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Global Supply and Shale in 2019 and Beyond

Stephen G. Beck
Senior Director, Upstream

Gulf Downstream Association
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www.stratasadvisors.com

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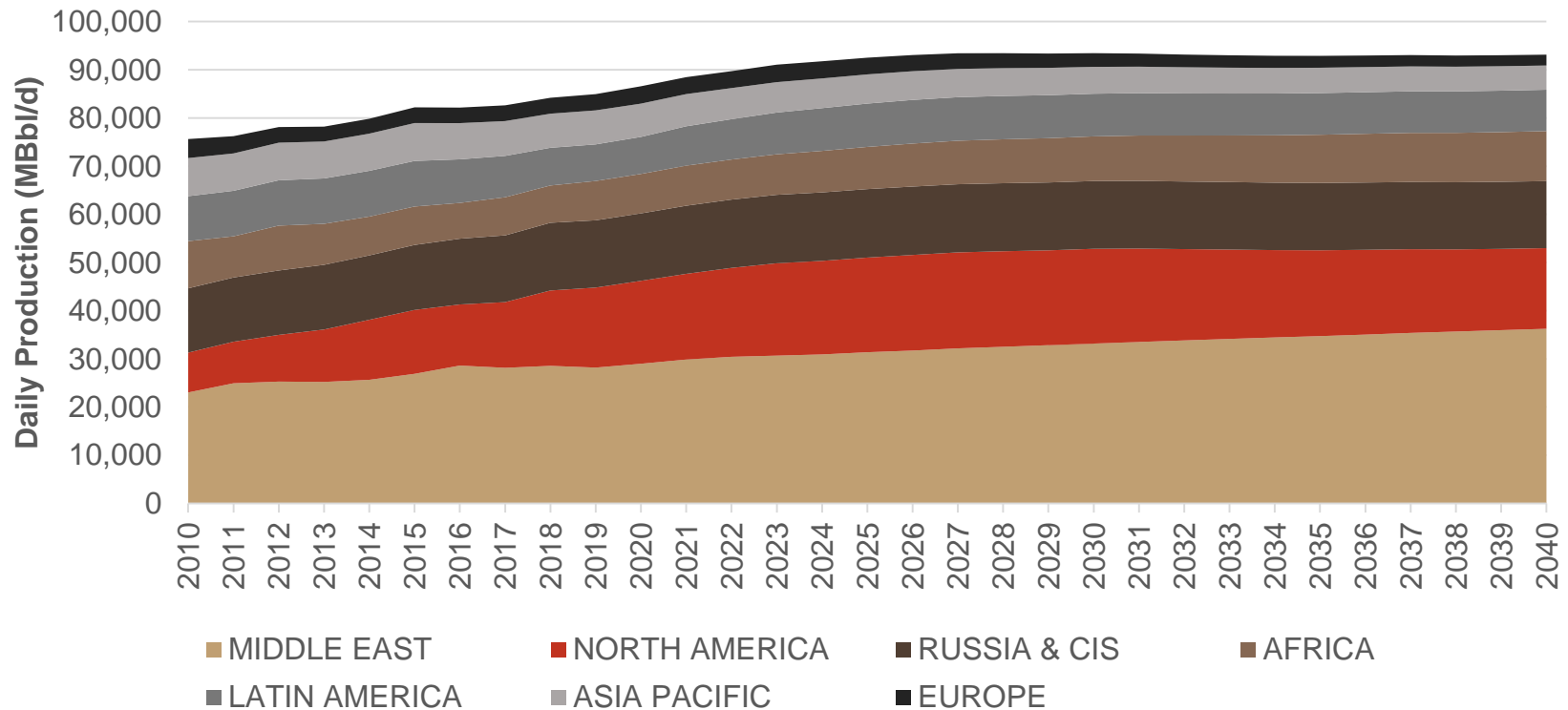




Crude and Condensate Supply Outlook

Supply growing through mid-2020's, then stabilizing

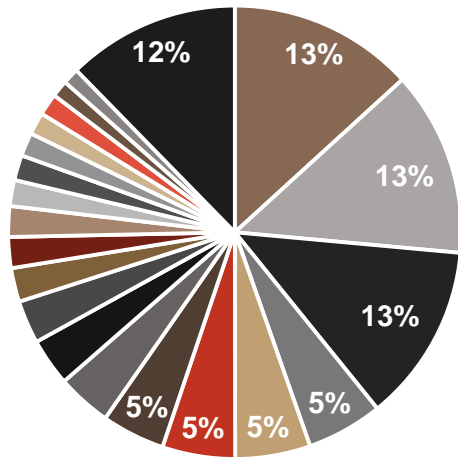
Crude Oil and Condensate Production by Region



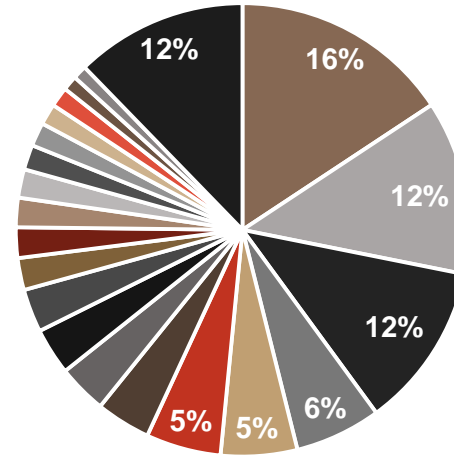
- Large resources coupled with technological know-how and proximity to markets are key drivers supporting Middle East, North America, and Russia/CIS success in fossil fuels

Global crude and condensate growing in familiar places

2018 Global Supply
84.2 MMBbl per Day



2023 Global Supply
91.1 MMBbl per Day



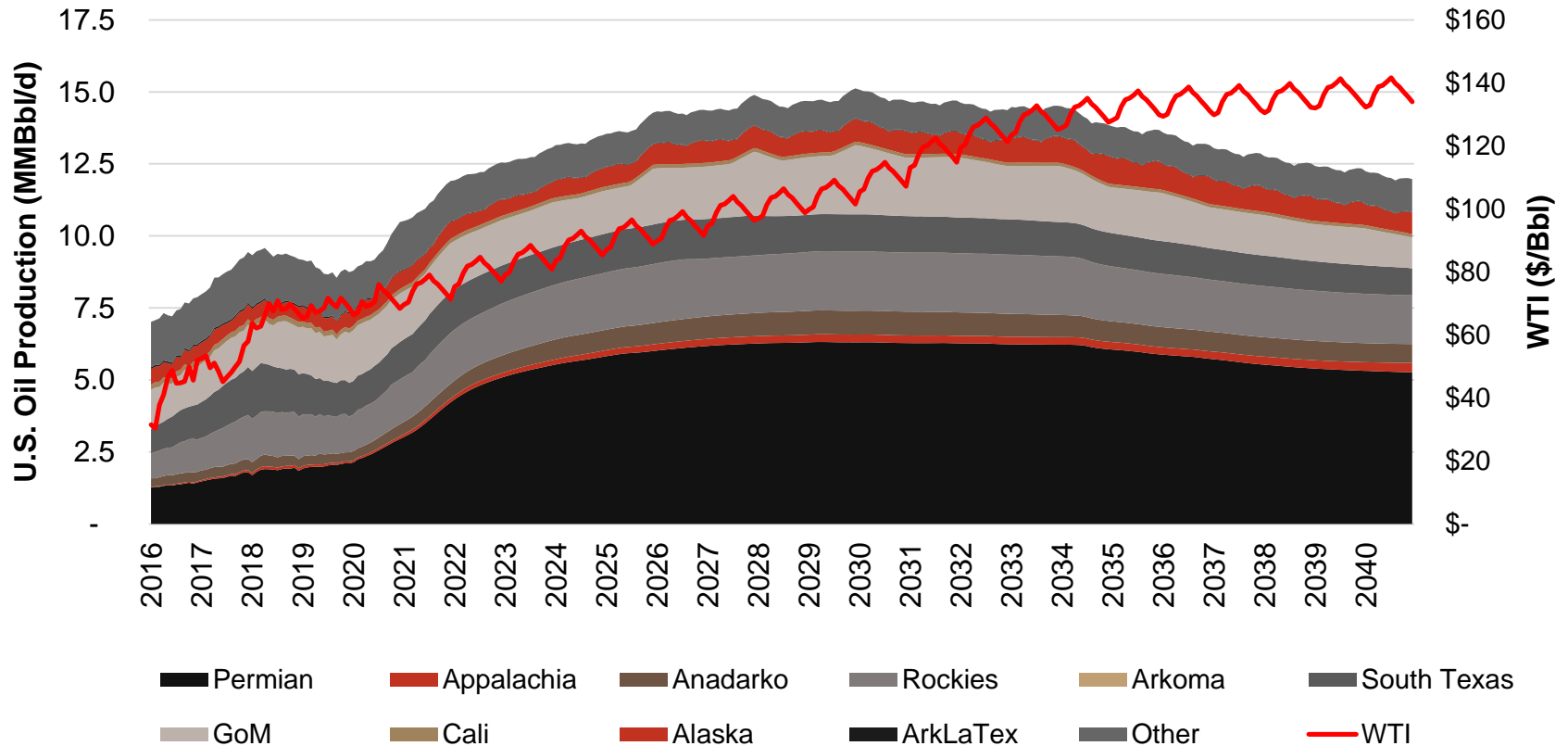
- Global crude oil and condensate production in October 2018 reached 84.8 million b/d, up by 1.2 million b/d compared to July 2018
- Total supply will reach approximately 86.9 million b/d by the end of 2020 as crude price slowly climb

