

STRATAS  
ADVISORS  
A HART ENERGY COMPANY



## Changing Oil & Gas Landscape 油气景观的演变

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China Petroleum & Chemical International Conference (CPCIC 2018)  
2018中国国际石油化工大会  
Sept. 11-13, 2018  
2018年9月11-13日

[www.stratasadvisors.com](http://www.stratasadvisors.com)

UPSTREAM | MIDSTREAM | DOWNSTREAM | FUEL & TRANSPORT



# Agenda 议程

- Overview of Stratas Advisors 公司介绍
- Major Themes 主要主题
- Upstream Supply Outlook 上游供应展望
- Global LNG Dynamics 全球液化天然气动态
- Other Hydrocarbon Flows 其他油气流动
- Key Takeaways 关键要点



## Overview of Stratas Advisors 公司介绍

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# Who We Are 我们是谁



# STRATAS

## ADVISORS

A HART ENERGY COMPANY

[www.stratasadvisors.com](http://www.stratasadvisors.com)

- Stratas Advisors is a global consulting and advisory firm that covers the full spectrum of the energy sector and closely linked industries
  - Stratas Advisors是一家全球咨询公司，业务范围涵盖能源领域和各个行业
- The world's leading businesses, governments and institutions turn to us for data, analysis and insight (IOCs, NOCs, independents, energy consumers and financial entities) 世界领先的企业，政府和机构向我们寻求数据，分析和洞察力（国际石油公司，国有石油公司，私营公司，能源消费者和金融实体）
- We help our clients achieve tangible results through informed strategic decision-making and implementation planning 我们通过明智的战略决策和实施计划帮助客户取得切实成果
- Key differentiators include
  - Global coverage with deep local knowledge
  - Integrated analysis across the entire energy value chain, including macro-level analysis (geopolitics, macro-economics, policies and regulations)主要区别包括：
  - 全球覆盖，具有深厚的本地知识
  - 整个能源价值链的综合分析，包括宏观层面分析（地缘政治，宏观经济，政策和法规）
- Our research and consulting staff comprises professionals located on the ground in key global energy market centers 我们的研究和咨询人员包括位于全球主要能源市场中心的专业人士
- Combined, our team brings over 500 years of combined energy industry expertise, including
  - Technical (Petroleum Engineers, Geologists, Process Engineers)
  - Economists
  - Political Scientists
  - Financial Analysts

我们的团队结合了500多年的能源行业综合专业知识，包括 技术（石油工程师，地质学家，工艺工程师），经济学家，政治科学家，财务分析师

# What We Offer 我们提供什么

Helping clients achieve tangible results 帮助客户取得切实成果

## Services 服务



An innovative online portal of data, information and insights across the oil & gas value chain and macro-level issues that includes GIS mapping and interactive data tools

一个创新的网站，包括石油和天然气价值链以及宏观层面问题的数据，信息和见解，包括GIS地图和交互式数据工具

## Consulting 咨询



A full range of consulting support, allowing you to gain an external perspective on strategic matters and to respond proactively by implementing the appropriate initiatives for success

全方位的咨询支持，使您能够获得战略问题的外部视角，并通过实施适当的成功举措积极响应

## Advisory



Customized retainer arrangements with access to senior Stratas Advisors staff who will answer your questions about:

- Macro-level developments
- Energy markets
- Industry events and trends
- Investment risks and opportunities

定制的保留安排，可以接触Stratas Advisors高级职员，他们将回答以下问题：

- 宏观层面的发展
- 能源市场
- 行业活动和趋势
- 投资风险和机遇

# Subscription Matrix 订阅矩阵

Macro 宏观	Upstream 上游	Midstream 中游	Downstream 下游	Fuel & Transportation 燃料与车辆
Stratas Energy Perspectives Stratas能源观点	Enhanced Shale Service 增强页岩服务	North American Shale-Related Infrastructure 北美页岩相关基础设施	Global Refining & Products 全球炼油与油品	Global Fuel Specifications 全球燃料规格
Long-term Price Forecasting 长期价格预测	StratasScope Stratas范围	North American Midstream (Oil, Natural Gas, NGLs) 北美中游 (石油, 天然气, 天然气液体)	North American Refining & Products 北美炼油与油品	Global Alternative Fuels 全球替代燃料
Short-term Price Forecasting 短期价格预测	Global Hydrocarbon Supply 全球碳氢化合物供应	Global Natural Gas Outlook 全球天然气展望	Base Petrochemicals 基础石化	Global Biofuels Assessment 全球生物燃料评估
	Global Heavy Crude Outlook 全球重质原油展望	Global LNG 全球液化天然气展望	Catalyst Market Outlook 催化剂市场前景	Global Biofuels Outlook 全球生物燃料展望
	Global Upstream Projects Analytics 全球上游项目分析	Global NGLs Outlook 全球天然气液体展望	Global Syngas Conversion 全球合成气转换	Global Transport Fuel Assessment 全球车用燃料评估
				Global Automotive 全球汽车

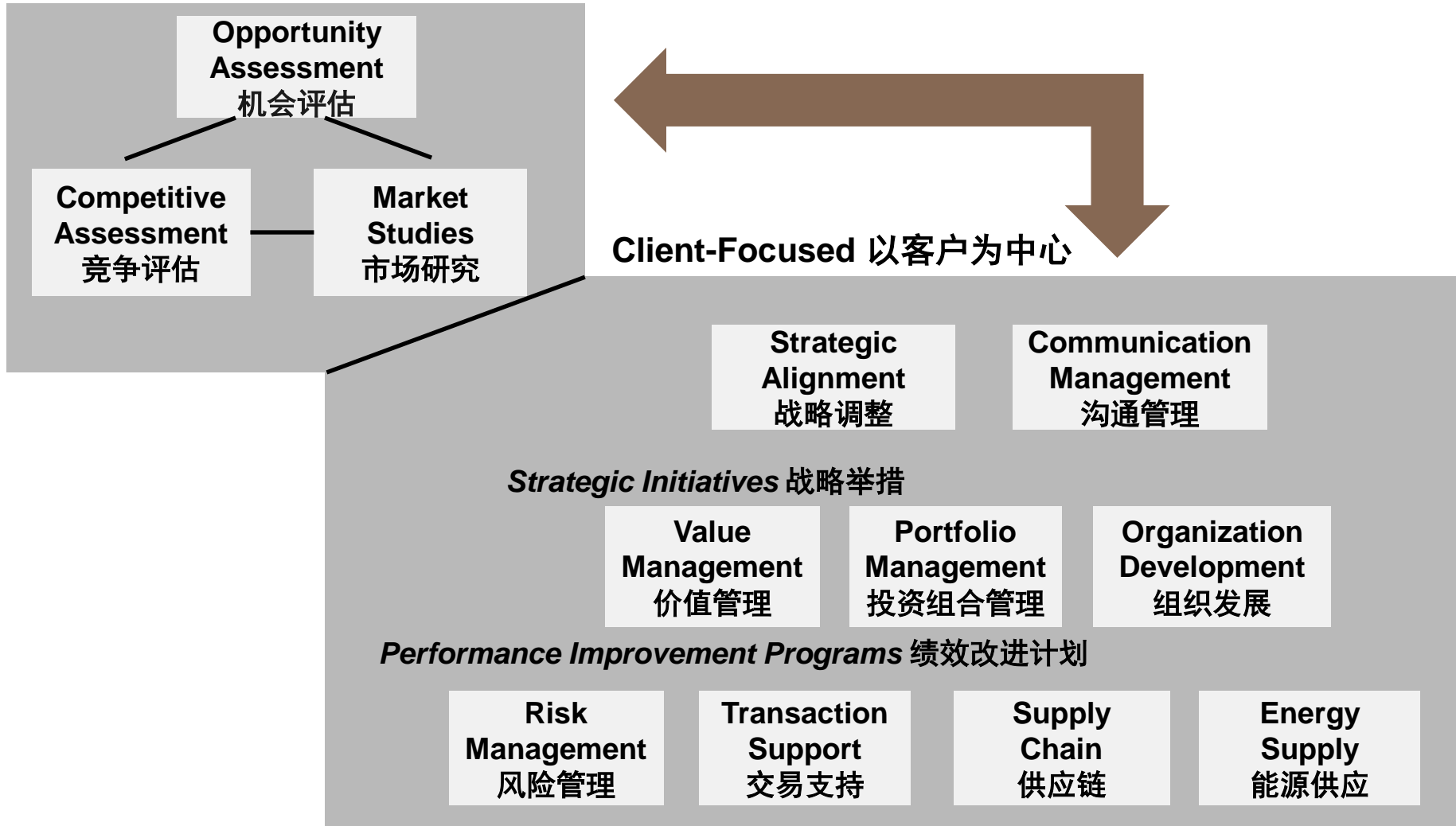
**Regional Assessments – North America, Latin America, Europe, Russia and CIS, Middle East, Africa, Asia**  
区域评估 - 北美, 拉丁美洲, 欧洲, 俄罗斯和独联体, 中东, 非洲, 亚洲

**Related Industries – Shipping and logistics, Heavy Industries, Power** 相关行业 - 航运和物流, 重工业, 电力



# Examples of Consulting Offerings 咨询服务的例子

## External Assessment 外部评估



# Examples of Advisory Retainers 咨询保留的例子

Macro-Level 宏观	Providing coverage of the geopolitical issues, economic trends and policy and regulatory developments that will shape the future environment 提供将影响未来环境的地缘政治问题，经济趋势以及政策和监管发展的报道
Energy Markets 能源市场	Providing integrated coverage of the energy markets including crude oil, oil products, natural gas, NGLs, coal and renewables (prices) 提供能源市场的综合覆盖，包括原油，石油产品，天然气，天然气液体，煤炭和可再生能源（价格）
Competitive Assessment 竞争评估	Providing a forward-looking assessment of the competitive landscape of the oil & gas sector across the entire value chain from a global and regional perspective including comparisons of strategy, structural positioning and financial performance 从全球和区域角度对整个价值链中的石油和天然气行业的竞争格局进行前瞻性评估，包括战略，结构定位和财务绩效的比较
Transactions & Investment Analysis 交易与投资分析	Providing analysis of transactions and capital investments associated with the oil & gas sector across the entire value chain from a global and regional perspective 从全球和区域角度分析整个价值链中与石油和天然气行业相关的交易和资本投资

***In addition to the above retainers, Stratas Advisors can develop a retainer that is customized for a client's specific needs***

**除上述外，Stratas Advisors还可以根据客户的具体需求开发定制保留咨询**



# Clients 客户

## Oil & Gas Operators 油气运营商

- IOCs 国际石油公司
- NOCs 国有石油公司
- Independents 私营公司
- Midstream operators 中游运营商
- Refiners 炼油厂
- Distributors 分销商
- Marketers 营销

## Service Providers 服务供应商

- Upstream 上游
- Midstream 中游
- Downstream 下游

## Petrochemical Manufacturers 石化制造商

## Catalyst Manufacturers 催化剂制造商

## Heavy Industries 重工业

## Power Generators 发电机

## Technology Licensors 技术许可人

## EPC Firms 工程采购建筑公司

## Automotive 车辆

- Light-duty 轻型
- Heavy-duty 重型
- Off-road 非道路

## Transport 运输

- Marine 海运
- Rail 轨运
- Air 航空

## Logistics 物流

## Finance 金融

- Sell-side 卖方
- Asset Management 资产管理
- Private equity 私人产权
- Hedge funds 对冲基金

## Energy Traders 能源交易员

## Government 政府

- Agencies 机构
- Regulators 监管机构

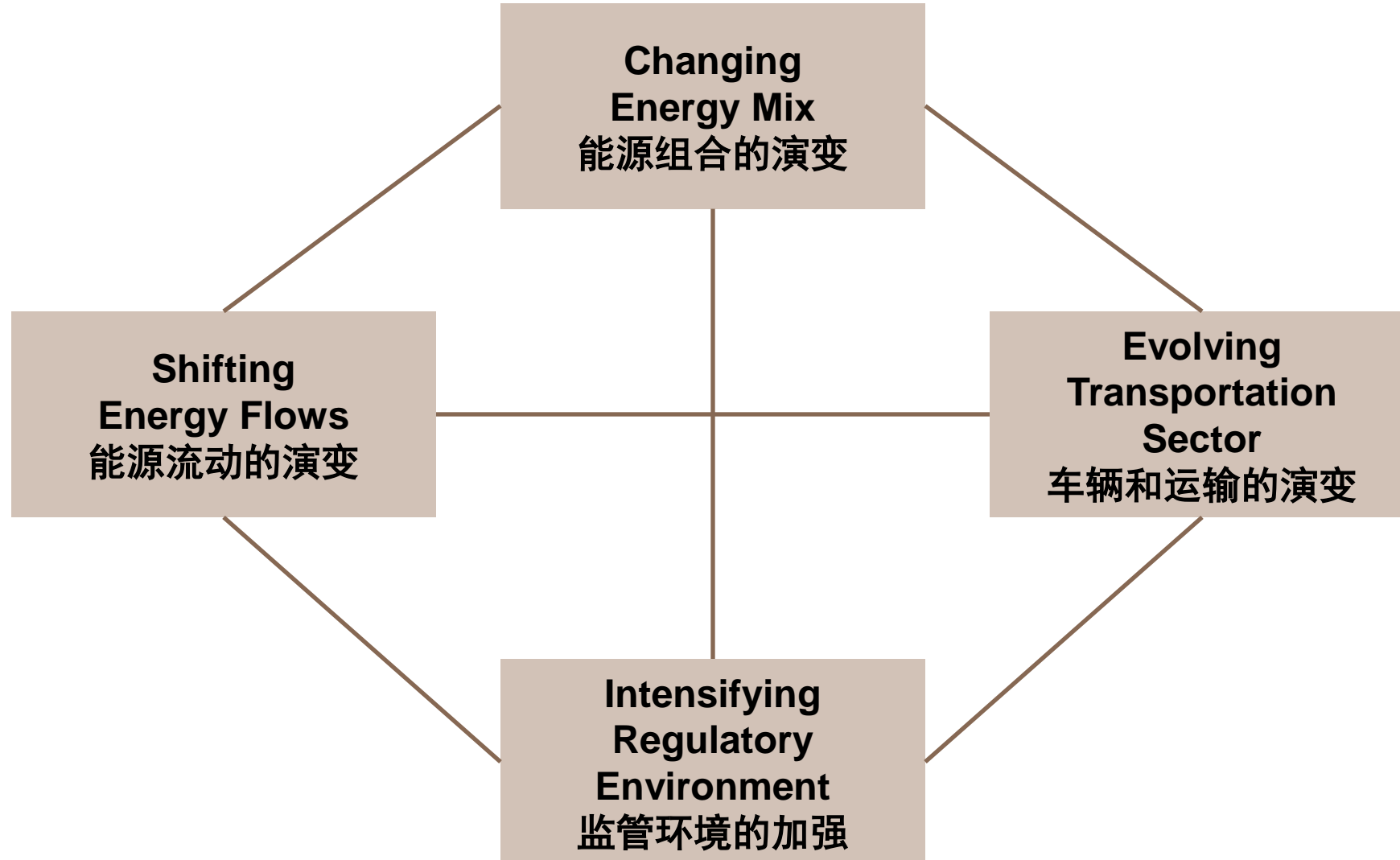


## Major Themes 主要主题

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# There are major themes that will affect the oil & gas sector

## 有一些主题将影响油气行业



# Changing Energy Mix 能源组合的演变

- **Shale** – North America and beyond 页岩 - 北美及其他地区
- **Non-shale** – growth areas, declining areas 非页岩 - 增长区域, 下降区域
- **Natural gas** – new importance 天然气 - 新的重要性

