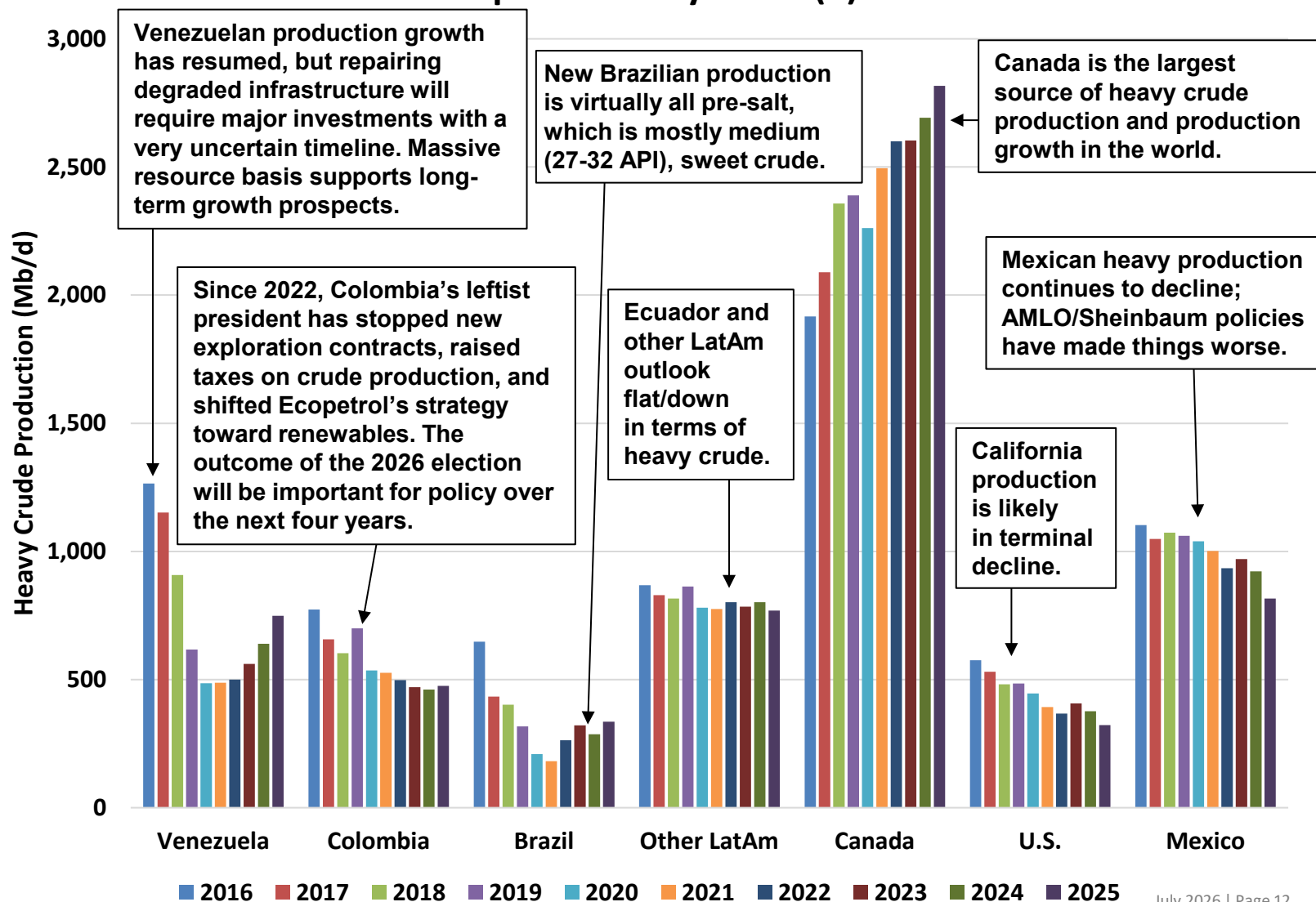
Heavy-light discounts widen in dollar terms during the 2026 price spike but remain narrow as a percentage of crude value. Complex refiners retain an advantage, although it is smaller than in historical heavy-crude-short cycles.