Lwr-48 Shale and tight play prospects remain bright

- Permian Wolfcamp is key driver of rapid growth
 - The Wolfcamp is comprised of multiple productive zones within what are commonly referred to as the A, B, C, and D benches
 - Two other unconventional resources in the Permian remain on our radar, the Bone Spring and Alpine High, both of which have attractive aspects as well as detractions
- The Eagle Ford will remain an important contributor for many years. Operators arrested declining production by doubling the number of rigs to work in the play since the trough of mid-2016. While the Eagle Ford boasts some of the best economics in North America shale, large swaths of the play are densely developed
- Looking north, the SCOOP (South Central Oklahoma Oil Province) and STACK (Sooner Trend Anadarko basin Canadian and Kingfisher counties) plays have quickly become some of the most interesting plays in the United States
 - In the STACK, over-pressured, liquids-rich Meramec and Woodford tend to have highest production rates
 - In the SCOOP, Woodford prospects remain a top priority
- The Niobrara reigns supreme among shales and tight rock resources in the Rockies
 - Economics in large portions of the Niobrara are advantaged due to mineral fee aspects of the acreage dating back to the transcontinental railroad. Outside Wattenberg, the prospects look brightest in the Powder River Basin

The Permian will remain the primary driver of shale growth

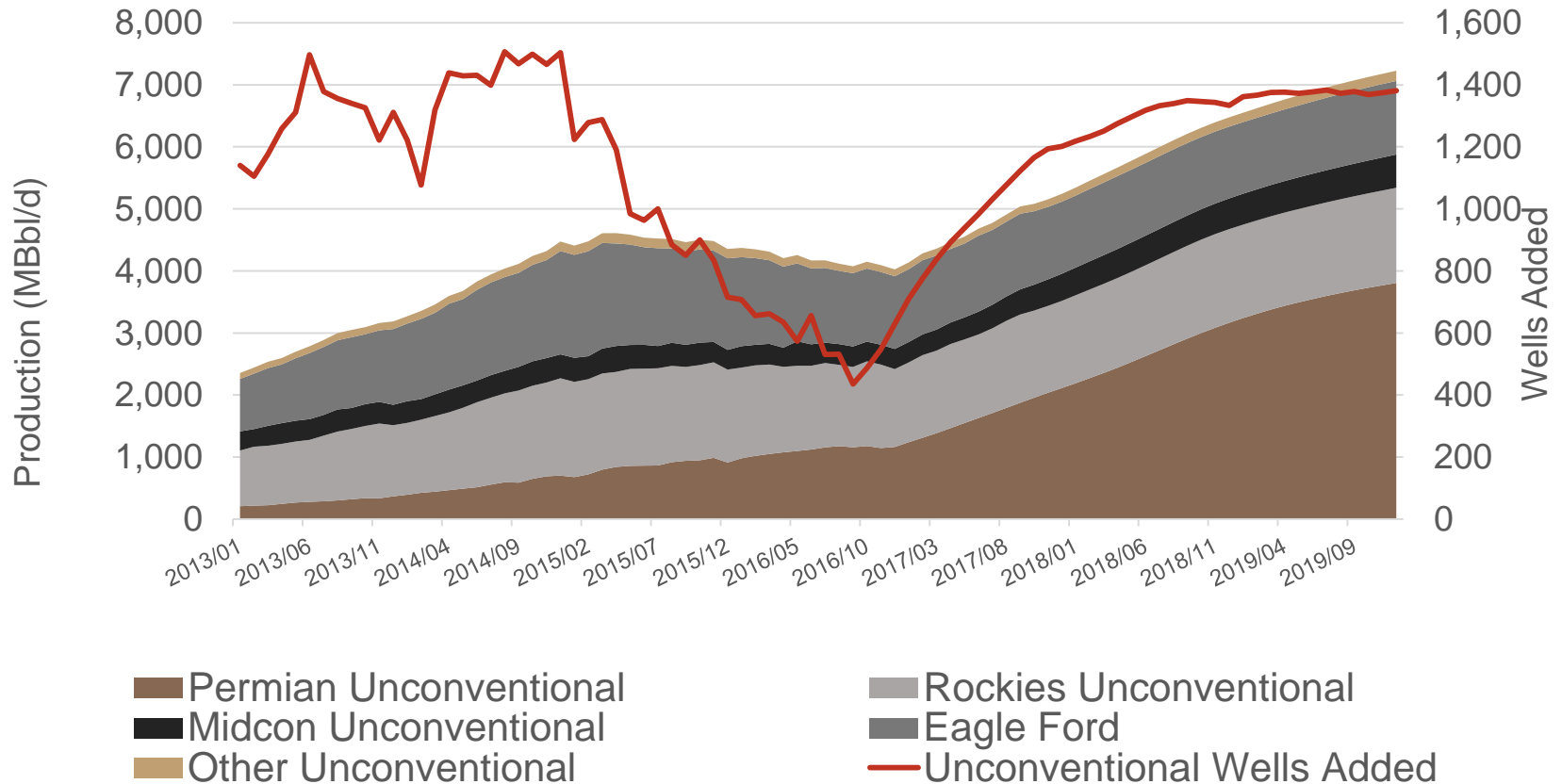
U.S. oil reaching ~15 MMBbl/d in '27 before falling to ~11.5 MMBbl/d in '40



Source: Stratas Advisors

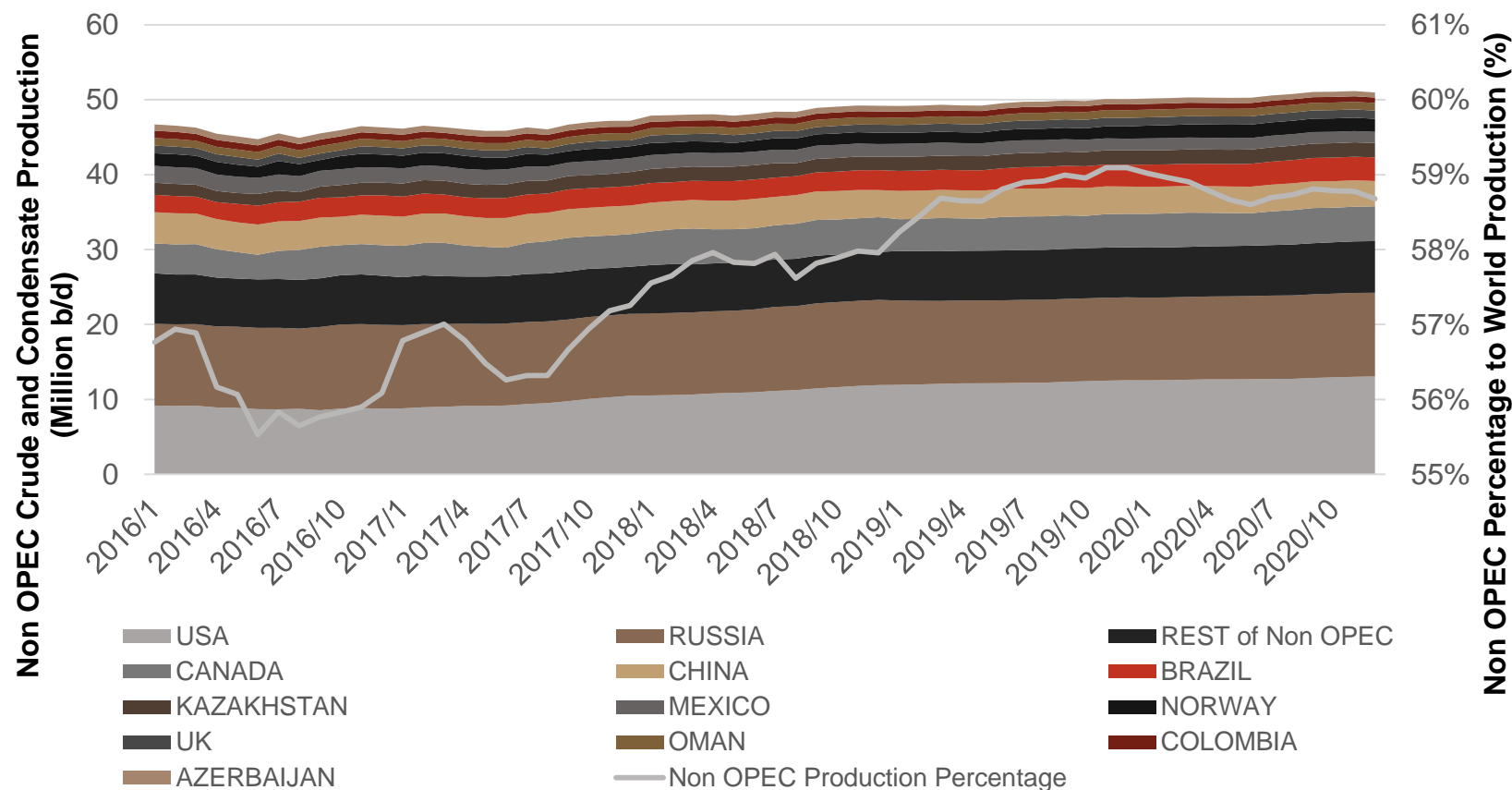
- The Permian is likely to peak in the mid- to late-2020's, followed by a long plateau
- Shale represents ~74% of U.S. oil production