- **Clean sources of energy** – increased focus 清洁能源 - 增加焦点
- **Alternative fuels** – transportation & non-transportation 替代燃料 - 道路和非道路



**Source of marginal production –  
across time horizons**

边际生产的来源 - 跨越时间范围

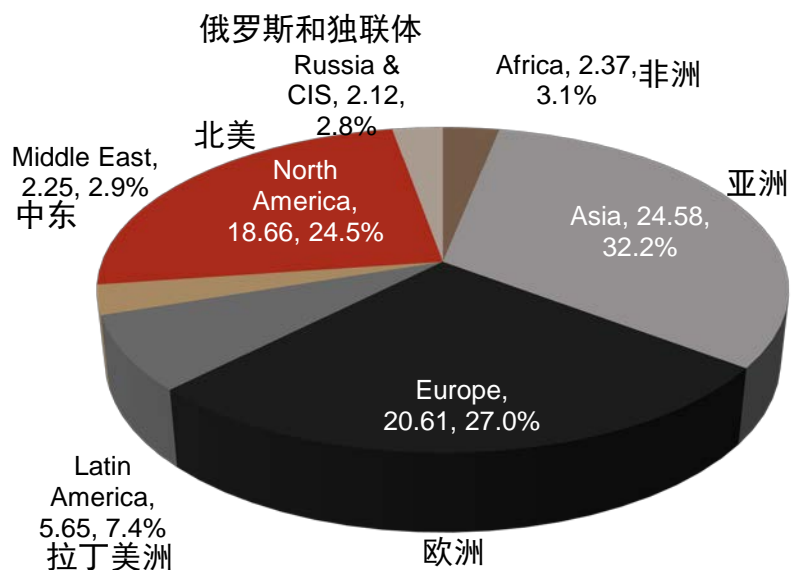


**Supply/Demand Dynamics**

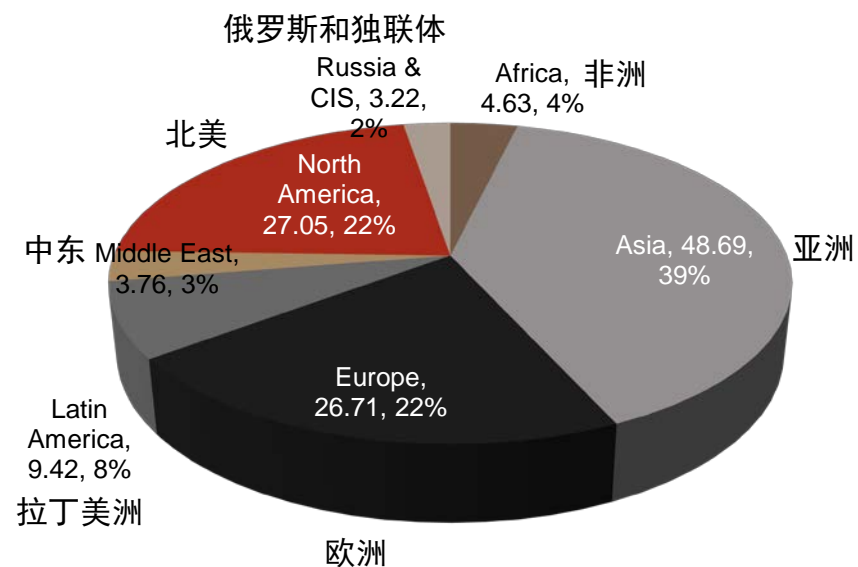
供需动态

# GDP Forecast 国内生产总值预测

**2016 Total GDP: 76.24 trillion USD**  
**2016年国内生产总值: 76.24万亿美元**

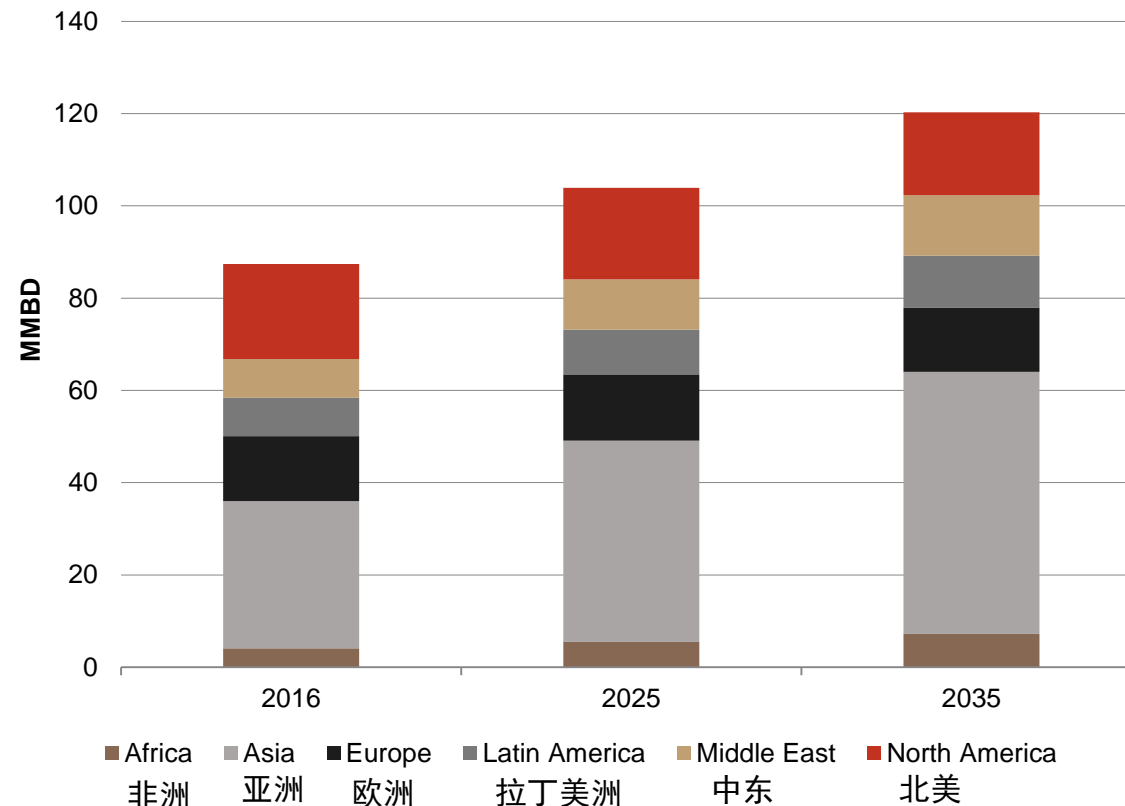


**2035 Total GDP: 123.47 trillion USD**  
**2035年国内生产总值: 123.47万亿美元**



Source: Stratas Advisors, 2010 prices and exchange rates  
 资料来源: Stratas Advisors, 2010年价格和汇率

# Oil Demand by Region 各地区的石油需求

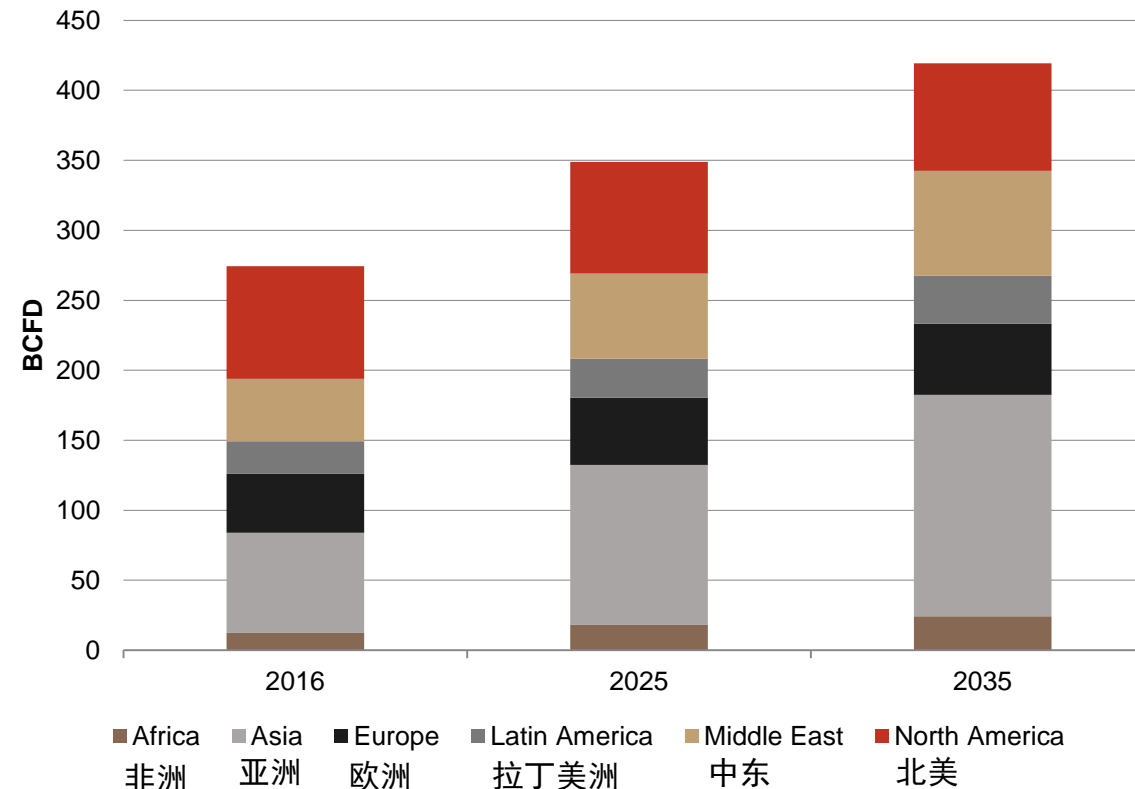


Source 资料来源: Stratas Advisors

- Global oil demand is expected to continued to increase 预计全球石油需求将继续增加
- Asia will represent the overwhelming portion of future demand growth 亚洲将成为未来需求增长的绝大部分
- Demand in North America and Europe is expected to decline 预计北美和欧洲的需求将下降



# Natural Gas Demand by Region 各地区天然气需求



Source 资料来源: Stratas Advisors

- Global demand for natural gas is expected to continued to increase 预计全球天然气需求将继续增加
- Asia will represent the overwhelming portion of future demand growth 亚洲将成为未来需求增长的绝大部分


# Shifting Energy Flows 能源流动的演变

**Differing rates of economic growth**  
不同的经济增长率

**Shifting focus from Atlantic Basin to Pacific Basin**  
将焦点从大西洋盆地转移到太平洋盆地

**Expanding role of US as an energy supplier**  
扩大美国作为能源供应商的作用

**Geopolitics – OPEC, Russia, Middle East, China/US**  
地缘政治 - 欧佩克，俄罗斯，中东，中国/美国



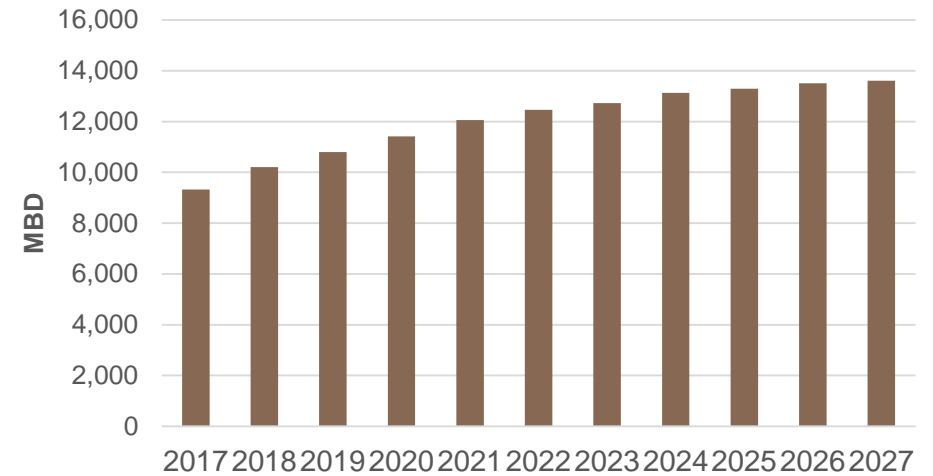
**Bottlenecks, dislocations and investment needs**  
瓶颈，错位和投资需求

# US Crude Production / Exports 美国原油生产/出口

- US crude oil production is forecasted to increase from 9.4 MMBD to 13.6 MMBD by 2027

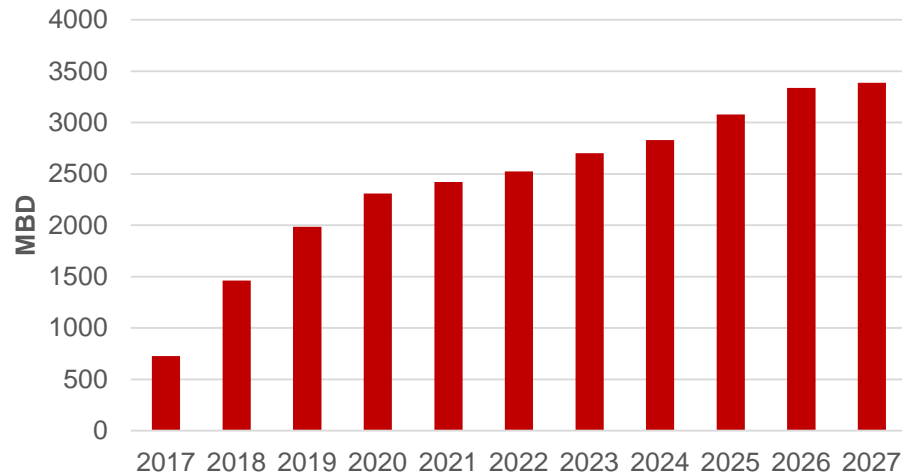
到2027年，美国原油产量预计将从9.4 MMBD增加到13.6 MMBD

### Crude Production 原油生产



Source 资料来源: Stratas Advisors

### Crude Exports 原油出口

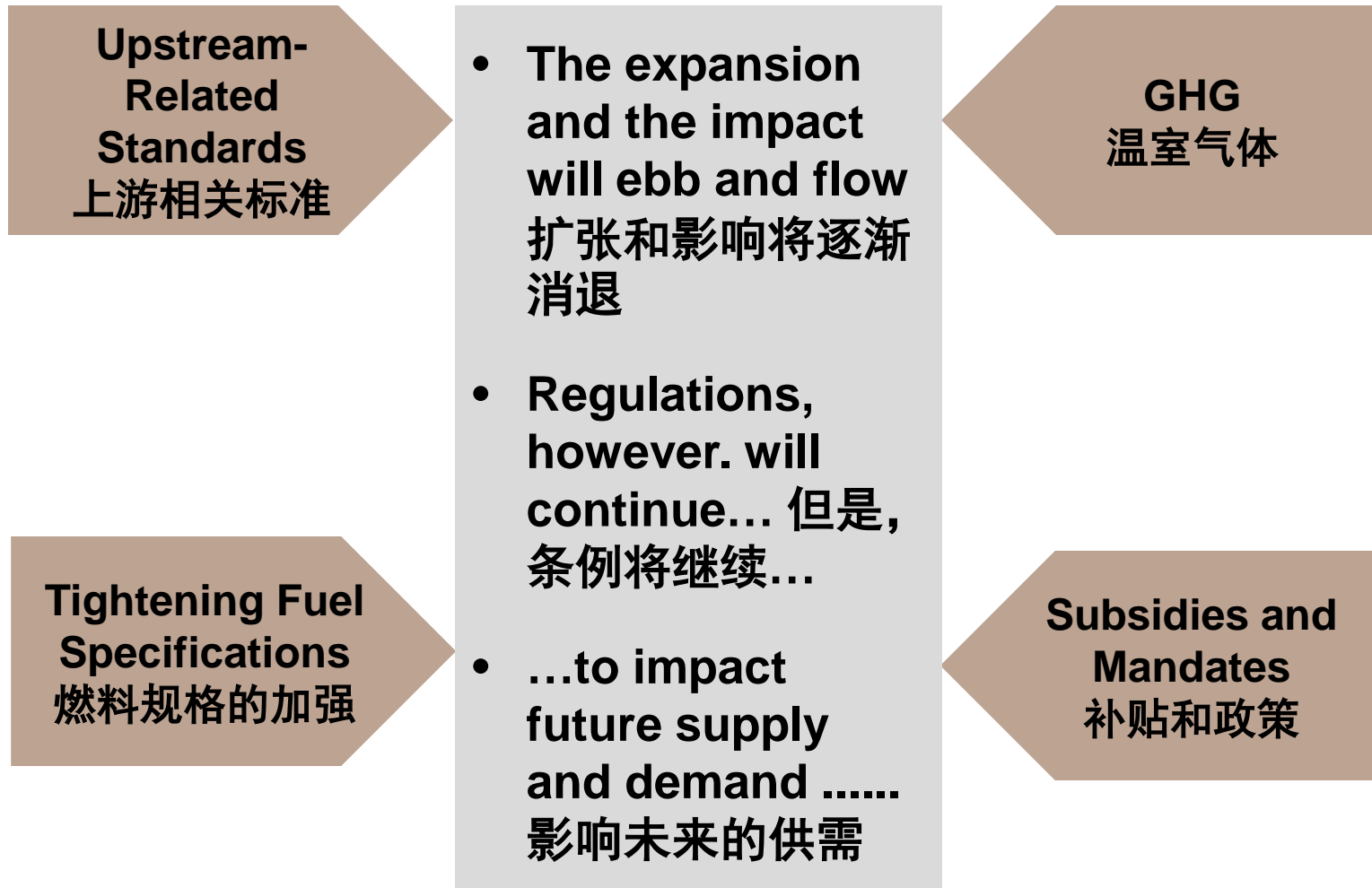


Source 资料来源: Stratas Advisors

- Simultaneously, US crude exports are forecasted to increase from 728 MBD to nearly 3.4 MMBD by 2027