- WTI Houston-WCS Houston averages about \$6.80/bbl in real terms in 2026. LLS-Mars remains much narrower at roughly \$1.10/bbl, reflecting adequate complex capacity and limited sustained scarcity for sour crude on the USGC.
- The absolute differential narrows in 2027 as flat prices fall, then widens in 2028-30 as higher Saudi and UAE supply adds medium-sour barrels while lower U.S. output removes light crude from the market.
- Longer term, U.S. LTO growth slows and Canadian and Venezuelan heavy production grow. The resulting widening is gradual and remains well below the pre-2019 environment because global complex capacity and weak resid demand absorb heavy barrels.
- The margin benefit increasingly comes from configuration/yields rather than feedstock discount alone. Hydrocrackers and cokers are positioned for stronger jet/diesel economics.
- Low U.S. gas prices preserve the competitive position of USGC coking refineries vs. Europe and LNG-dependent Asia. That advantage becomes more important when product markets are disrupted, even if the heavy discount itself stays compressed.
- Western Hemisphere supply remains structurally lightening: Canada is the principal reliable source of heavy growth, while Mexico, California and much of Latin America decline and Venezuelan recovery remains highly uncertain.

Western Hemisphere Heavy Crude⁽¹⁾ Production Declining

Americas heavy (<25 API) crude production declined from 7.2 MMb/d in 2016 to a low of 5.8 MMb/d in 2020 but recovered to around 6.3 MMb/d in 2025 due to continued Canadian production growth and some recovery in Venezuelan heavy crude supply. Meanwhile, Americas light/medium crude production increased from 14.9 MMb/d in 2016 to 22.5 MMb/d in 2025, driven mostly by growth in U.S. shale crude production, with additional significant light crude production growth from Argentina's Vaca Muerta shale formation, light/medium crude from Guyana, and medium-sweet crude from Brazilian pre-salt formations.

Western Hemisphere Heavy Crude⁽¹⁾ Production



U.S. Refiners Remain Advantaged but Regional Prospects Diverge – USWC Closures Accelerate as More Products Move West

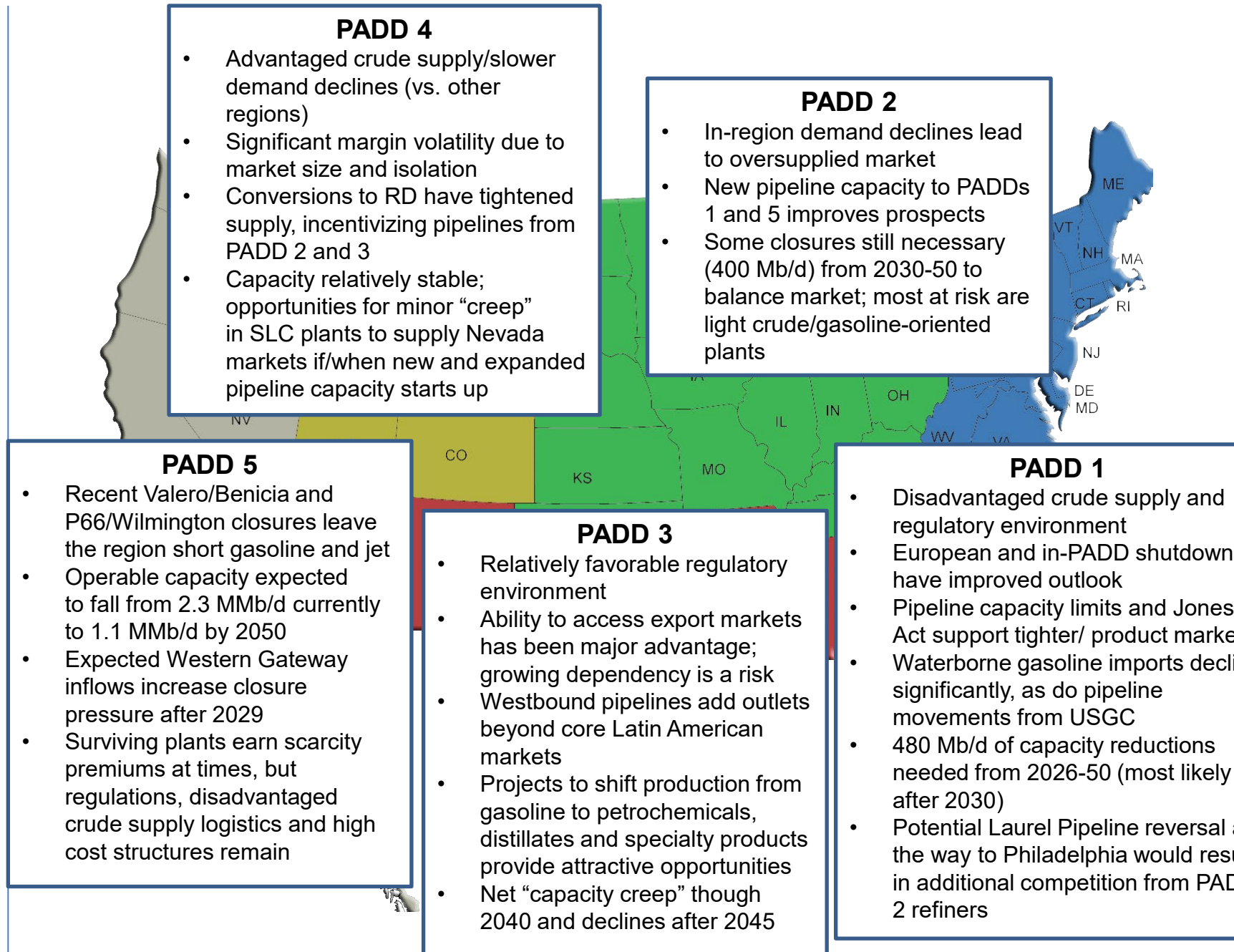
U.S. refining remains globally advantaged by scale, complexity, low-cost natural gas, flexible crude access and (in the case of the USGC) access to growing export markets. Declining domestic demand, new pipelines and differing cost and regulatory environments will lead to regionally variable prospects and changing trade flows – both within the U.S. and import/export markets.