Technology, better process, and insourcing driving shale results



- The Permian is the beacon in 2018. Longer laterals, higher proppant loads, zipper fracs, and enhanced processes kept costs in-line during low prices
- Looking forward, Stratas anticipates modest cost inflation with rising prices. However, several factors will provide limits to cost escalations

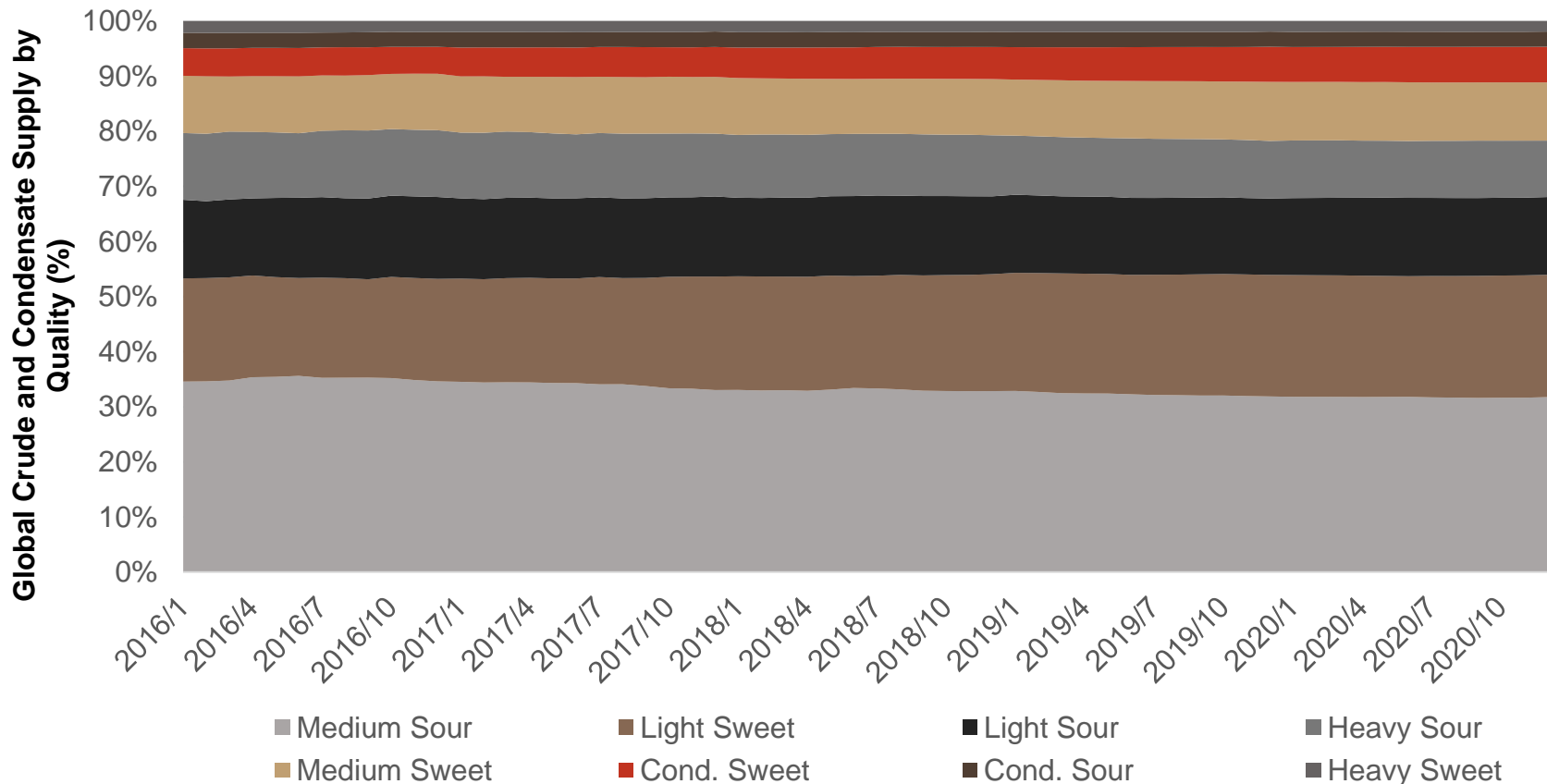
Shale share of global supply pushing higher in 2019



Source: Stratas Advisors

- Currently, U.S. and Russia together account for 47% of non-OPEC production
- Total non-OPEC production will account for 58%-59% of global supply by 2019-2020 driven by strong growth in the US

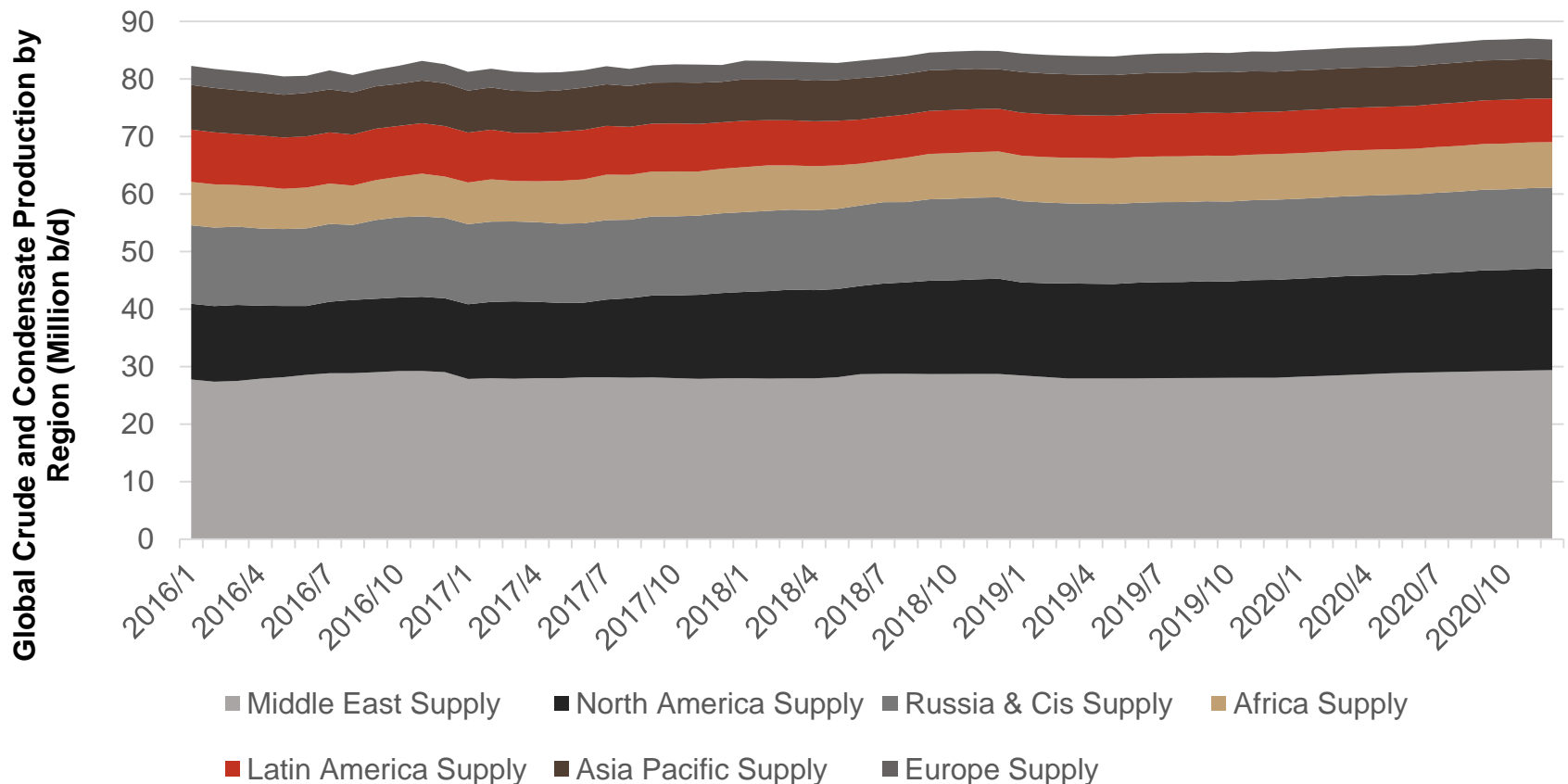
Global crude quality becoming slightly sweeter and lighter



Source: Stratras Advisors

- The top 3 crude streams are medium sour oil (33%), light sweet oil (21%), and light sour oil (14%)
- As U.S. keeps ramping up oil production from its shale operations, the percentage of light sweet oil will increase by 1.2% by the end of 2020