同时，预计到2027年美国原油出口量将从728 MBD增加到近3.4 MMBD

# Expanding Regulatory Environment 监管环境的扩大



# Evolving Transportation Sector 车辆和运输的演变

## Common Drivers 共同驱动力

- **Electrification** 电动化
- **Digitization** 数字化
- **Autonomous** 自主性
- **Efficiency** 效率
- **Clean** 清洁

### Light-Duty 轻型车

Size of fleet, Powertrain 车队规模, 动力总成

### Heavy-duty and Off-Road 重型车和非道路

Still dependent on diesel 仍然依赖柴油

### Marine 海运

IMO, Shipping Patterns 国际海事组织, 航运模式

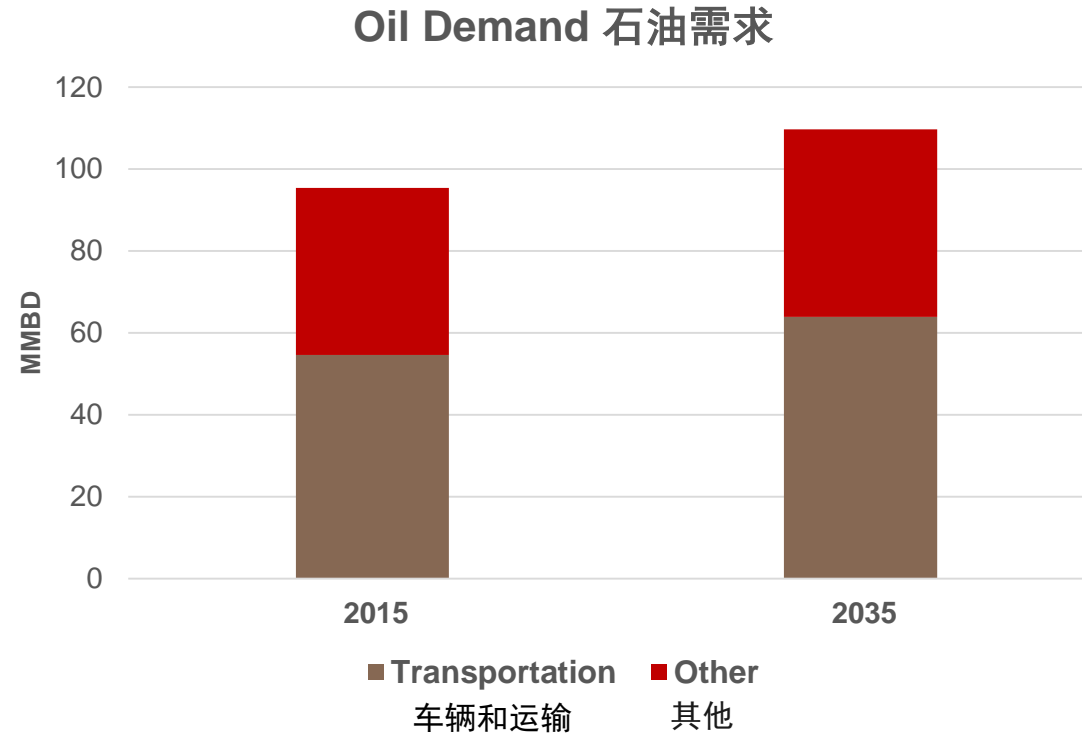
### Rail 轨运

Freight, Passengers 货运, 乘客

### Aviation 航空

Number of flights, Point-to-Point 航班数量, 点对点

# Importance of Transportation 车辆和运输的重要性



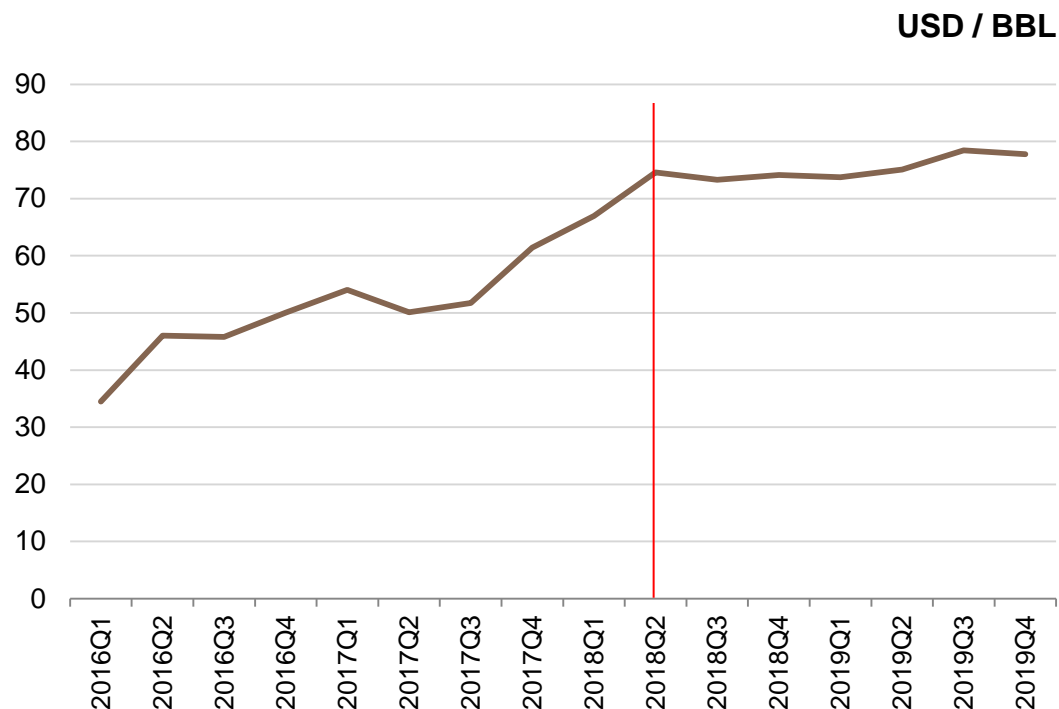
Source 资料来源: Stratas Advisors

- The portion of oil demand in 2015 represented by the transportation sector was 57% 以车辆和运输业为代表的2015年石油需求部分为57%
- By 2035 the portion of oil demand represented by the transportation is forecasted to still remain around 60% 到2035年，车辆和运输所代表的石油需求部分预计仍将保持在60%左右



# Brent Crude to remain between \$70 and \$80

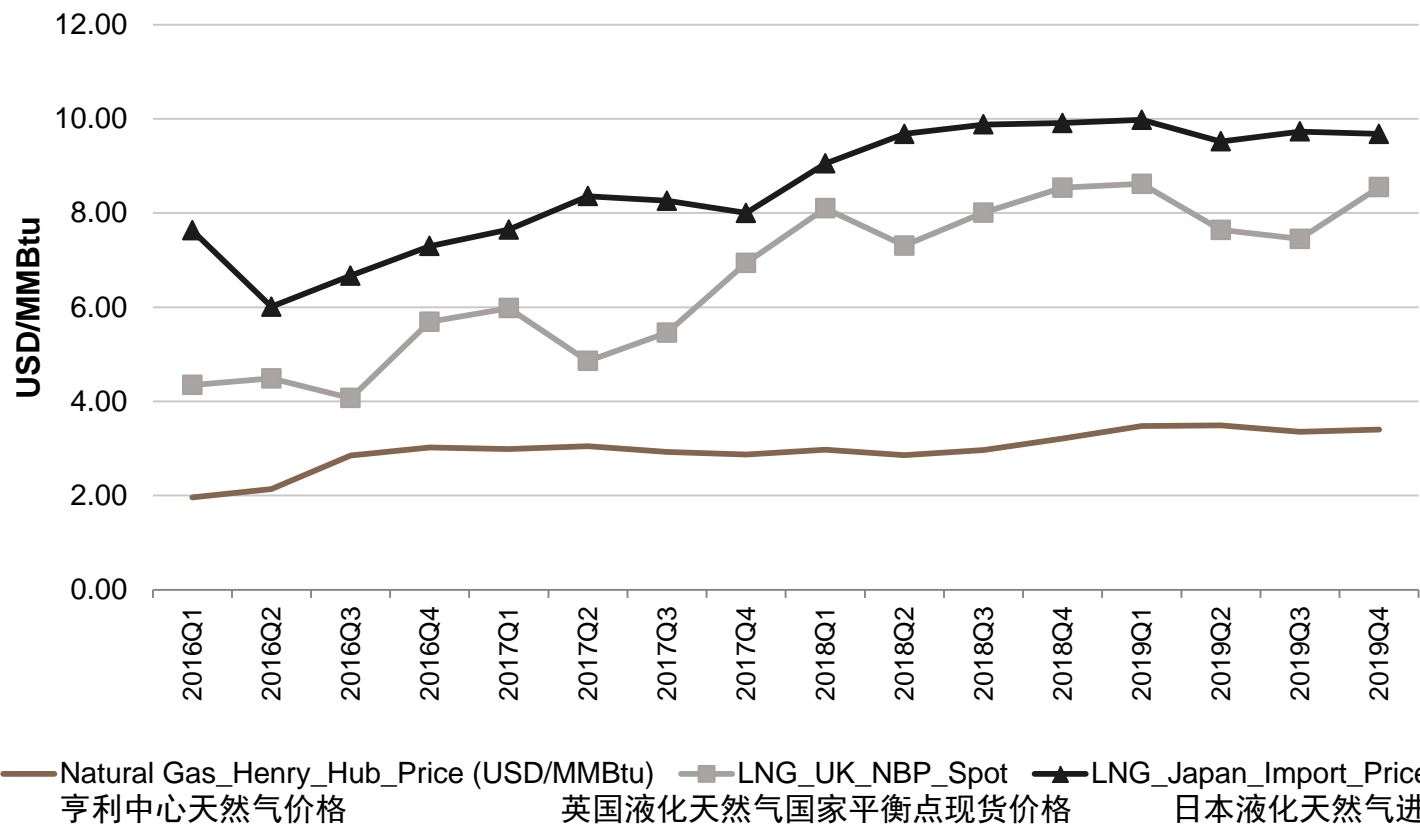
## 布伦特原油价格在70美元至80美元之间



Source 资料来源: Platts 普氏, Stratas Advisors

- Brent is accelerating in a trend upward as supply/demand conditions tighten 随着供需状况收紧，布伦特原油正在加速上行
- Global demand growth is forecasted to continue to increase 全球需求增长预计将继续增长
- The rate of growth in shale production is forecasted to slow... 预计页岩生产增长速度将放缓.....
- ...coupled with global production headwinds that outstrips OPEC gains 再加上全球生产逆风，超过欧佩克的收益

# Natural Gas Prices to Stabilize 天然气价格稳定



- Prices in Asia are forecasted to plateau around USD 10.00 through 2019 亚洲的价格预计将在2019年至10美元左右达到稳定水平
- While differential between Asia and Europe is expected to narrow 虽然亚洲和欧洲之间的差异有望缩小
- Prices in the US are forecasted to stay flat until Q1 of 2019 because of the impact... 由于影响，美国的价格预计将持续到2019年第一季度.....

...from low inventories going into the winter heating season 从低库存进入冬季采暖季节

Source: Platts, Stratras Advisors

# Scenario Narratives 场景叙事

- **Upside Case: Shifting to a New Global Framework** 上行案例：转向新的全球框架
  - Technology / carbon reduction focus 技术/碳减排重点
- **Reference Case: Muddling Through** 参考案例：得过且过
  - Business as usual / focus on efficiency 照常营业/注重效率
- **Downside Case: Breakdown into Multi-Polarization** 下行案例：分析多极化
  - Energy Security Focus 能源安全焦点