- The supply, demand and operational/cost advantages enjoyed by USGC refiners, particularly vs. refiners in other developed countries and in key export markets such as Latin America, are structural in most cases.
- High natural gas costs and elevated freight prices have added to the advantages vs. LNG- and long-haul, marine-dependent refiners in Europe and Asia. While the natural gas and freight cost advantages have declined since peaking in 2022, they will remain higher than pre-COVID levels.
- Loss of access to Russian energy (crude and natural gas) adds to the competitive disadvantages of European refiners and will lead to continued capacity declines in Western Europe and Russia.
- USGC refiners will have to grow exports of gasoline, diesel and jet fuel by about 800 Mb/d (47% gasoline) from 2025-50 (see Section 7 and Appendix 5) to maintain regional capacity at current levels during that period. We do see net “capacity creep” of about 400 Mb/d through 2040, with a similar level of declines in the mid-to-late 2040s. The creep will be concentrated at the most competitive refineries, so there could be closures of less-competitive facilities even before 2040. There will also be significant incentives for hydrocracker projects at certain refineries to shift yields from gasoline to distillates, as we’ve noted in previous reports.

Domestic demand declines and new pipelines will result in changing trade flows and refinery closures in other regions, with most of these happening after 2030. Surviving refiners will maintain attractive margins as regional supply/demand remains balanced or in some cases short middle distillates.

- PADDs 5, 2, and 1 will require refinery capacity reductions of about 1,200 Mb/d, 400 Mb/d and 480 Mb/d, respectively, from 2026 through 2050 (with most coming after 2030) for regional supply/demand to remain balanced (see Section 7 and Appendix 5). While the overall level of closures will be driven by the underlying supply/demand dynamics, the actual timing and which refineries will be closed will be determined by various factors specific to the refineries and their corporate ownership. These include corporate strategies, required capital expenditures, the ability to compensate for the loss of capacity with another in-system refinery, a major casualty event, NIMBY pressures, and many other factors.
- PADD 5 closures are driven by high regulatory costs, declining regional gasoline demand and new inbound pipelines. Our forecast assumes the P66/Kinder Morgan Western Gateway Pipeline will be completed on schedule in 2029, leading to additional closures post-2029. This development will also reduce the need for exports (especially for gasoline) from PADD 3 and provide an additional outlet for PADD 2 product, leading to fewer PADD 2 closures (than would otherwise be the case) in the 2030s and 2040s.
- PADD 1’s gasoline deficit declines significantly from 2.4 MMb/d in 2025 to 1.8 MMb/d in 2050, with PADD 1 imports falling to just structural levels (most from the Irving refinery) of about 100 Mb/d by 2045. Total required deliveries of gasoline from PADD 3 decline by about 400 Mb/d, carrying major implications for the Colonial and Products (SE) pipelines.