The Middle East, North America, and Russia/CIS account for nearly 70% of global supply



Source: Stratas Advisors

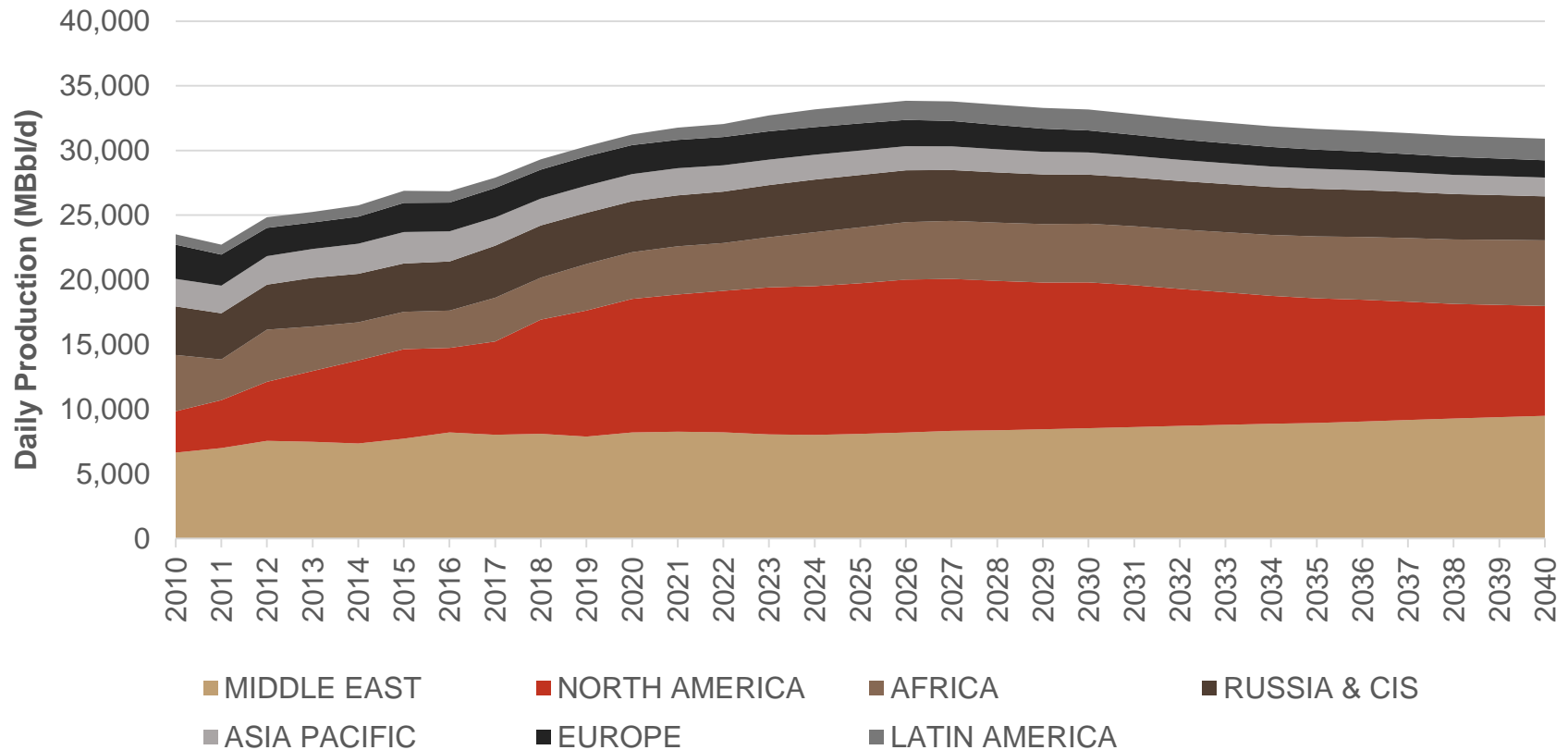
- The Middle East is the top oil and condensate producing region, contributing 34% of estimated total world supply
- Production growth will mainly come from North America over the next 2 years

Assessment of longer-term drivers

- IMO compliance will reduce the demand for heavy crude by some 400,000 barrels per day in 2020. Russia/CIS, Middle East, and Latin America are expected to bear the brunt of the decrease due to sulfur content and operational challenges
- Offshore activity is expected to begin picking up in the new decade. Supporting factors for offshore include higher average prices, consolidation in shale, and improved economics for offshore due to process improvements
- Natural gas markets are expected to begin resembling global crude oil markets with expanding LNG activity, highlighted by well-identified global benchmark prices, flow tracking of cargos, and liquid spot markets
 - Natural gas demand will increasingly be serviced by supplies from North America, Russia/CIS, the Middle East and Asia Pacific
- Companies operating in shale applied technology, process improvements, and changed business practices to remain competitive during the low price environment. These enhancements will continue to benefit shale companies for years
- The U.S. will be a major supply source for natural gas liquids, especially propane

Shale, led by North America, driving light crude production

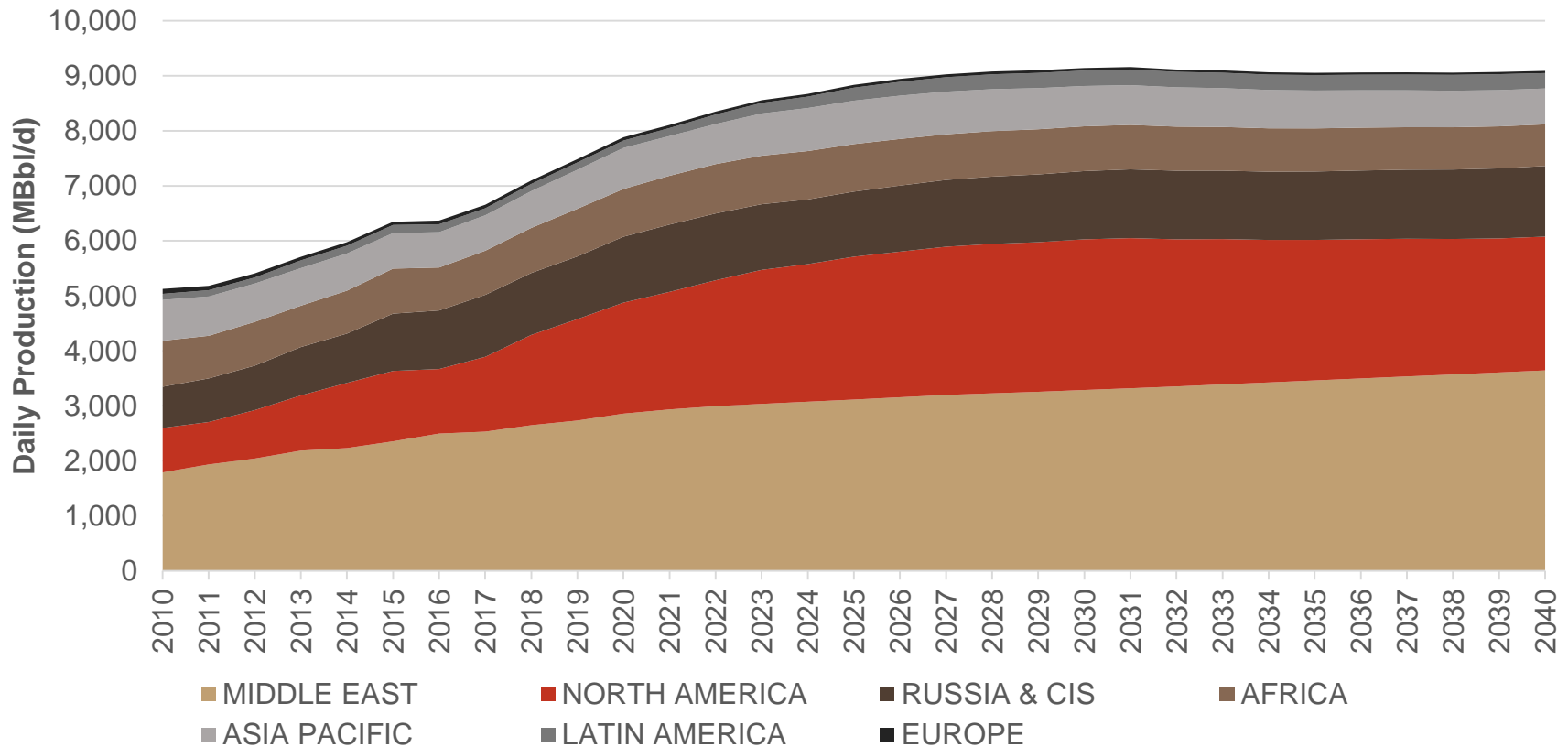
Light Crude Production by Region



- North American shale will drive production through the mid- to late-2020's
- Longer-term, the Middle East retakes the lead as top producer in light crude