# Scenario Inputs 场景输入点

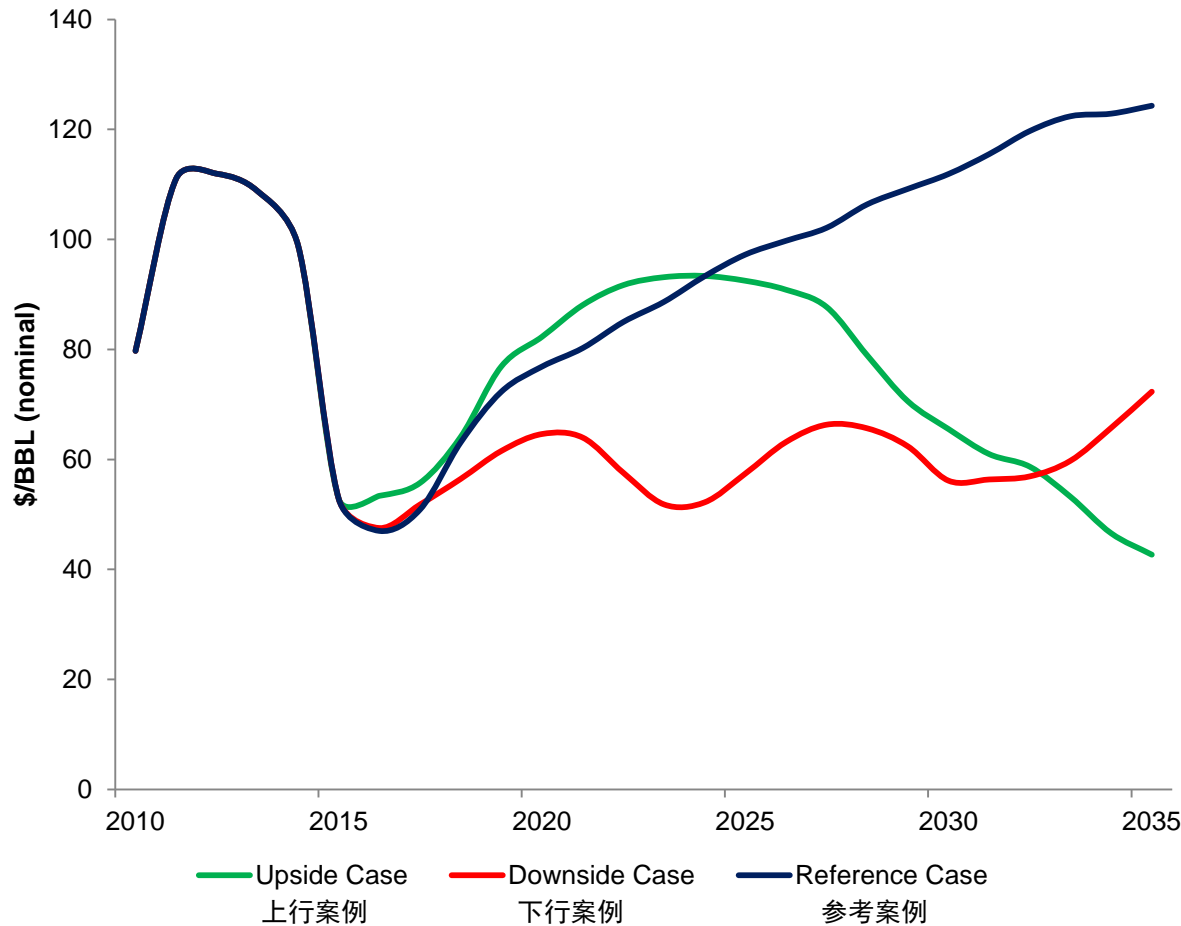
Relative Impact of Factors

因素的相对影响



Factor 因素	Reference 参考案例	Upside 上行案例	Downside 下行案例
<b>GDP Growth</b> 国内生产总值增长	Moderate 中等	Strong 强	Weak 弱
<b>Technology penetration</b> 技术渗透	Power-focused; efficiency gains strong but new tech minimal on transportation 电源为重点;效率提高,但新技术对运输的影响最小	Aggressive penetration of renewables and EVs; strong efficiency gains 可再生能源和电动汽车的积极渗透;效率提升	Moderate, but based on energy security, not carbon 中等, 但基于能源安全, 而不是碳
<b>Geopolitical stability</b> 地缘政治稳定性	Regional conflicts 区域冲突	Focus on global cooperation 专注于全球合作	Trade wars, conflict ridden 贸易战, 冲突缠身
<b>Policy</b> 政策	Limited meaningful action; some countries take action 行动有限;一些国家采取行动	Widespread carbon-reduction focus 广泛的碳减排重点	Energy-security focused 以能源安全为重点

# Oil Price Outlook – Brent Crude 油价展望 - 布伦特原油



Business as usual – increasing demand with cost inflation

照常营业 - 通过成本膨胀增加需求

Demand weak; price oscillates as OPEC invests to suppress new investment and gain share

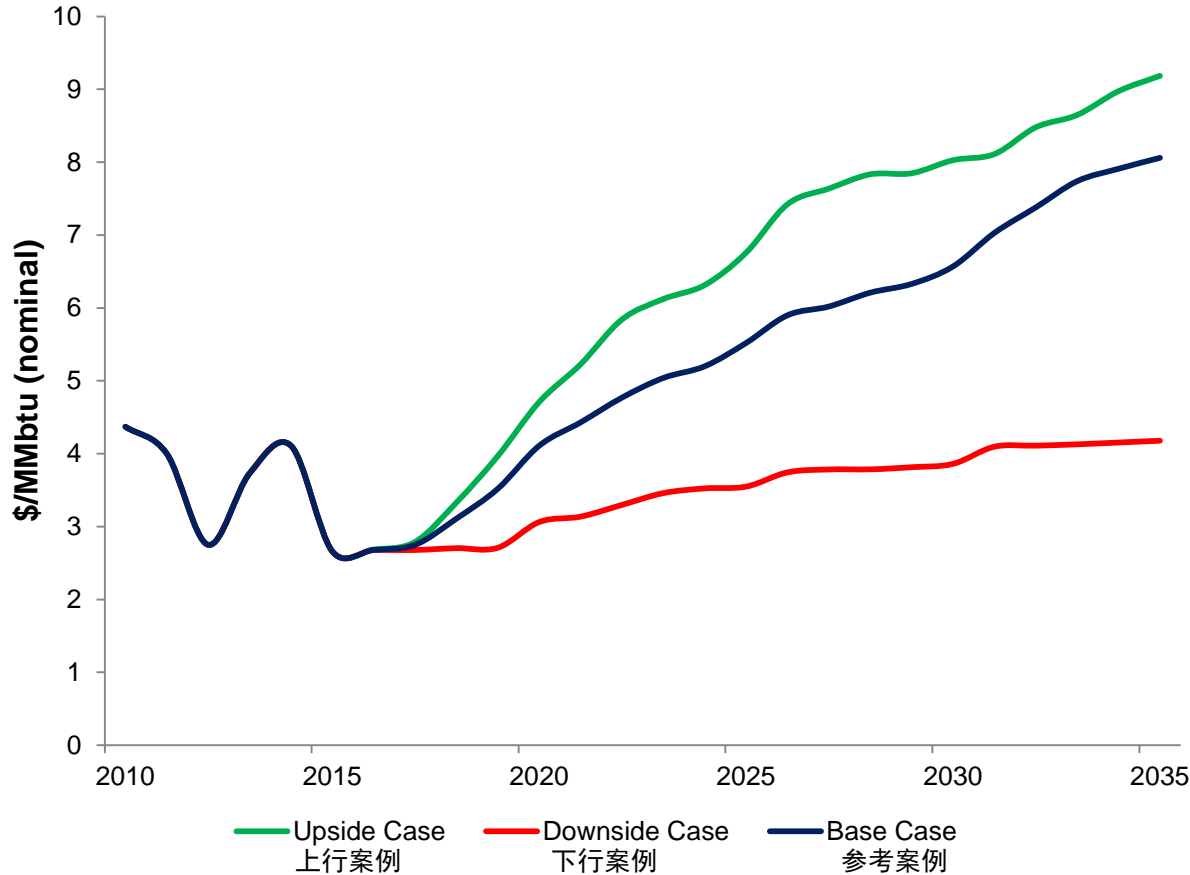
需求疲软;随着欧佩克投资以抑制新投资并获得份额, 价格波动

Demand pops on strong growth, but wanes as fracking spreads and world moves away from CO<sub>2</sub>

需求强劲增长, 但随着水力压裂蔓延和世界摆脱二氧化碳的影响而减少

# Natural Gas Price Outlook – Henry Hub

## 天然气价格展望 - 亨利中心



Strong gas demand as world becomes more CO2 focused; price increases temper as fracking spreads

随着世界变得更加关注二氧化碳，强劲的天随着水力压裂蔓延，价格上涨

Exports drive greater demand – both through LNG and pipeline – setting marginal price

出口推动了更大的需求 - 通过液化天然气和管道 - 设定边际价格

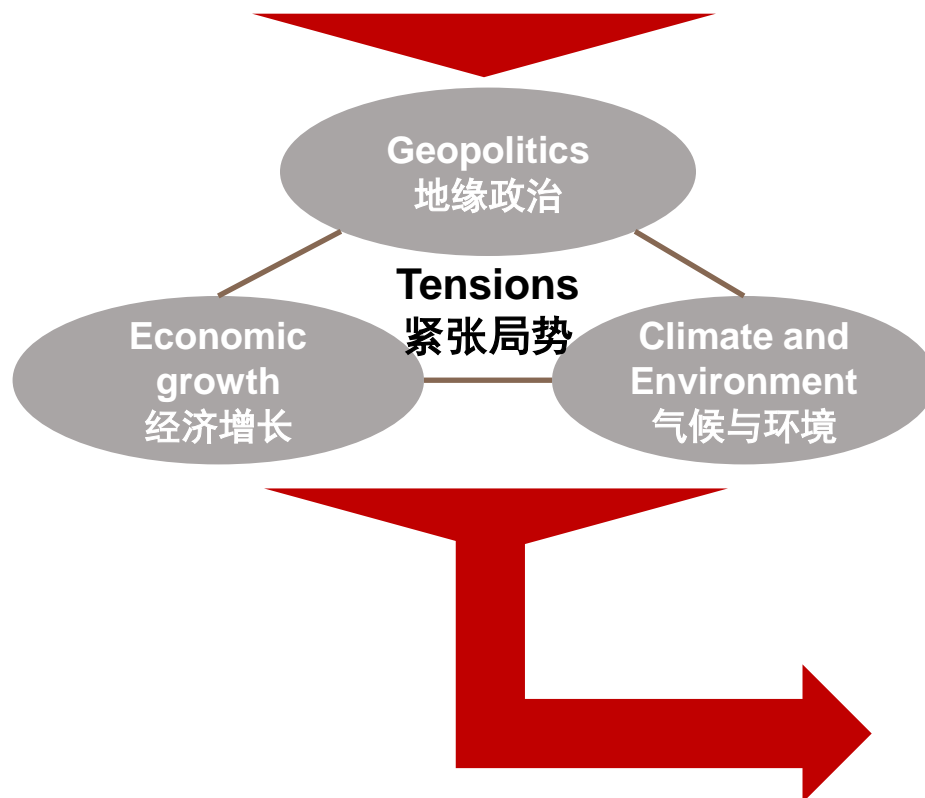
Price remains US centric as trade is stymied and carbon reduction remains of minimal concern

价格依然以美国为中心，因为贸易陷入困境，碳减排仍然是最小的问题



# Looking Forward 向前看

Hydrocarbons will remain an important part of the energy mix 碳氢化合物仍将是能源结构的重要组成部分

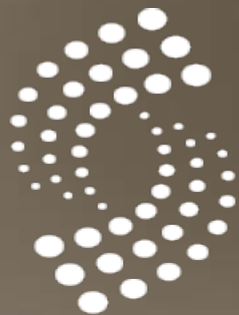


Volatility, Cyclicity and Uncertainty 波动性，周期性  
和不确定性

Tomorrow will not be the same as today 明天将不会  
像今天一样

# Need to Take a Strategic Approach 需要采取战略方针

- Understand your portfolio of businesses within the context of current environment and future environment 在当前环境和未来环境的背景下了解您的业务组合
- Invest only in assets and positions for which structural advantages can be established – structural disadvantages cannot be overcome through improving operations 仅投资可以建立结构优势的资产和头寸 - 通过改善运营无法克服结构性缺点
- Consider opportunities across time horizons and in terms of materiality – and the organizational capabilities required for success 考虑跨越时间范围和重要性的机会 - 以及成功所需的组织能力
- Assess current and future risk factors – and the ability to manage – and the impact on ability to drive risk-adjusted returns 评估当前和未来的风险因素 - 以及管理能力 - 以及对推动风险调整回报的能力的影响
- Utilize a comprehensive business model that links forward-looking strategies with capabilities, assets and external network to drive value for all stakeholders 利用全面的业务模型，将前瞻性战略与能力，资产和外部网络联系起来，为所有利益相关者创造价值



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## Supply Outlook 供应展望

Stephen Beck 斯蒂芬贝克  
Senior Director, Upstream 上游高级主任

[www.stratasadvisors.com](http://www.stratasadvisors.com)

UPSTREAM | MIDSTREAM | DOWNSTREAM | FUEL & TRANSPORT



# Assessment of Upstream Oil & Gas Developments 评估上游油气开发

- IMO compliance will reduce the demand for heavy crude by some 400,000 barrels per day in 2021 – with Russia and Venezuela are expected to bear the brunt of the decrease due to sulfur content and operational challenges 在2021年，国际海事组织的合规性将使重质原油需求减少约40万桶 - 俄罗斯和委内瑞拉预计将因硫含量和运营挑战而首当其冲
- Permian liquids production at yearend is expected to exceed 1 million barrels per day compared to December 2017. Growth will continue in 2019, albeit at a slower pace 与2017年12月相比，年底的二叠纪液体产量预计将超过每天100万桶。增长将在2019年继续，尽管速度较慢
- Offshore activity should pick 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 海上活动应在十年内回升 - 海上的支持因素包括更高的平均价格，页岩整合以及由于流程改进而改善海上经济效应
- Natural gas will increasingly resemble global crude oil markets with well identified global price benchmarks, flow tracking of cargos, and liquid spot markets 天然气将越来越像全球原油市场，具有明确的全球价格基准，货物流量跟踪和液体现货市场
- Natural gas demand will increasingly be serviced by supplies from North America, Russia, and the Middle East/ Africa 天然气需求将越来越多地来自北美，俄罗斯和中东/非洲的供应
- 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 在页岩应用技术，流程改进和变更业务实践中运营的公司保持竞争力。这些改进将继续使页岩公司多年受益
- The U.S. will be a key supply source for natural gas liquids, especially propane 美国将成为天然气液体的主要供应来源，尤其是丙烷



Global Upstream 全球上游

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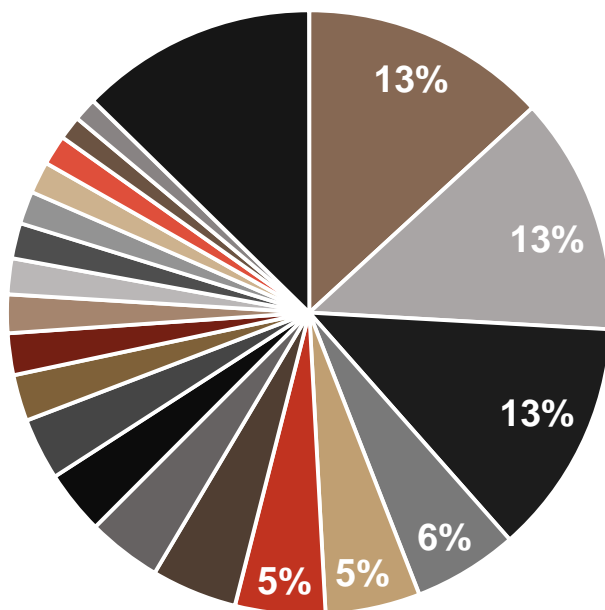
# Global crude and condensate growing in familiar places

## 全球原油和凝析油在熟悉的地方生长

### 2018 Global Crude and Condensate Supply

82.7 MMBbl per Day

2018年全球原油和凝析油供应 每天82.7 MMBbl

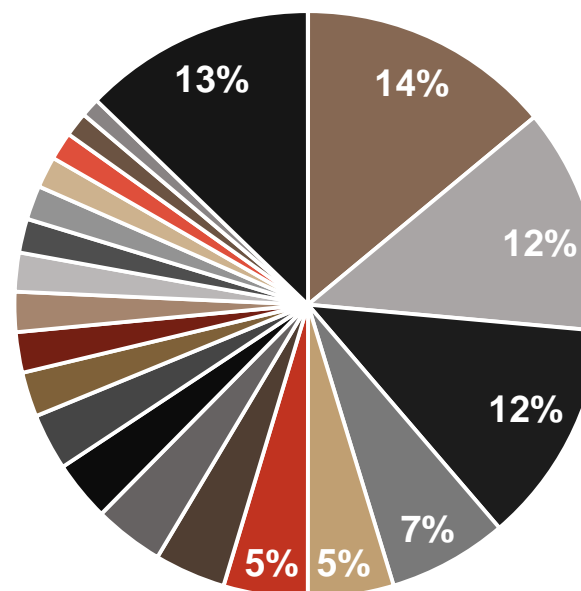


- RUSSIA 俄国
- SAUDI ARABIA 沙特阿拉伯
- USA 美国
- IRAQ 伊拉克
- CANADA 加拿大
- IRAN 伊朗
- CHINA 中国
- UAE 阿联酋
- KUWAIT 科威特
- BRAZIL 巴西
- NIGERIA 尼日利亚
- MEXICO 墨西哥
- KAZAKHSTAN 哈萨克斯坦
- NORWAY 挪威
- ANGOLA 安哥拉
- VENEZUELA 委内瑞拉
- QATAR 卡塔尔
- ALGERIA 阿尔及利亚
- LIBYA 利比亚
- UK 英国
- Other 其他