U.S. Regional Prospects and Challenges



Global Regional Refining Comparison – Positioning Impacted by Both Fundamentals and Politics

U.S.	Second-largest in world, most complex/dynamic refineries. Advantaged on crude and natural gas supply vs. other developed economies. Stagnating domestic demand, global leader in exports.
China	Surpassed U.S. in capacity in 2023 to become largest global refiner. Targeted on domestic, not export demand. Growth slowing, complexity increasing, focus on petrochemicals.
Middle East	Advantaged crude supply but high geopolitical risk, recently increased. Fuels-focused additions have slowed; current priorities are repairs, petrochemicals and overseas joint ventures.
India	Fastest long-term demand growth region; private facilities are large, complex and efficient. Russian sanctions temporarily provided advantaged crude – Venezuelan crude production growth provides some long-term benefit. Potential for more regulatory issues/higher costs in the future.
Rest of Asia/Pacific	Demand growth center, challenging region for financing and project development/construction, with the situation varying significantly by country.
Latin America	Economic woes, governance issues and trouble with project execution limit expansion and impact utilization. Demand growth will continue to be met primarily by U.S. exports.
Developed Asia/Pacific	Disadvantaged due to higher crude and operating costs, declining regional demand and difficult regulatory environment. South Korean refiners most complex and competitive in the region.
Africa	Strong demand growth but significant issues with project execution, corruption, regulatory environment, access to skilled labor, financing, infrastructure and operating ability. Success with Dangote, Angolan projects could increase investment and improve prospects.
Russia	Sanctions/lack of outside investment and technology will cause “slow bleed” in refinery conditions and capabilities. Extended war with Ukraine worsens prospects, increases damage to refineries, results in “brain drain.” Decreased access to European market will be long term.
Europe	Same disadvantages as developed APAC, but worse, especially regulatory. Loss of Russian crude and gas particularly challenging. Expect continued closures/conversions to biofuels and terminals.

Biofuels and EVs

The EPA's final 2026-27 RFS rule materially tightens compliance demand after the 2025 reset. D4 RIN prices and renewable diesel margins rise sharply in 2026, but the RIN bank, idled capacity and import flexibility limit a return to the extreme 2021-23 environment on a sustained basis.

- The final rule raises the 2026 and 2027 D6 percentage standards to 15.5% and 15.78%, respectively, and reallocates 70% of qualifying 2023-25 small refinery exemptions (SREs).
- Combined U.S. biodiesel, RD and SAF demand rebounds from about 256 Mb/d in 2025 to roughly 346 Mb/d in 2026 and 385 Mb/d in 2027.
- D4 RINs average about 197 cents/gal in 2026. The total RVO cost rises to approximately \$12.87/bbl of clean domestic gasoline and diesel sold, increasing the compliance cost embedded in consumer fuel prices.
- RD crack spreads recovered above 250 cents/gal by mid-2026 and move into the 300-cent range in H2 2026 before declining in 2027-28. Stronger margins reactivate idled assets and attract imports, capping sustained upside.
- The end of the BTC and the shift to 45Z place more incentive burden on RINs for imported or non-45Z-eligible supply. North American feedstock eligibility and the soybean-oil tariff also widen the value gap between domestic and foreign pathways.
- The EPA deferred the import/feedstock RIN haircut until at least 2028, changed default equivalence values and removed eRINs. Those decisions reduce near-term supply uncertainty but leave 2028 policy as a major sensitivity.

Renewable Fuel Standard and 45Z

- The EPA's final 2026-27 RFS rule materially raises the demand floor for biomass-based diesel and advanced fuels relative to the February case.
- The EPA did not implement the proposed 50% RIN-value reduction for imported fuels or fuels made from imported feedstocks in the 2026-27 rule, although the issue may return for 2028. Default equivalence values fall to 1.5 RINs/gal for RD and renewable jet beginning in 2027, but the EPA expects most RD producers to qualify for 1.6.
- The 45Z production credit favors U.S., Canadian and Mexican feedstocks, while the U.S. soybean-oil tariff and tight domestic supply keep North American feedstock values above international benchmarks. The result is a stronger policy premium for eligible pathways and continued feedstock-basis volatility. This also keeps RIN prices and total RVO compliance costs high.
- RD and biodiesel production margins surged in H1 2026 and are expected to remain strong through the remainder of the year. Some normalization is expected in 2027 and supply continues to ramp up to meet demand. Nonetheless, the margin forecast has been increased from our February report throughout the forecast period.

EV and gasoline-demand implications

- The global EV sales forecast is lower from 2026 onward, led by a weaker U.S. path and a narrower Chinese light-duty-vehicle definition. U.S. EV sales fall to about 1.15 million units in 2026 from 1.49 million in 2025, while global sales rise more gradually from about 21.5 million in 2026 to 32.2 million in 2030.
- The slower EV path raises long-term gasoline demand relative to the February forecast but does not reverse the transition. EV displacement grows from about 0.9 MMb/d in 2025 to ~10.6 MMb/d by 2050.



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