Shale is also driving condensate production

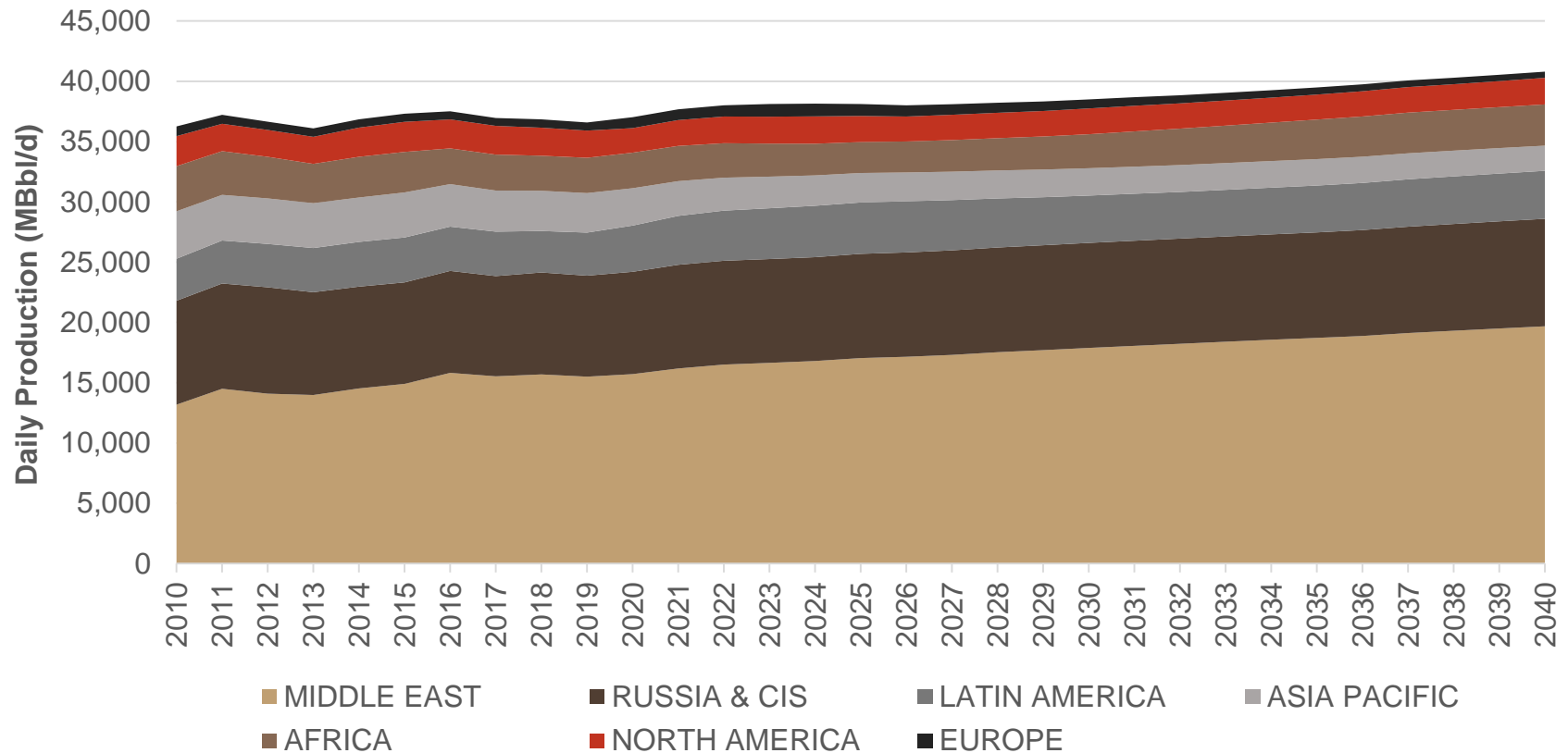
Condensate Production by Region



- Portions of the Permian, Eagle Ford, and SCOOP are rich in condensate resources
- Longer-term, the Middle East, is the top producer in condensate

Medium crude supply geared for slow, steady growth

Medium Crude Production by Region

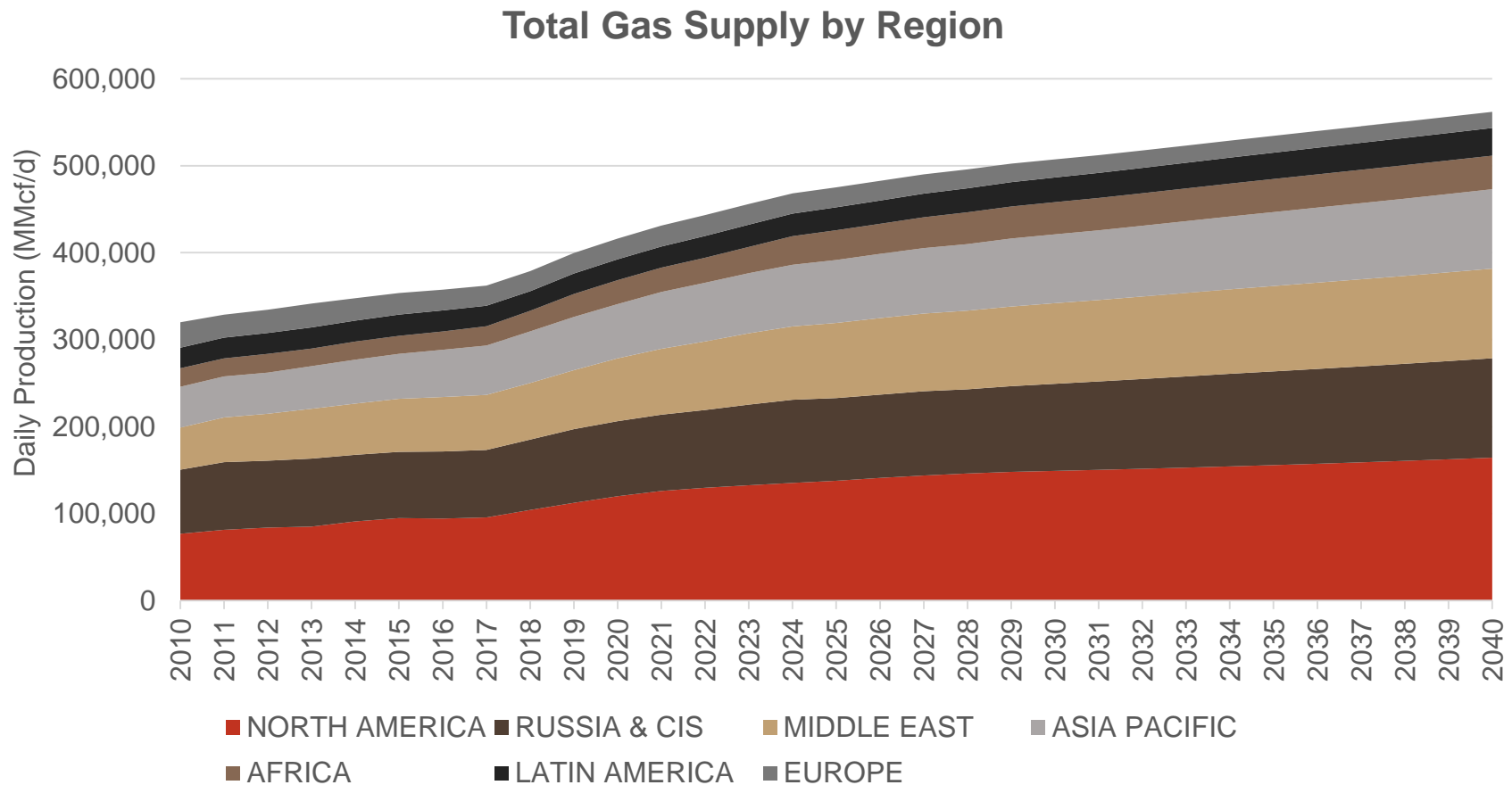


- Iraq and Iran are key drivers of Medium growth
- While risk is omnipresent, these are resources of known quantity and value