### 2023 Global Crude and Condensate Supply

86.2 MMBbl per Day

2023年全球原油和凝析油供应 每天86.2 MMBbl

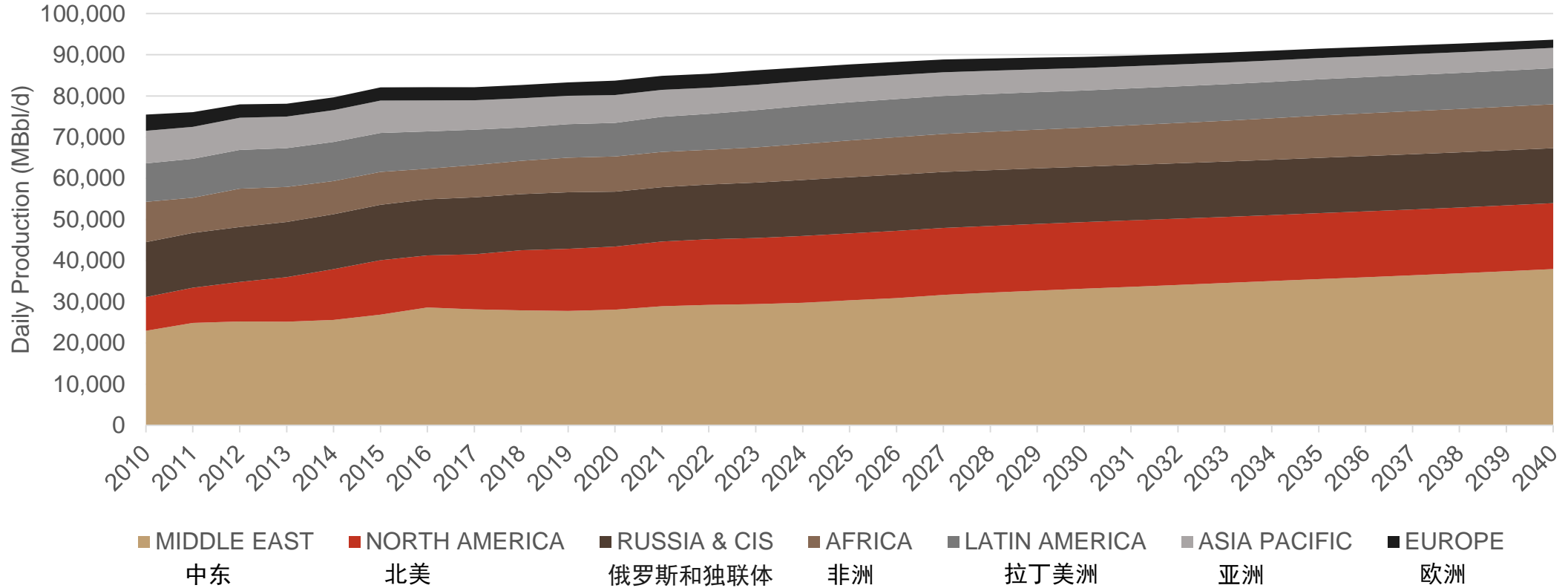


- USA 美国
- RUSSIA 俄国
- SAUDI ARABIA 沙特阿拉伯
- IRAQ 伊拉克
- IRAN 伊朗
- CANADA 加拿大
- UAE 阿联酋
- BRAZIL 巴西
- CHINA 中国
- KUWAIT 科威特
- NORWAY 挪威
- NIGERIA 尼日利亚
- MEXICO 墨西哥
- KAZAKHSTAN 哈萨克斯坦
- ANGOLA 安哥拉
- QATAR 卡塔尔
- LIBYA 利比亚
- ALGERIA 阿尔及利亚
- VENEZUELA 委内瑞拉
- OMAN 阿曼
- Other 其他



# Longer-term, supply expected to increasingly consolidate 从长期来看，供应有望日益巩固

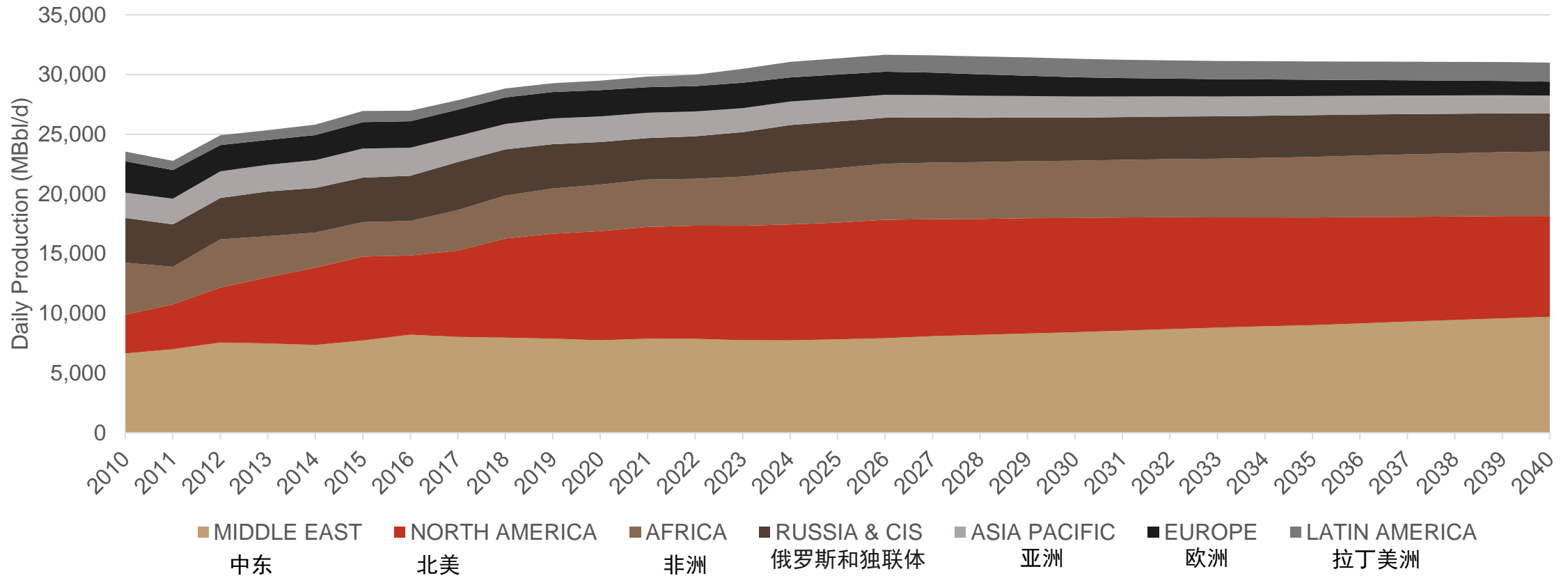
Crude Oil and Condensate Production by Region 各地区原油和凝析油产量



- The Middle East, North America, and Russia+CIS will capture more of the fossil fuel market in the long-term due to their large resource bases, technological prowess, and proximity to markets  
中东，北美，俄罗斯和独联体将长期占据更多的化石燃料市场，因为它们拥有庞大的资源基础，技术实力和市场接近度

# US shale will drive North American light crude production 美国页岩将推动北美轻质原油生产

Light Crude Production by Region 各地区轻质原油产量

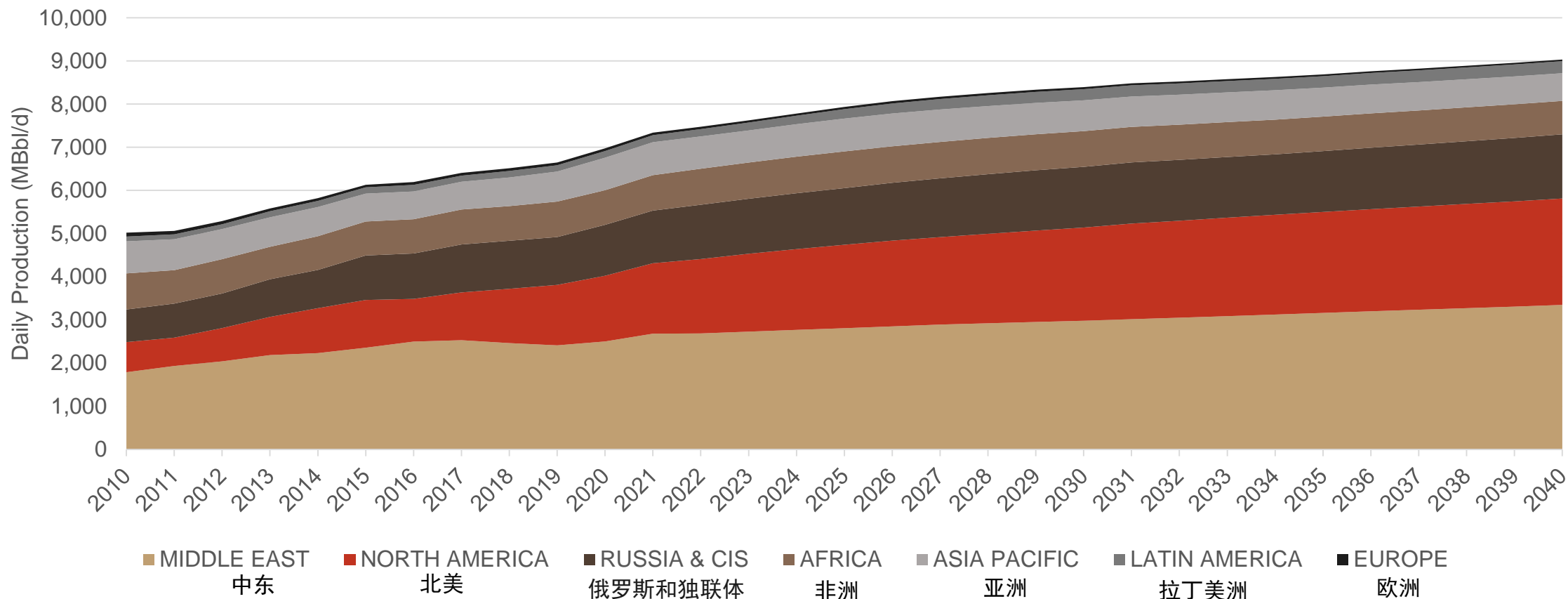


- Production growth in shale will be greatest in the Permian Basin. Other notable contributors are the Eagle Ford, Bakken, Niobrara, and Powder River Basin 二叠纪盆地的页岩产量增长最大。其他著名的贡献者是鹰福特，巴肯，奈厄布拉勒和粉河盆地



# ...and condensate production 和凝析油生产

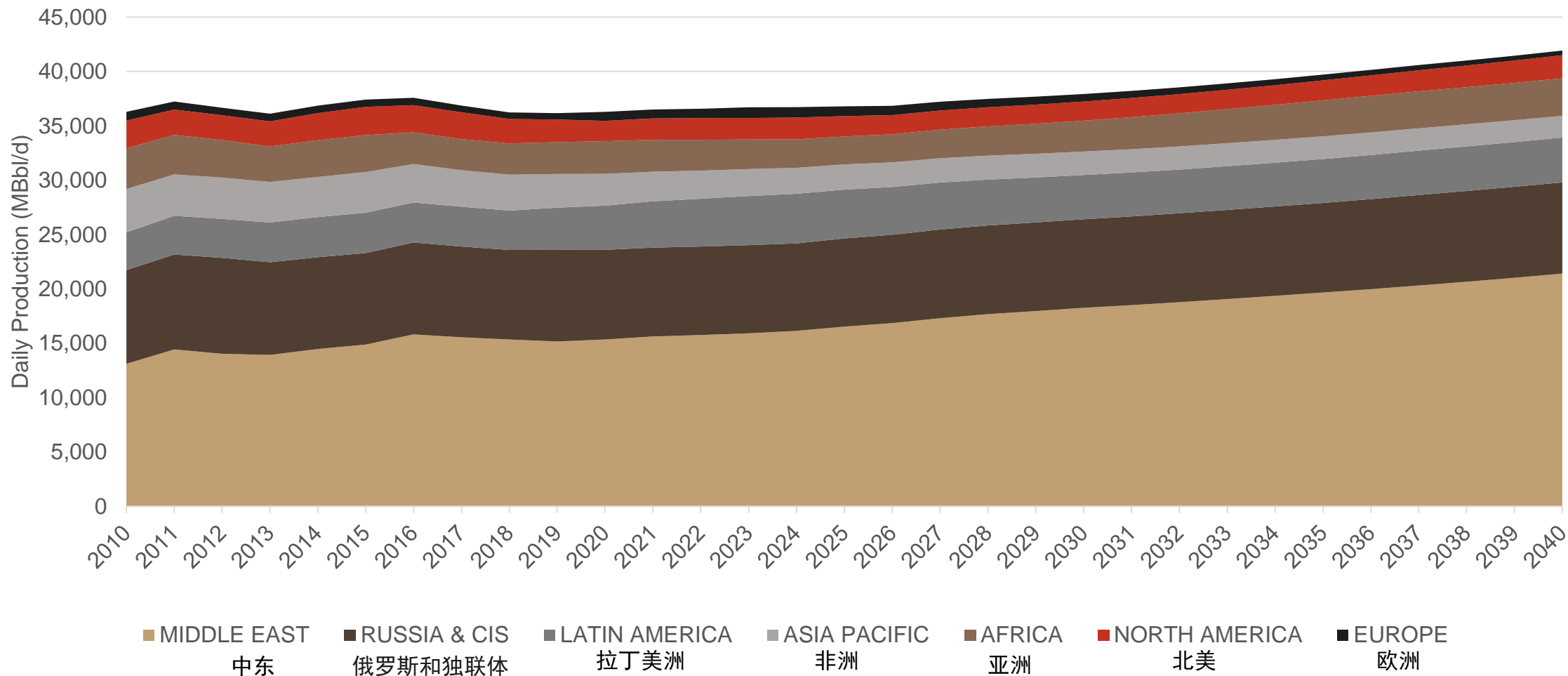
Condensate Production by Region 各地区的凝析油生产



- Portions of the Permian, Eagle Ford, and SCOOP, areas with robust activity, are rich in condensate resources 二叠纪，鹰福特和中南部俄克拉荷马州石油省的部分地区活跃，富含凝析油资源