Gas and NGL Supply Outlook

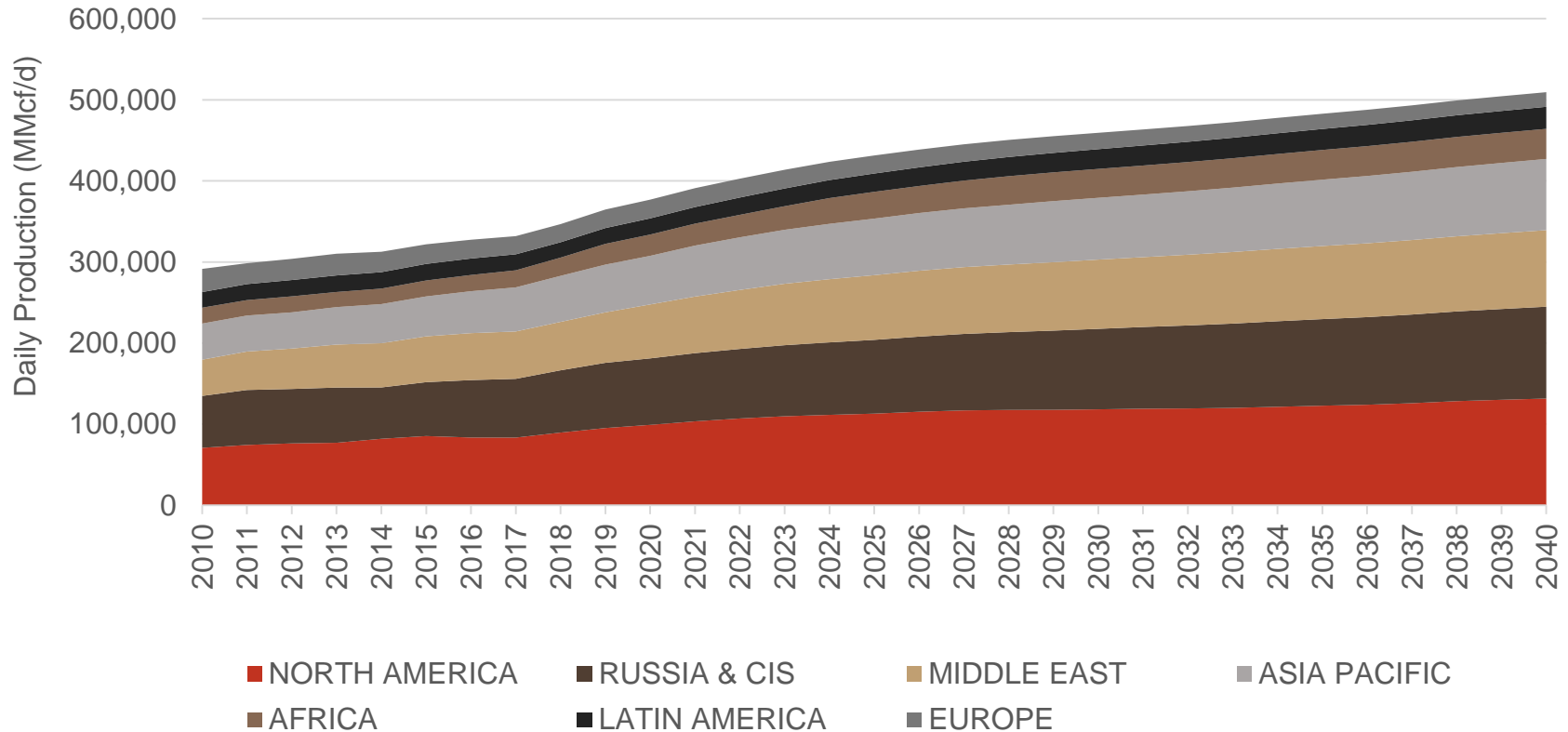
North America is a major source of gas and NGL growth



- With respect to dry gas, the Marcellus is a world scale resource with access to multiple markets
- Associated gas from the Permian and Eagle Ford, among others, are insensitive to gas prices

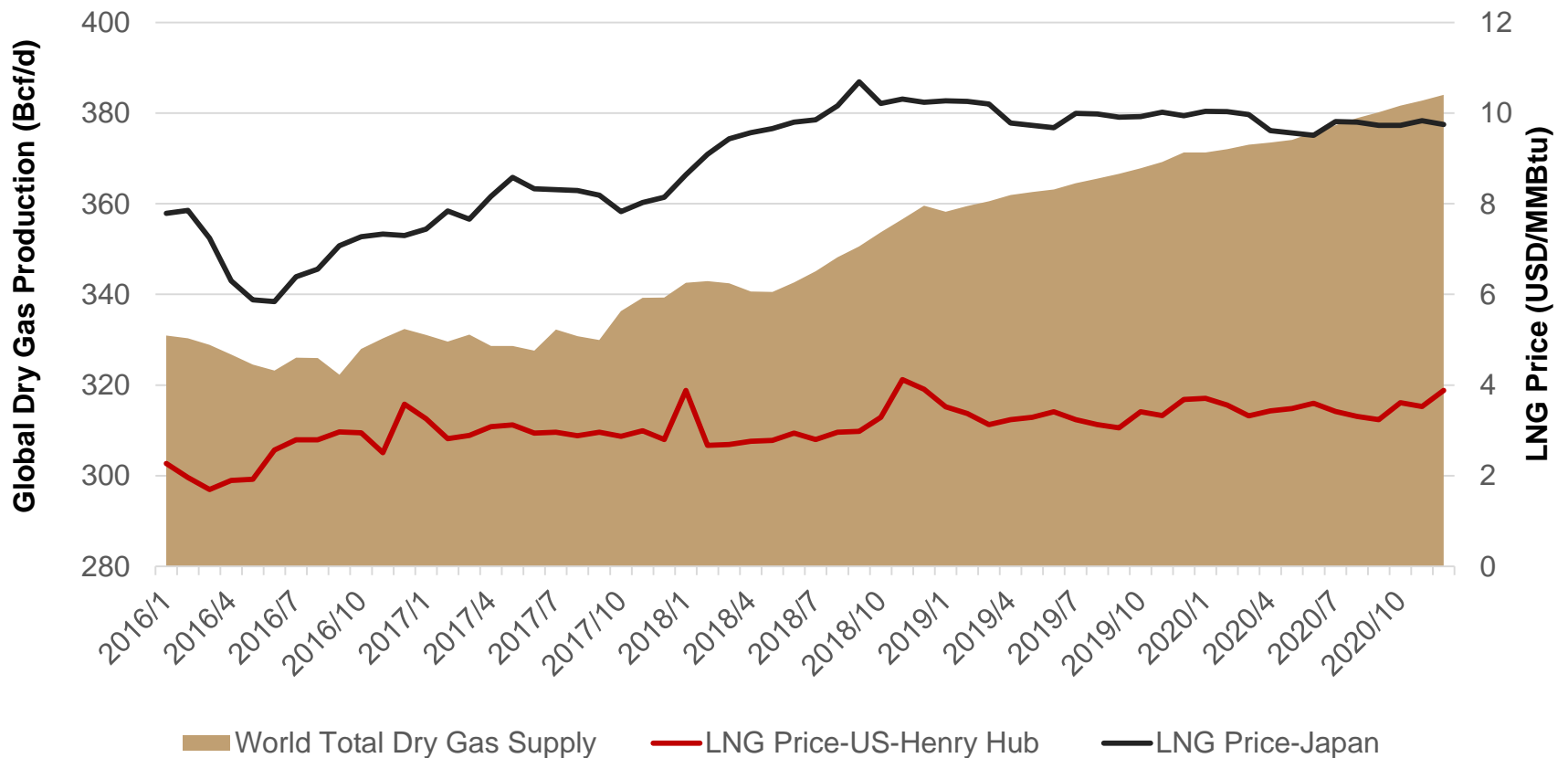
North America, Russia/CIS, and the Middle East are well positioned for the long-term

Dry Gas Supply by Region



- More than half of global dry gas is sourced from North America, Russia/CIS, and the Middle East
- Intense competition and large resource bases will benefit consumers

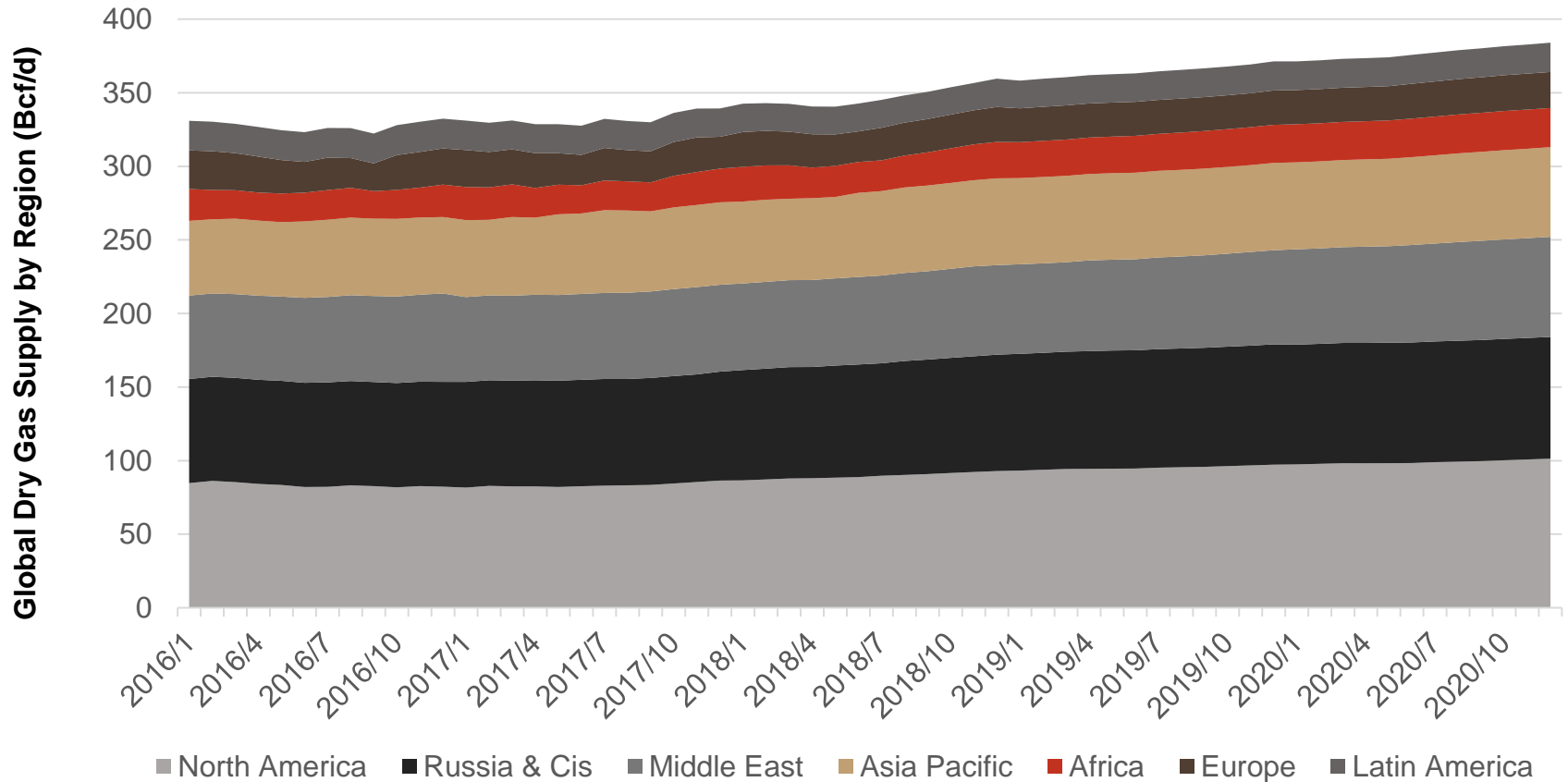
Global gas production to rise steadily over the next 2 years



Source: Stratas Advisors

- Global dry gas production reached 353 Bcf/d in October 2018, setting yet another new production record. Looking forward, global dry gas is projected to grow by another 24 Bcf/d by yearend 2020
- Robust growth in dry gas should lead Asian LNG prices to \$10/MMBtu by the end of 2020

North America will contribute a third of global dry gas production growth in the next 2 years

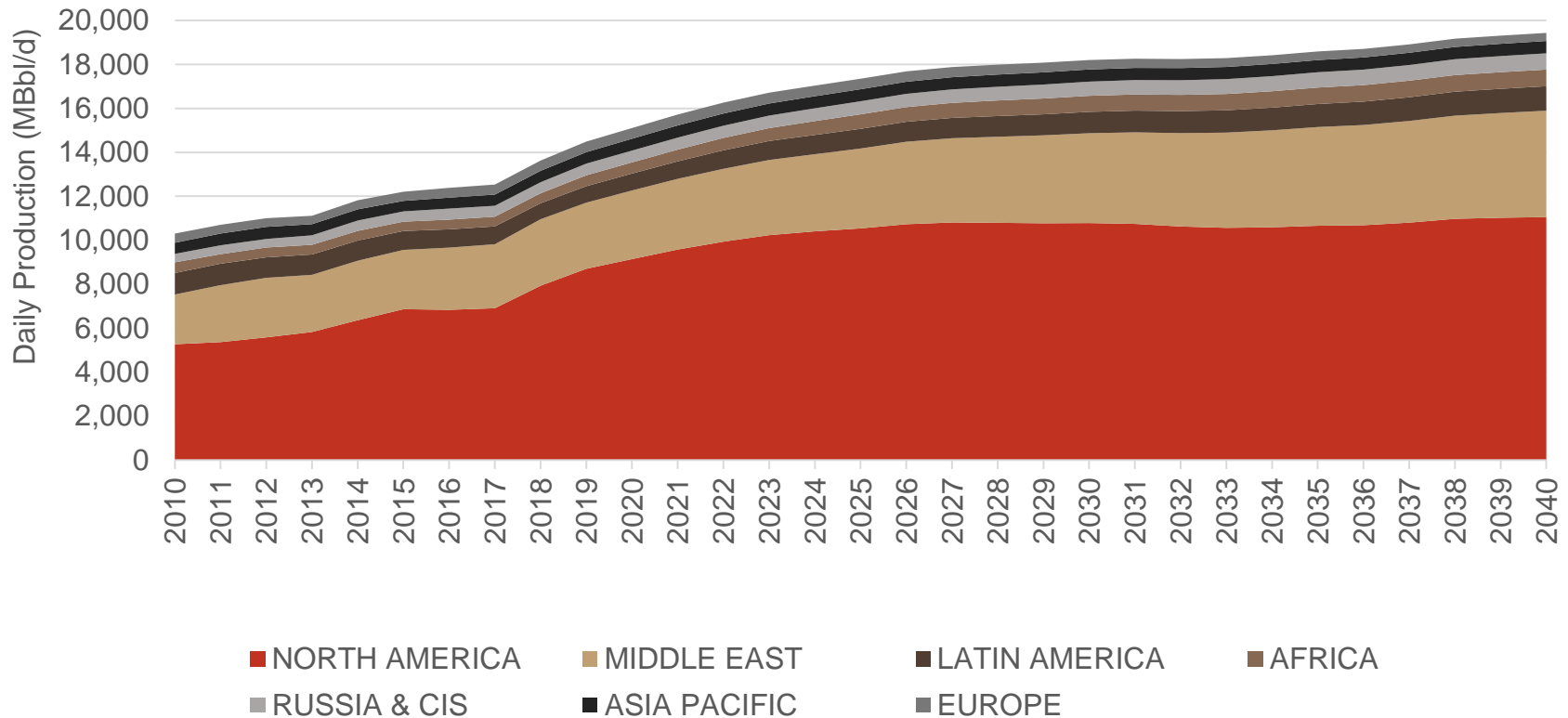


Source: Stratas Advisors

- North America and Russia/CIS are the top 2 gas producing regions, followed by the Middle East and Asia Pacific
- North America should see a 10 Bcf/d increase between August 2018 and December 2020

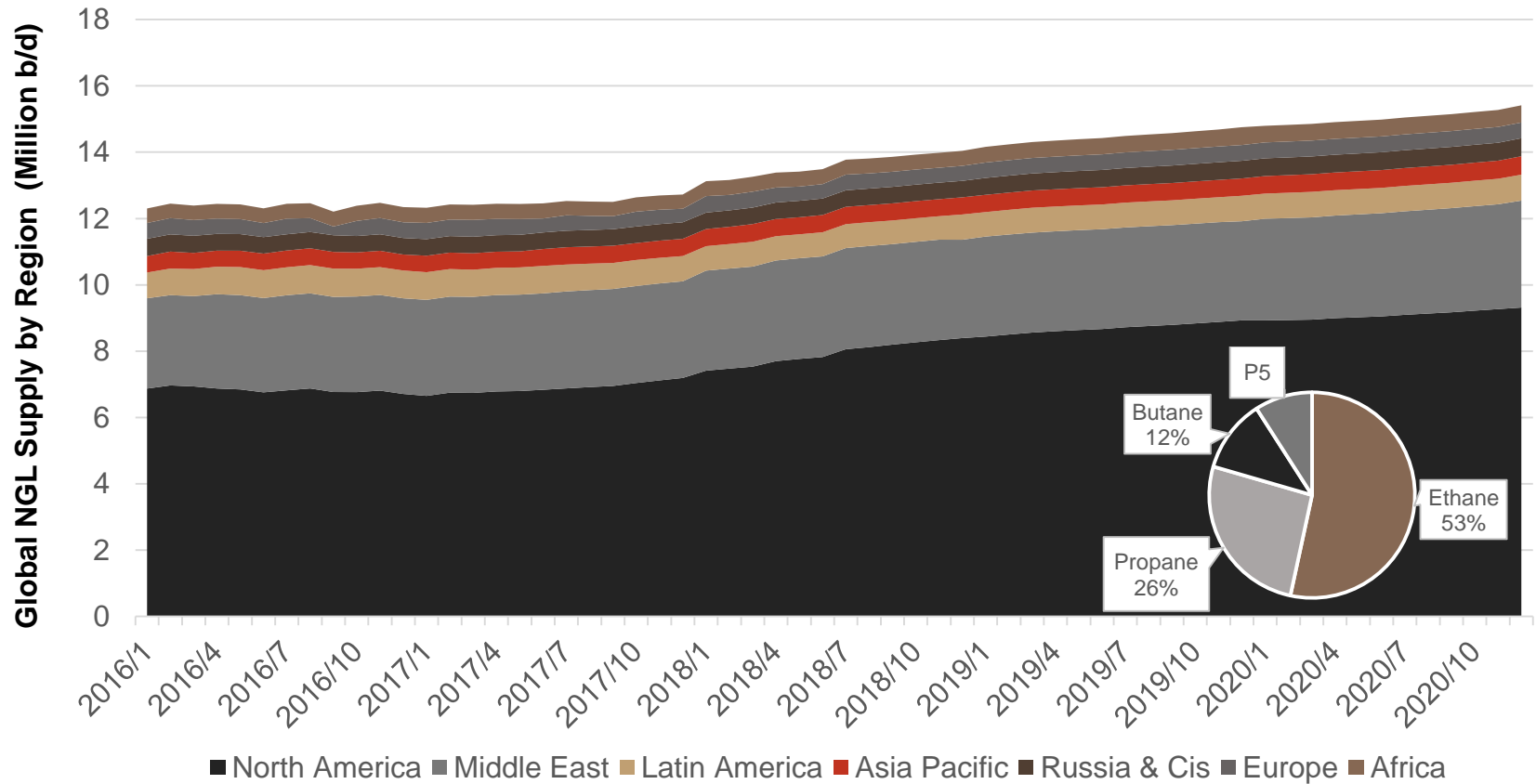
North America is projected to supply more than 60% of NGL volume