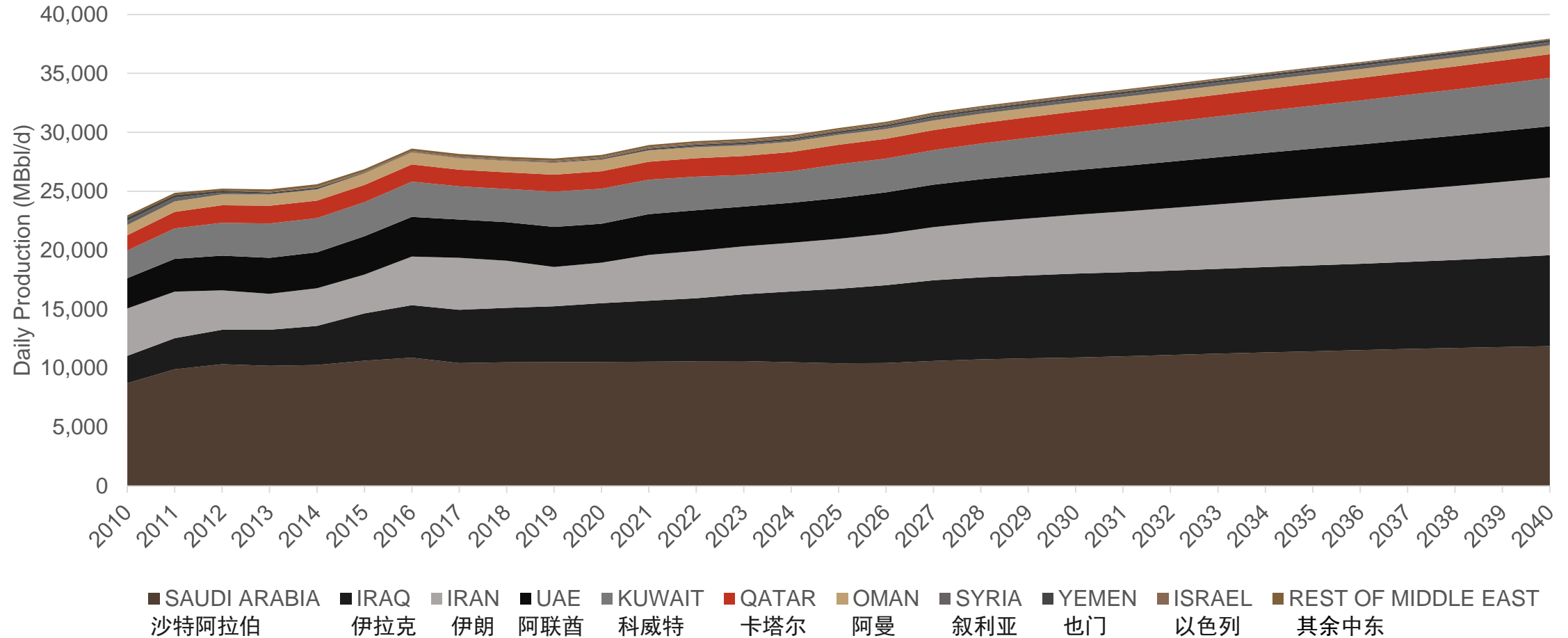
# Medium crudes will increasingly come from the Middle East 中等原油将越来越多地来自中东

Medium Crude Production by Region 各地区中等原油产量



# Where Iraq and Iran are key drivers of growth 伊拉克和伊朗是增长的主要推动力

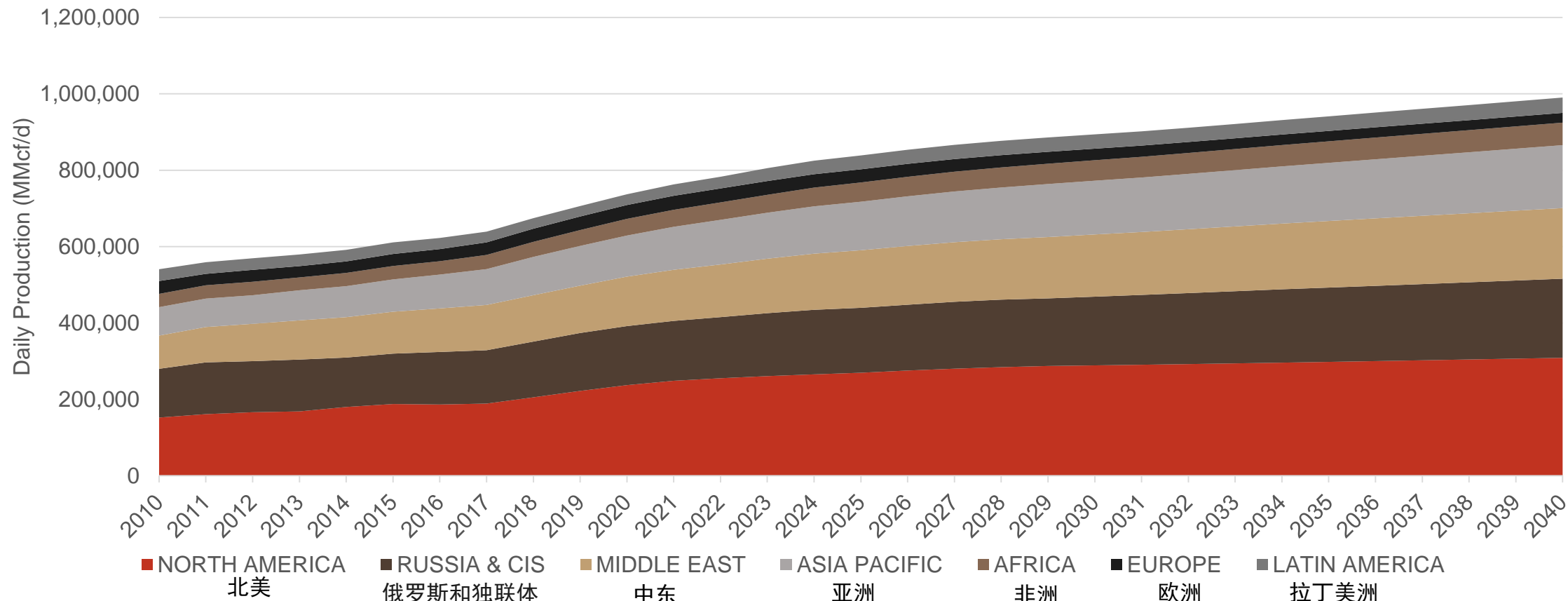
Middle East Supply by Country 中东按国家供应



- While risk is omnipresent with respect to Middle Eastern resources, these are resources of known quantity and value 虽然中东资源的风险无处不在，但这些资源是已知数量和价值的资源

# Dry and associated gas are both driving North American growth 干气和伴生气都在推动北美的增长

Total Gas Supply by Region 各地区的天然气供应总量

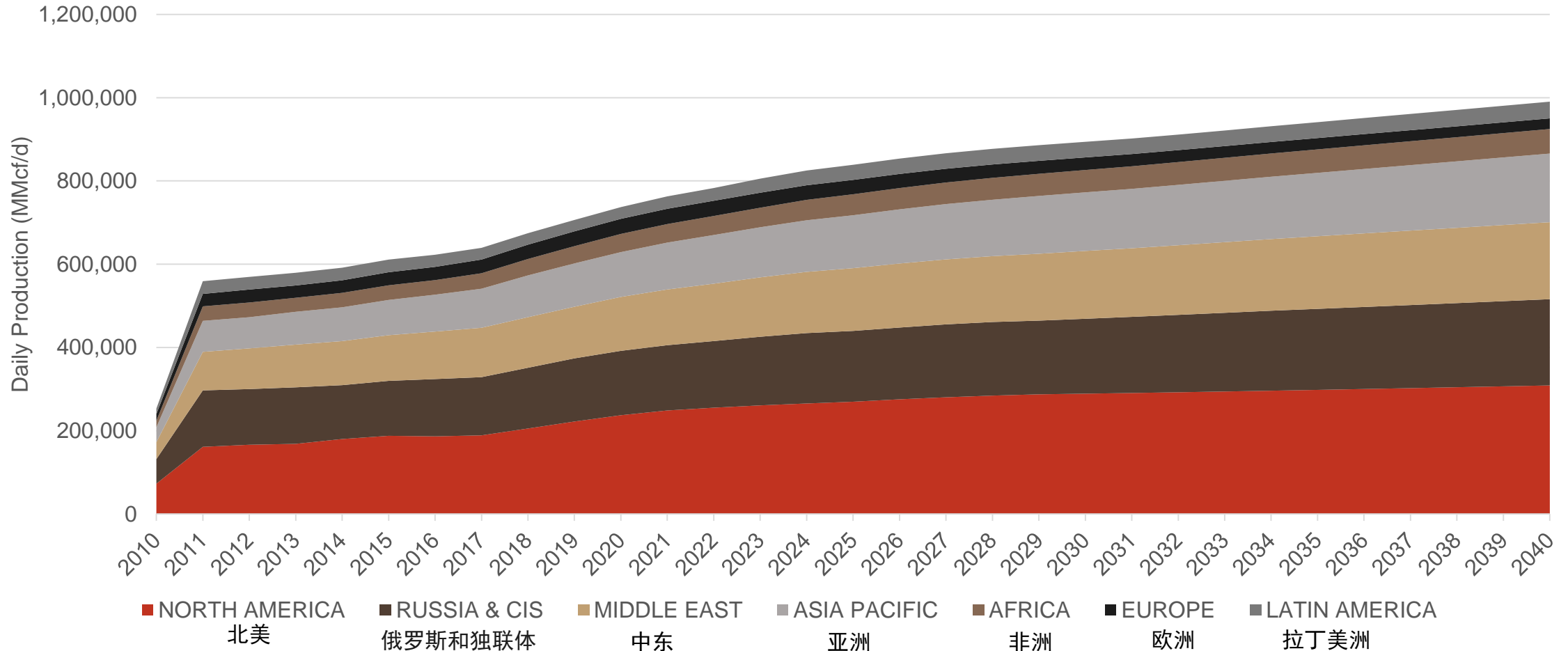


- With respect to dry gas, the Marcellus is a world scale resource with access to multiple markets 关于干气，马塞勒斯是一个可以进入多个市场的世界级资源
- Associated gas from the Permian and Eagle Ford, among others, are insensitive to gas prices 来自二叠纪和鹰福特等的伴生气对天然气价格不敏感

# North America, Russia+CIS, and Middle East supply more than half of future demand

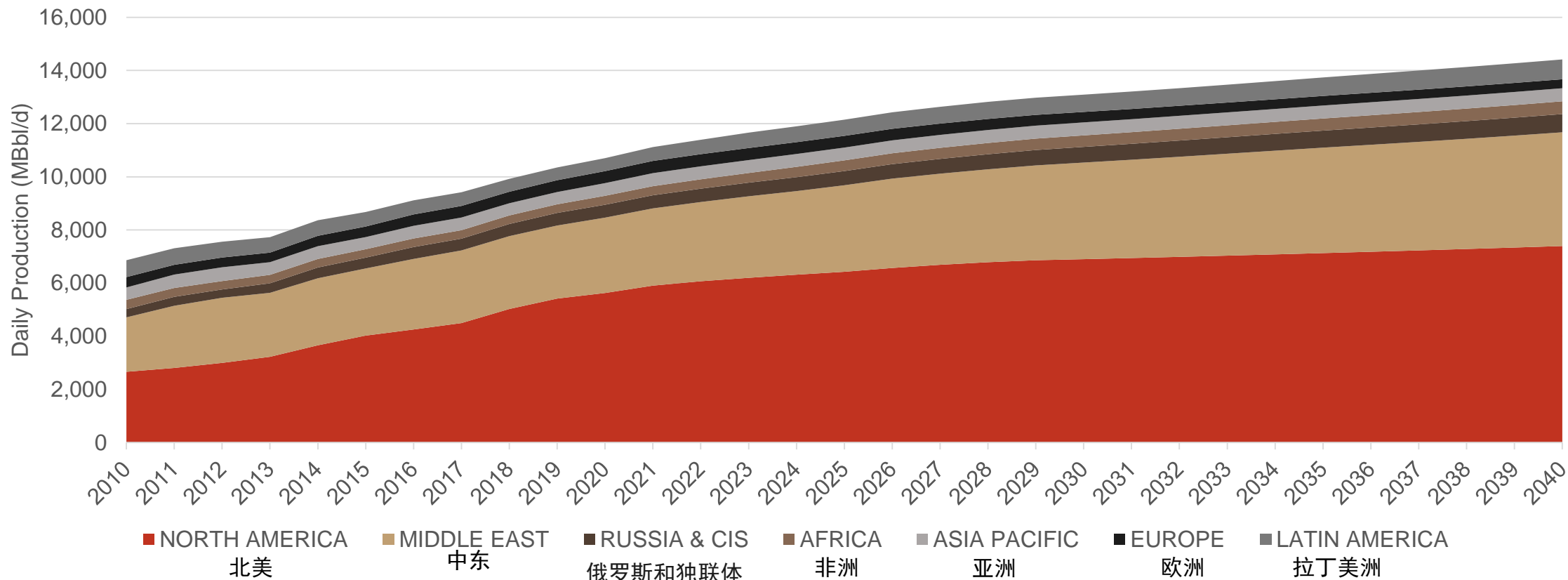
北美，俄罗斯+独联体和中东的供应量占未来需求的一半以上

Dry Gas Supply by Region 各地区的干气供应



# North America is projected to supply almost half of NGL volume 预计北美将提供几乎一半的天然气液体产量

NGL Supply by Region 各地区天然气液体供应



- Wells in the Permian, Eagle Ford, SCOOP, Utica, and more are a key source of NGLs 二叠纪井，鹰福特，中南部俄克拉荷马州石油省，尤蒂卡等都是天然气液体的主要来源
- In recent years, significant volumes of ethane were not captured by processors. Hence, growth in ethane could outpace expectations should prices rise adequately 近年来，处理器未捕获大量乙烷。因此，如果价格充分上涨，乙烷的增长可能超过预期



U.S. Shale 美国页岩

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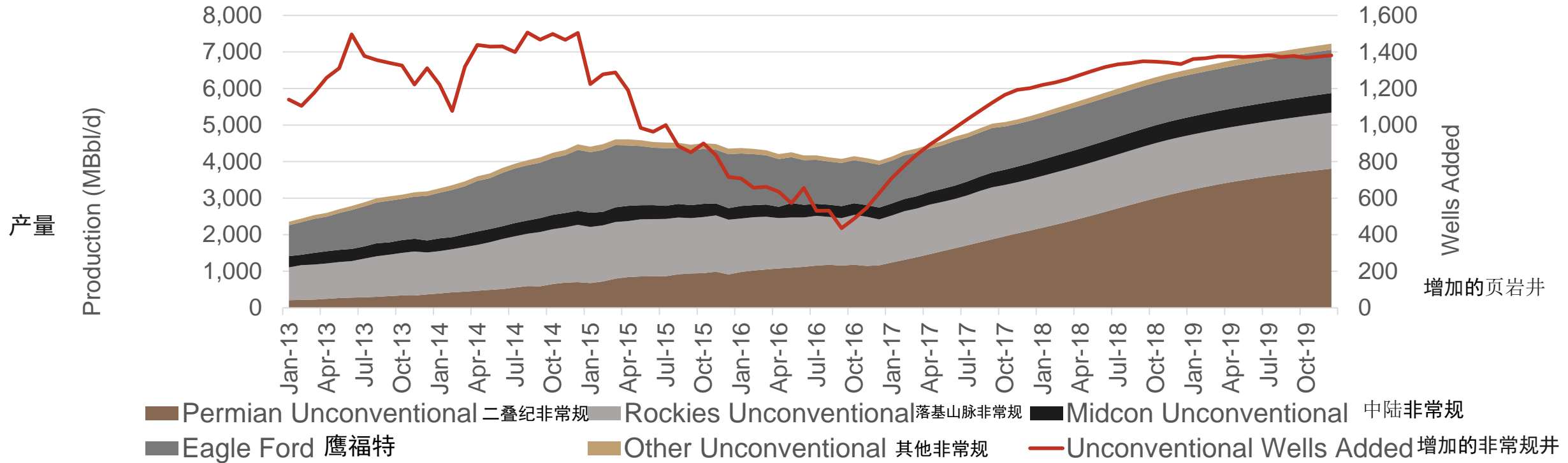
# Lwr-48 Shale and tight play prospects remain bright