NGL Supply by Region



- Wells in the Permian, Eagle Ford, SCOOP, Utica, and more are a key source of NGLs
- In recent years, significant volumes of ethane were not captured by processors. Hence, growth in ethane could outpace expectations should prices rise adequately

Global NGL production will continue to be dominated by North America

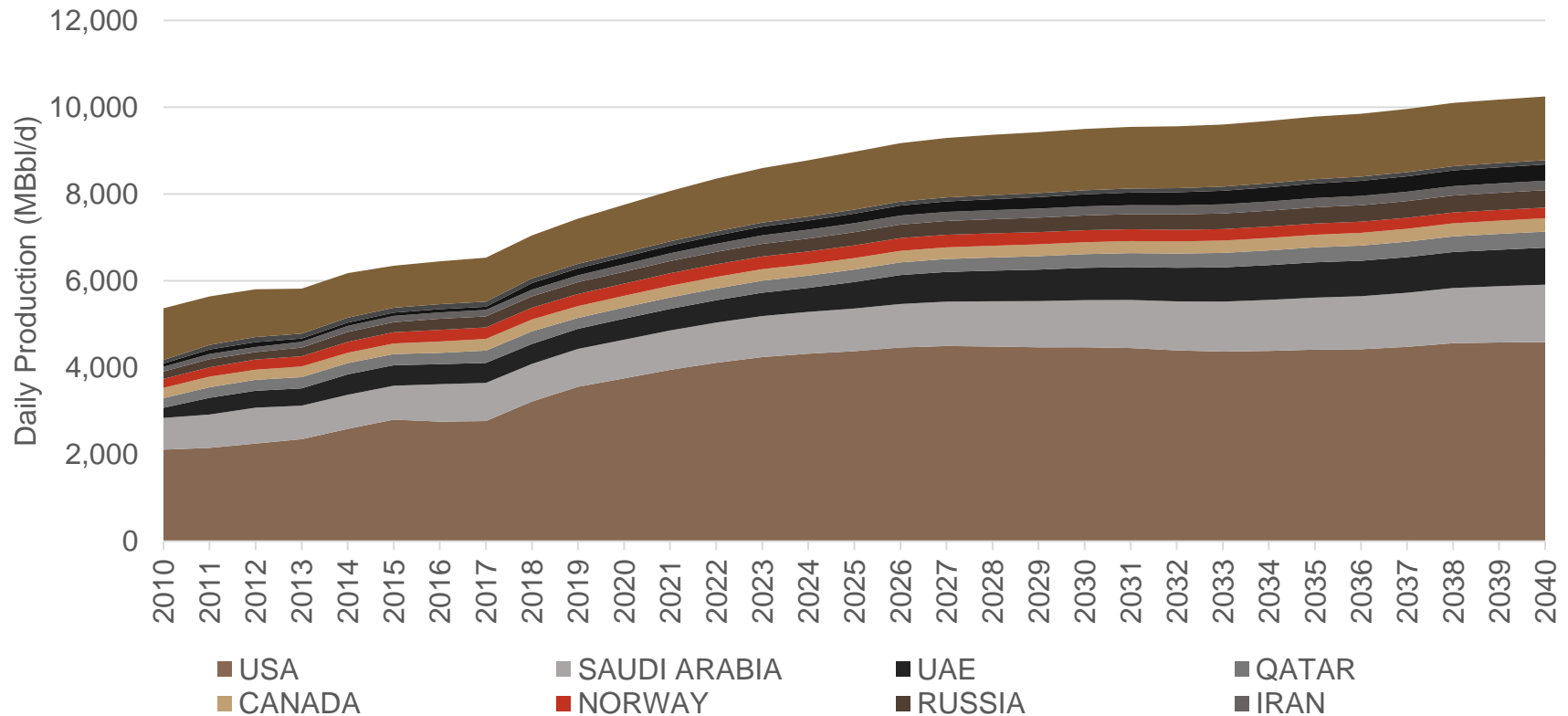


Source: Stratas Advisors

- North America is the top NGL producer, accounting for approximately 58% of global NGL supply
- Ethane constitutes more than half of global NGL output

Ethane supply to ramp rapidly

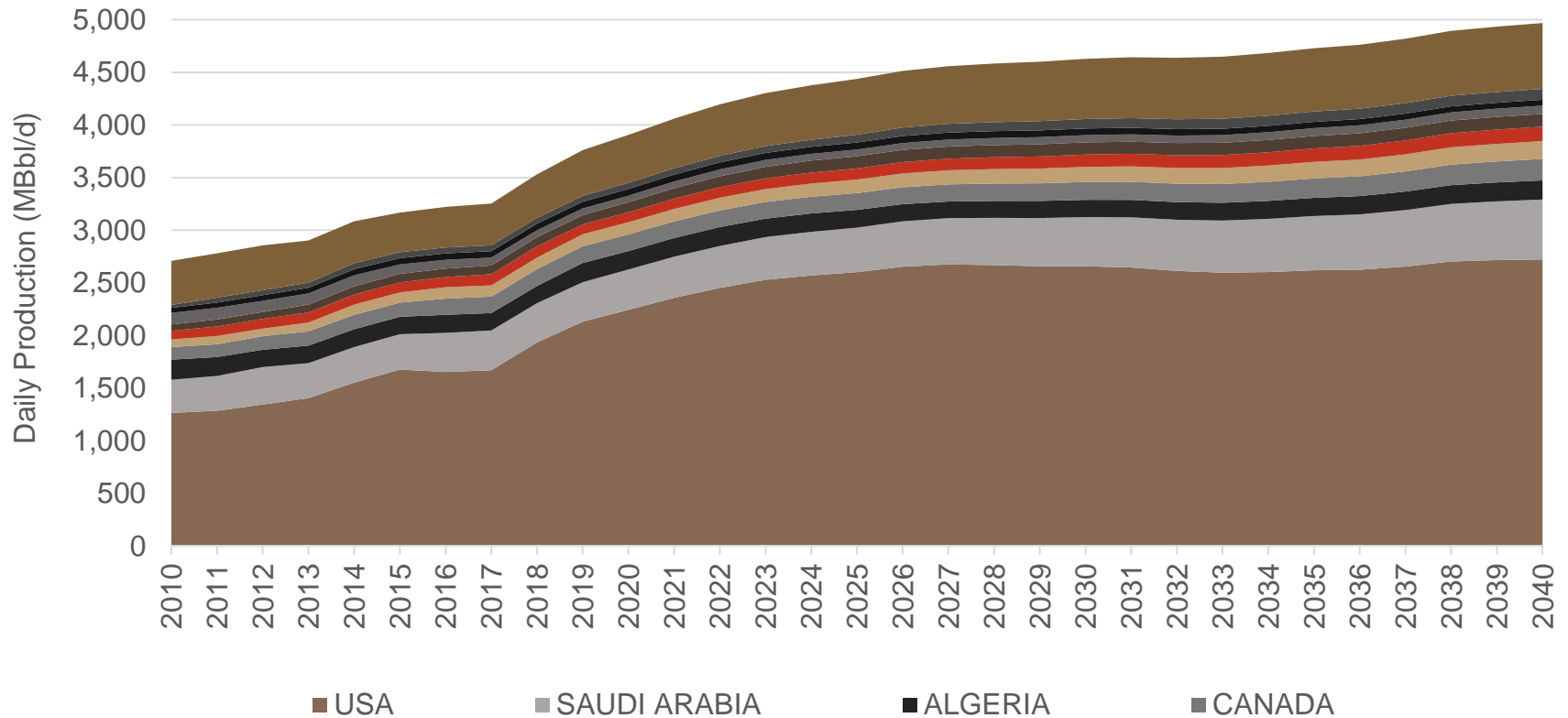
Ethane Supply by Country



- Ethane growth driven largely by robust Permian activity
- Efforts to curb flaring and ongoing infrastructure build-outs add to ethane capture

Propane shares a similar story with ethane...

Propane Supply by Country



Major Takeaways

Crude Oil

- Global oil and condensate production to reach 86.9 million b/d by end of 2020, and 93.2 million b/d by 2040
- U.S. will account for almost half of global growth before 2020. Long term growth relies on Middle East
- OPEC production cuts of 1.2 million b/d indicated for 1H2019
- Asian countries stand to benefit from ample supply and low prices caused by the shale boom

Natural Gas and NGL

- Global dry gas production will ramp up to over 380 Bcf/d by the end of 2020, and 509 Bcf/d by 2040
- Global NGL production will reach close to 15 million b/d by the end of 2020, and over 19 million b/d by 2040
- U.S. and Middle East will account for the majority of global gas output
- As U.S. expands LNG export capacity, Asian LNG consumers will benefit from lower price, while Qatar and Australia will experience fierce competition for market share

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1616 South Voss Road | Suite 675 | Houston, TX 77057 | United States | TEL +1.713.260.6426 | stratasadvisors.com

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