## Lwr-48页岩和致密油的发挥前景仍然光明

- Permian Wolfcamp is key driver of rapid growth 二叠纪Wolfcamp是快速增长的关键驱动力
  - The Wolfcamp is comprised of multiple productive zones within what are commonly referred to as the A, B, C, and D benches  
Wolfcamp通常被称为A, B, C和D长凳的多个生产区组成
  - 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 detractors 二叠纪另外两个非常规资源仍然在我们的雷达上, 即Bone Spring和Alpine High, 两者都具有吸引力和减退的方面
- The Eagle Ford will remain an important contributor for many years 多年来, 鹰福特仍将是重要的贡献者
  - Operators arrested declining production by doubling the number of rigs to work in the play since the trough of mid-2016 自2016年中期以来, 运营商通过将钻井平台数量增加一倍来逮捕产量下降
  - While the Eagle Ford boasts some of the best economics in North America shale, large swaths of the play are densely developed 虽然鹰福特拥有一些北美页岩中最好的经济效应, 但是大片页岩区却发展得很密集
- 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 向北看, SCOOP (中南部俄克拉荷马州石油省) 和STACK (Sooner Trend阿纳达科盆地加拿大和翠鸟县) 很快成为美国最有趣的页岩区之一
  - In the STACK, over-pressured, liquids-rich Meramec and Woodford tend to have highest production rates 在STACK中, 过压, 富含液体的梅勒梅克和伍德福德往往具有最高的生产率
  - In the SCOOP, Woodford prospects remain a top priority 在SCOOP中, 伍德福德的前景仍然是重点
- The Niobrara reigns supreme among shales and tight rock resources in the Rockies 奈厄布拉勒在落基山脉的岩层和致密岩石资源中占据着至高无上的地位
  - Economics in large portions of the Niobrara are advantaged due to mineral fee aspects of the acreage dating back to the transcontinental railroad 由于可追溯到横贯大陆铁路的矿物费方面, 奈厄布拉勒大部分地区的经济效应都很有优势
  - Outside Wattenberg, the prospects look brightest in the Powder River Basin 在瓦滕伯格之外, 粉河盆地的前景看起来最亮眼



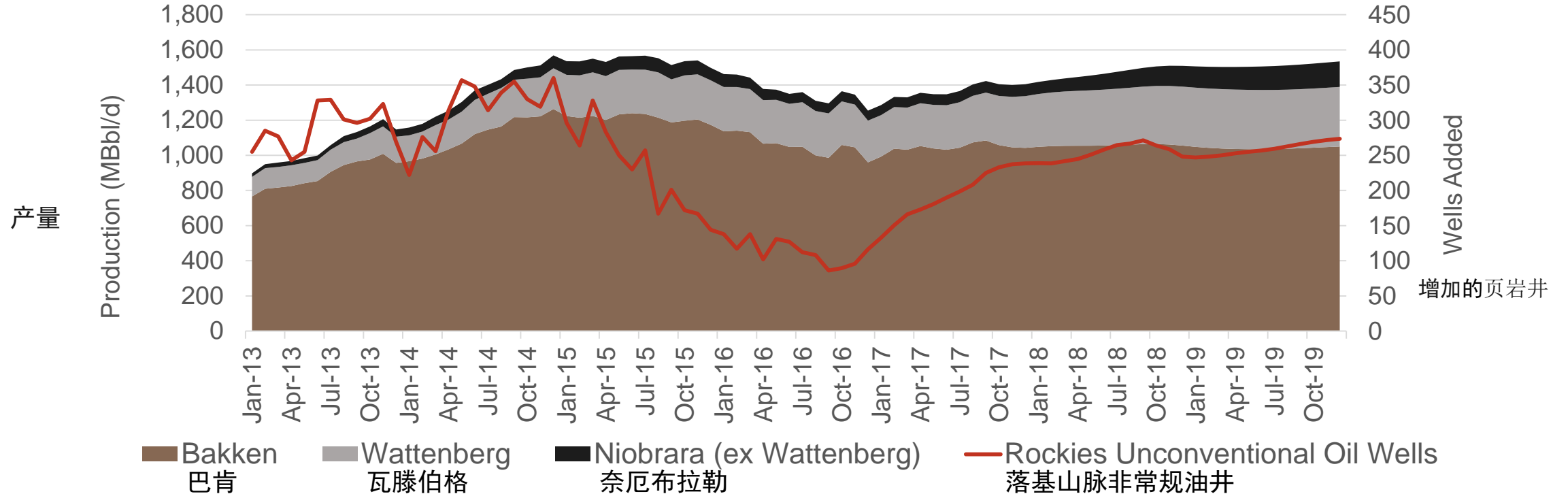
# Technology, better process, and insourcing driving shale results 技术，更好的流程和内包驱动页岩结果



- The Permian is the beacon in 2018. Longer laterals, higher proppant loads, zipper fracs, and enhanced processes kept costs in-line during low prices 二叠纪是2018年的灯塔。更长的侧面，更高的支撑剂载荷，拉链压裂和增强的工艺使得低成本的成本保持在线
- Looking forward, Stratas anticipates modest cost inflation with rising prices. However, several factors will provide limits to cost escalations 展望未来，Stratas预计随着价格上涨会出现适度的成本膨胀。但是，有几个因素会限制成本上升

# The Rockies' has reemerged with the Powder River

## 落基山脉已经与粉河重新出现



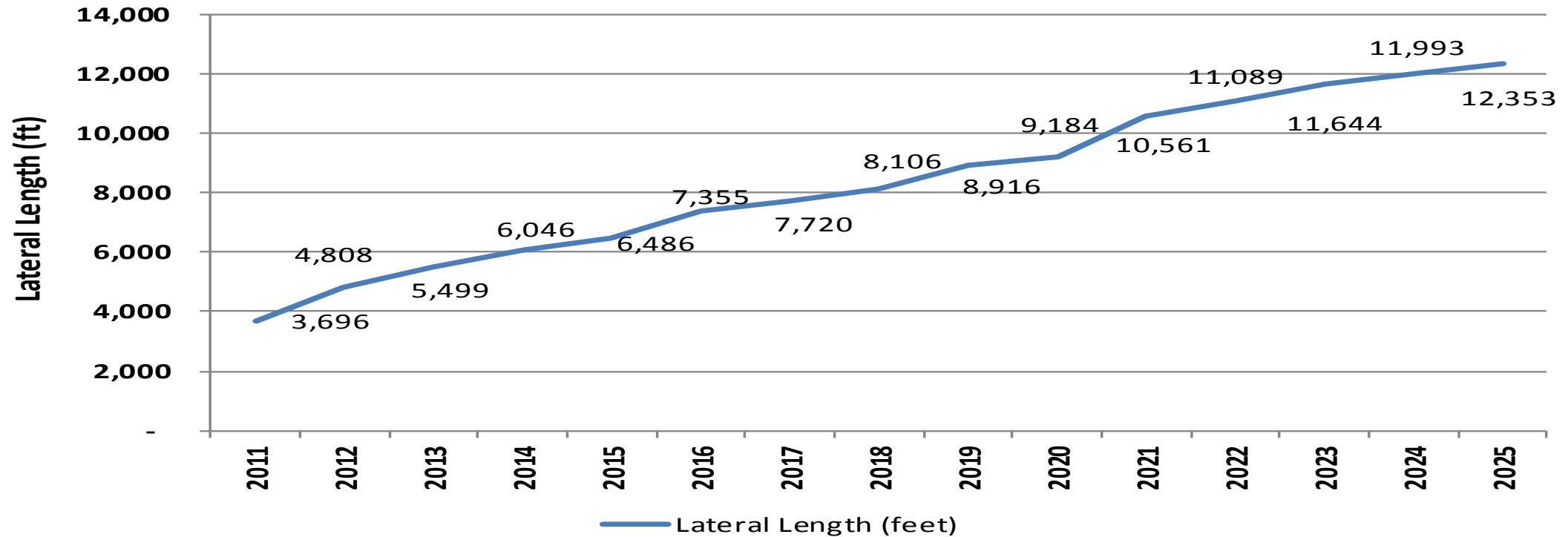
- In the Rockies, low prices turned into resolve, and resolve morphed into determination 在落基山脉，低廉的价格变成了决义，而决义变成了决心
- Today's Rockies is a true manufacturing model in shale... 今天的落基山脉是页岩中真正的制造模型.....
- ... stable, predictable capital spending, leading to stable and predictable production and reliable cash flow 稳定，可预测的资本支出，导致稳定和可预测的生产和可靠的现金流

# Permian: It's a BIG deal! 二叠纪非常重要!

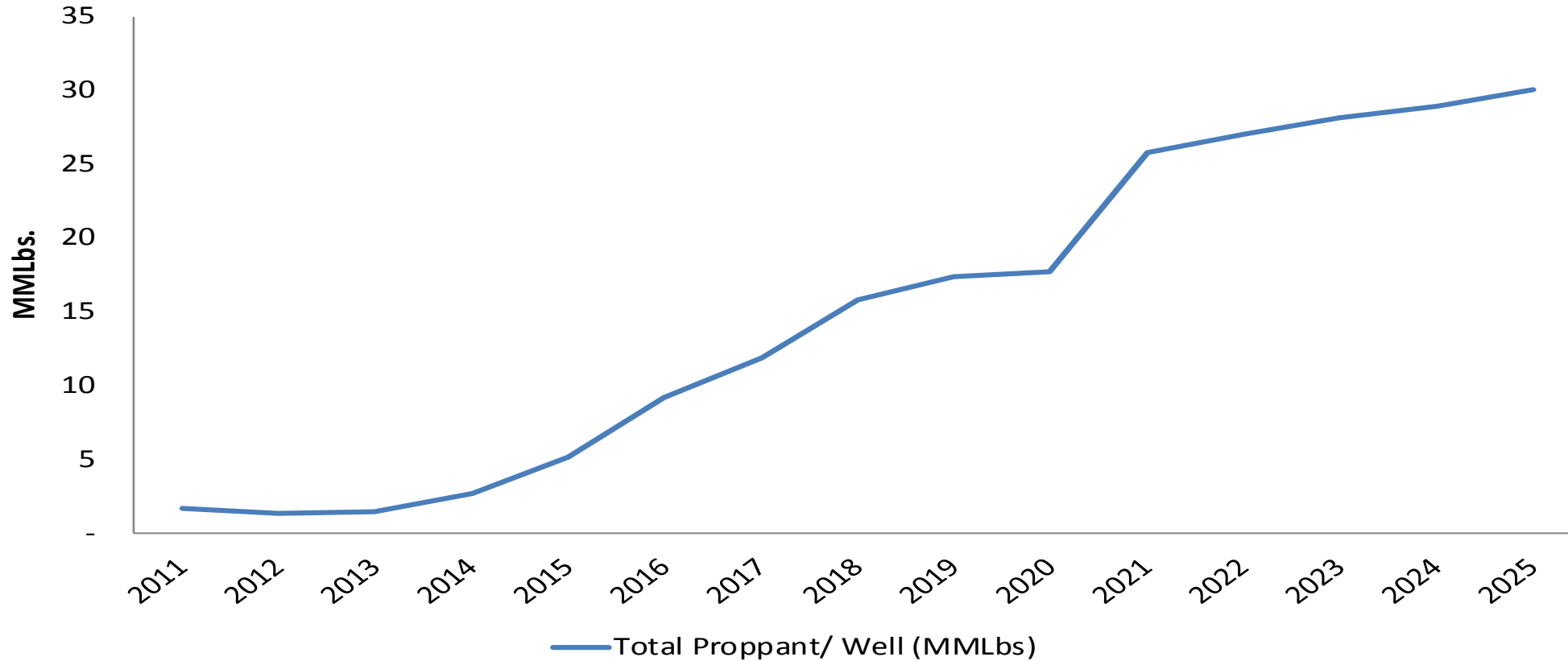
- Everything about the Permian shouts big: big areal extent, big production, big rig counts, and big potential 关于二叠纪的一切都大喊：大面积，大产量，大钻井数和巨大潜力
- 2018 looks poised to be the biggest year yet for this prolific basin 2018年看起来有望成为这个多产盆地最大的一年
- Permian oil production will post record growth in 2018 and will likely reach about 3.9 million b/d at yearend, up from roughly 2.9 million b/d at December 2017 二叠纪石油产量将在2018年创纪录增长，并可能在年底达到约390万桶/日，高于2017年12月的约290万桶/日
  - The lion's share of the growth is coming from the Delaware Basin Wolfcamp, where production is projected to surpass 1.5 million b/d at yearend 增长的最大部分来自特拉华盆地Wolfcamp，年产量预计将超过150万桶/日
- Record Permian growth is based on robust drilling activity coupled with longer lateral wells and new completion designs 记录二叠纪的增长基于强大的钻井活动以及更长的侧井和新的完井设计
  - Wide scale application of long laterals and stage spacing optimization driving growth outlook 大横向宽幅应用和阶段间距优化推动增长前景
  - Higher proppant loading is the second key driver behind the Permian's astonishing production growth 较高的支撑剂装载量是二叠纪惊人的产量增长背后的第二个关键驱动因素
  - A comment worth noting – higher proppant loading will not transform poor rock into great rock. **Rock quality matters!** 值得注意的评论 - 更高的支撑剂载荷不会将贫瘠的岩石变成巨大的岩石。**岩石质量很重要!**
- Bigger production fueled by bigger completions and laterals will lead to big spending 由更大的完工和分支推动更大的生产将导致大笔支出

# Longer laterals will proliferate in the Permian and beyond

## 较长的侧面将在二叠纪及其以外扩散

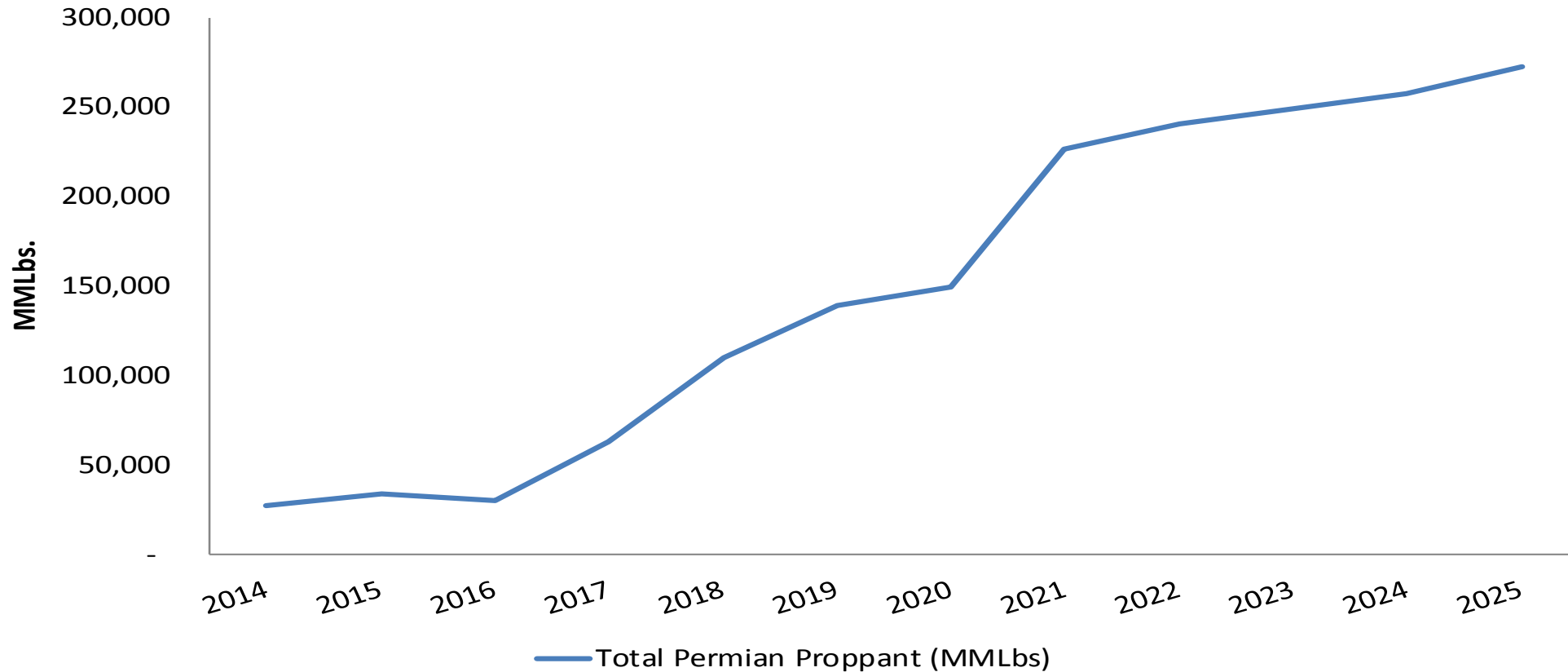


# ...and proppant demand should follow suit 并且支撑剂需求也应该跟随



# Exponential growth in proppant driven by longer laterals and tighter stage spacing

支撑剂呈指数增长，由更长的横向和更紧密的阶段间距驱动

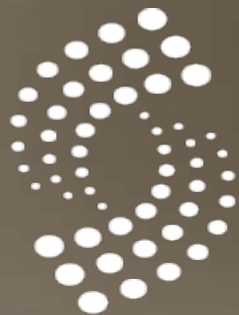


# Oil field services and supply chains have changed

## 油田服务和供应链发生了变化

- Traditionally, oil field chemical products were distributed to the major oil field service companies, and hence, the big box service providers were major gatekeepers for oil field chemicals 传统上，油田化学产品被分配给主要的油田服务公司，因此，大型箱子服务提供商是油田化学品的主要守门人
- In recent years, exploration and production companies have been in-sourcing a greater number of materials used at well sites with cost reductions being the key motivation behind this shift 近年来，勘探和生产公司一直在采购更多用于井场的材料，降低成本是这一转变背后的主要动机
- Increased preference for environmentally friendly alternatives to harsh chemicals has fed a burgeoning cottage industry of “green” oil field chemical manufacturers 越来越多的人选择使用环保的苛刻化学品替代品，这促进了“绿色”趋势
  - Furthermore, these companies appear to work more directly with exploration and production companies 油田化学品制造商蓬勃发展的家庭手工业 此外，这些公司似乎更直接地与勘探和生产公司合作
- Specialty distributors have entered the market 专业经销商已进入市场
  - Nexeo Solutions, a company with over 1,400 supplier partnerships  
Nexeo Solutions是一家拥有1,400多家供应商合作伙伴的公司
  - SMC Oilfield Chemicals, which focuses on joining together people and resources to provide specialty chemicals used in oilfield applications  
SMC油田化学品公司专注于联合人员和资源，提供油田应用中使用的特种化学品
- In-sourcing and backward vertical integration are here for the long-term 从长远来看，内包和后向垂直整合是存在的





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## Supply/Demand Dynamics 供需动态

John E. Paisie, EVP

约翰派西, 执行副总裁

George Popps, Director

乔治波普斯, 主任

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# Global LNG Dynamics 全球液化天然气动态

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# Global LNG Storylines – Another inflection point coming?

## 全球液化天然气故事情节 - 另一个转折点即将到来?

### Startups in U.S., Australia, Elsewhere 开创公司在美国, 澳大利亚, 其他地方

- Australia wrapping up startup of its latest liquefaction wave; U.S. set for big years from 2018-2020  
澳大利亚结束其最新液化浪潮的启动; 美国定于2018年至2020年为大年
- First exports from an FLNG (PFLNG Satu) and the Arctic (Yamal LNG) 首批出口来自大型浮式液化天然气 (PFLNG Satu) 和北极 (亚马尔液化天然气)
- Brownfield expansions being considered in Qatar, PNG 卡塔尔和巴布亚新几内亚正在考虑棕地扩张计划

### New Markets Opening Up 新市场开放

- FSRUs opening up small markets with growth potential in Southeast Asia, Africa, Latin America 浮动式天然气接受站开辟了东南亚, 非洲, 拉丁美洲具有增长潜力的小市场
- South Asia becoming next major import destination with India, Bangladesh, Pakistan terminals 南亚成为印度, 孟加拉, 巴基斯坦终端的下一个主要进口目的地
- Environmental concerns leading to greater demand and concerted governmental efforts to add gas to energy mix (India, China) 环境问题导致更大的需求和政府协同努力为能源结构增加天然气 (印度, 中国)

### Lack of Liquefaction Investment 缺乏液化投资

- Only one positive FID taken in 2017 – 3.4 mtpa at Coral FLNG in Mozambique 2017年只有一项正面的最终投资决策 - 在莫桑比克的珊瑚大型浮式液化天然气达到3.4百万吨
- Other once-promising projects have been shelved across the world, including in Canada 其他有前景的项目已被搁置在世界各地, 包括加拿大
- Lack of projects in early- to mid-stages of development 缺乏开发在早期到中期的项目

# Global developments are being affected by the major players

## 全球发展受到主要参与者的影响

How the major players are reacting to each other 主要参与者如何相互作出反应

### China 中国

- China targets 10% natural gas in energy mix by 2020, 15% by 2030  
到2020年，中国的能源结构中天然气目标为10%，到2030年为15%
- US LNG could be affected by tariffs 美国液化天然气可能会受到关税的影响

### Russia 俄罗斯

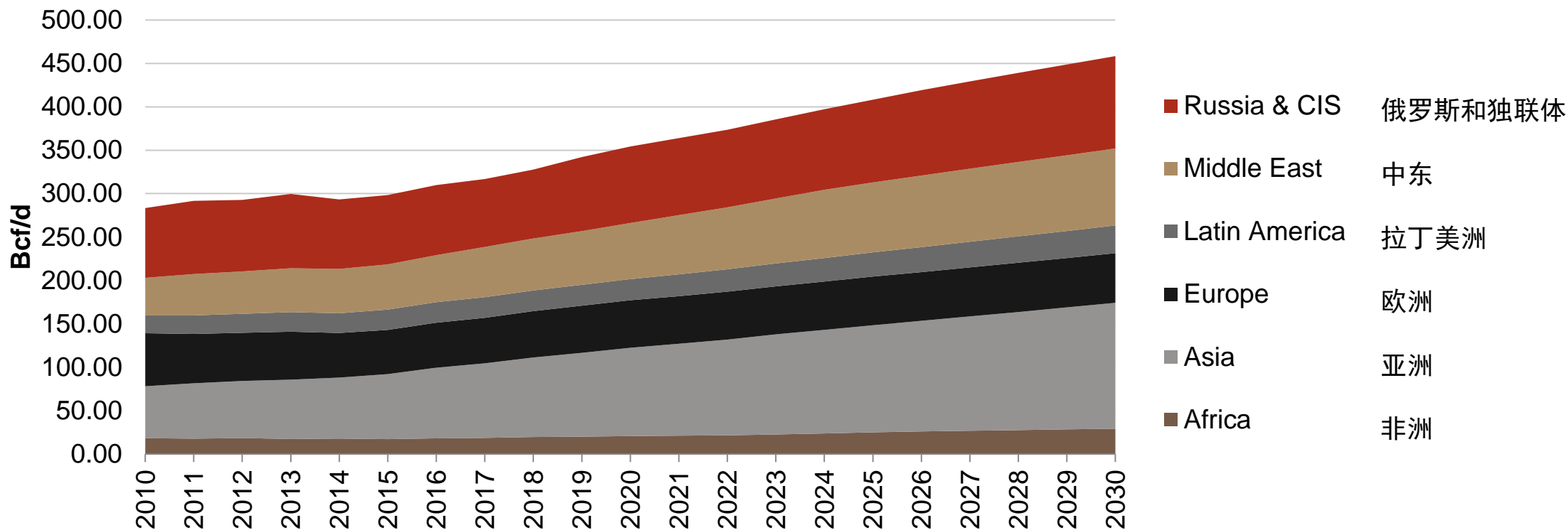
- Novatek, JOGMEC sign deal to cooperate on LNG delivery to Asia-Pacific, including via North Sea Route 联咏与日本石油天然气和金属国家公司 (JOGMEC) 签署协议，合作向亚太地区提供液化天然气，包括通过北海航线

### Middle East 中东

- Qatar announces ~25 mtpa of new LNG capacity to come online by 2025  
卡塔尔宣布，到2025年，新的液化天然气产能将达到约2500万吨
- PetroChina signs 22 year supply deal for 3.4 mtpa with Qatargas 2  
中石油与卡塔尔2号公司签订了22年供应协议，总价值为340万吨



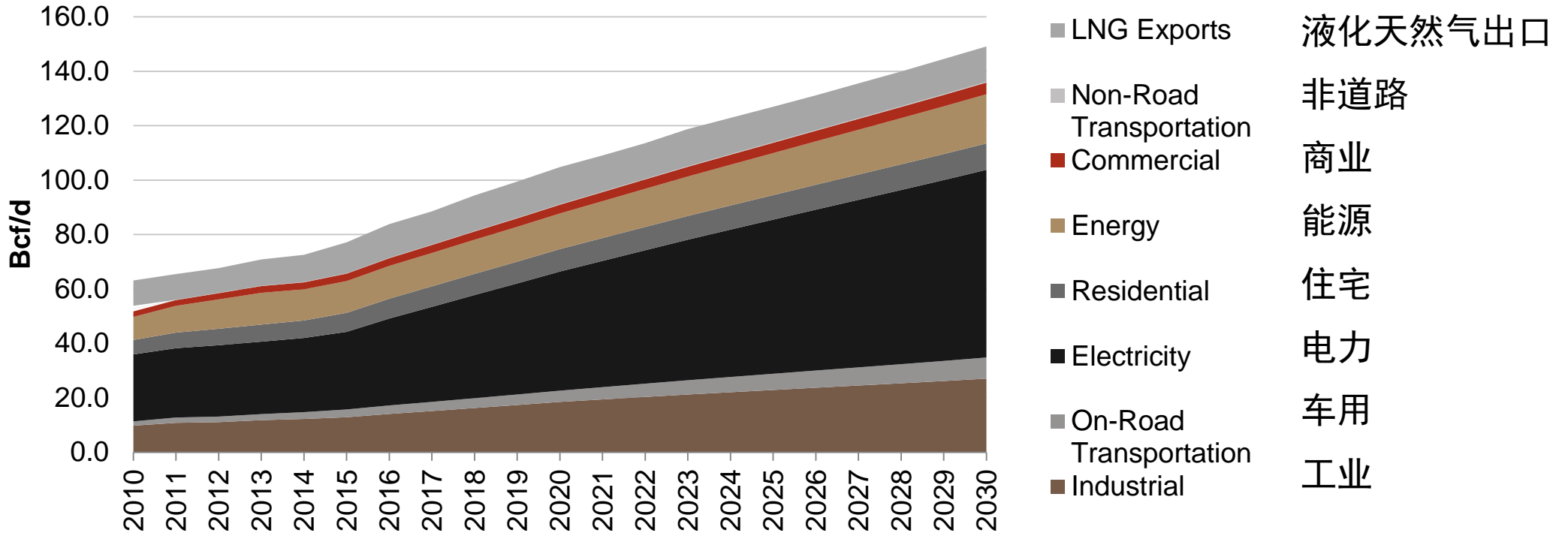
# Global natural gas demand being led by Asia 全球天然气需求由亚洲引领



- Developing regions in Asia, Middle East, elsewhere will be main growth drivers 亚洲，中东和其他地区的发展中地区将成为主要增长动力
- Asia expected to account for nearly 1/3 of global demand, up from 27% currently 亚洲预计占全球需求的近1/3，高于目前的27%
- New energy mix targets from India, China will force major energy consumers to move towards natural gas 来自中国印度的新能源结构目标将迫使主要能源消费者转向天然气

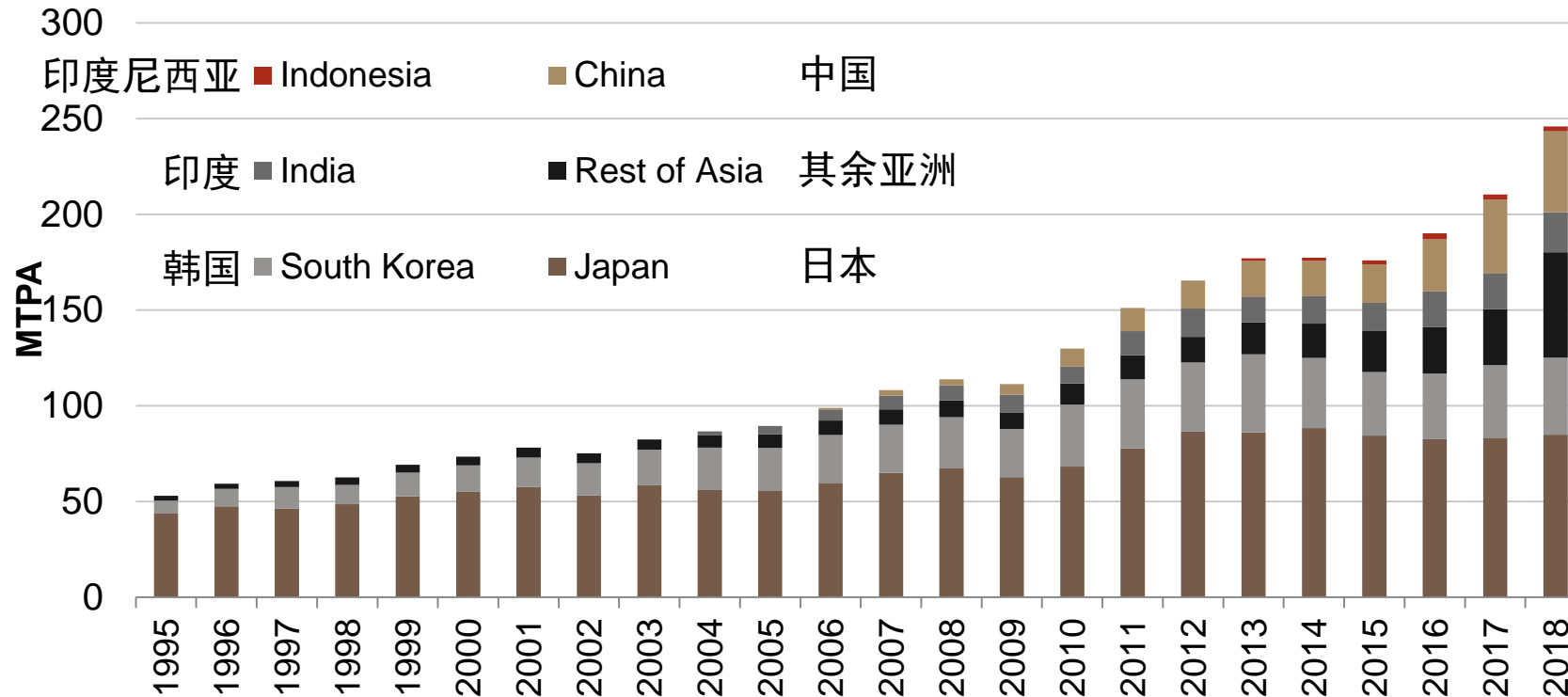
# Asian gas demand being driven by power generation

## 亚洲天然气需求受发电驱动



- Gas demand in Asia to be fueled primarily by electricity generation demand, particularly in fast-developing markets in South and Southeast Asia 亚洲的天然气需求主要来自发电需求，特别是在南亚和东南亚快速发展的市场
- Increased industrialization fuels strong secondary demand growth 工业化的增加推动了二次需求的强劲增长
- On-road transportation, while remaining a minor factor, will experience large relative growth, mostly in China 在保持较小因素的同时，公路运输将经历大的相对增长，主要是在中国

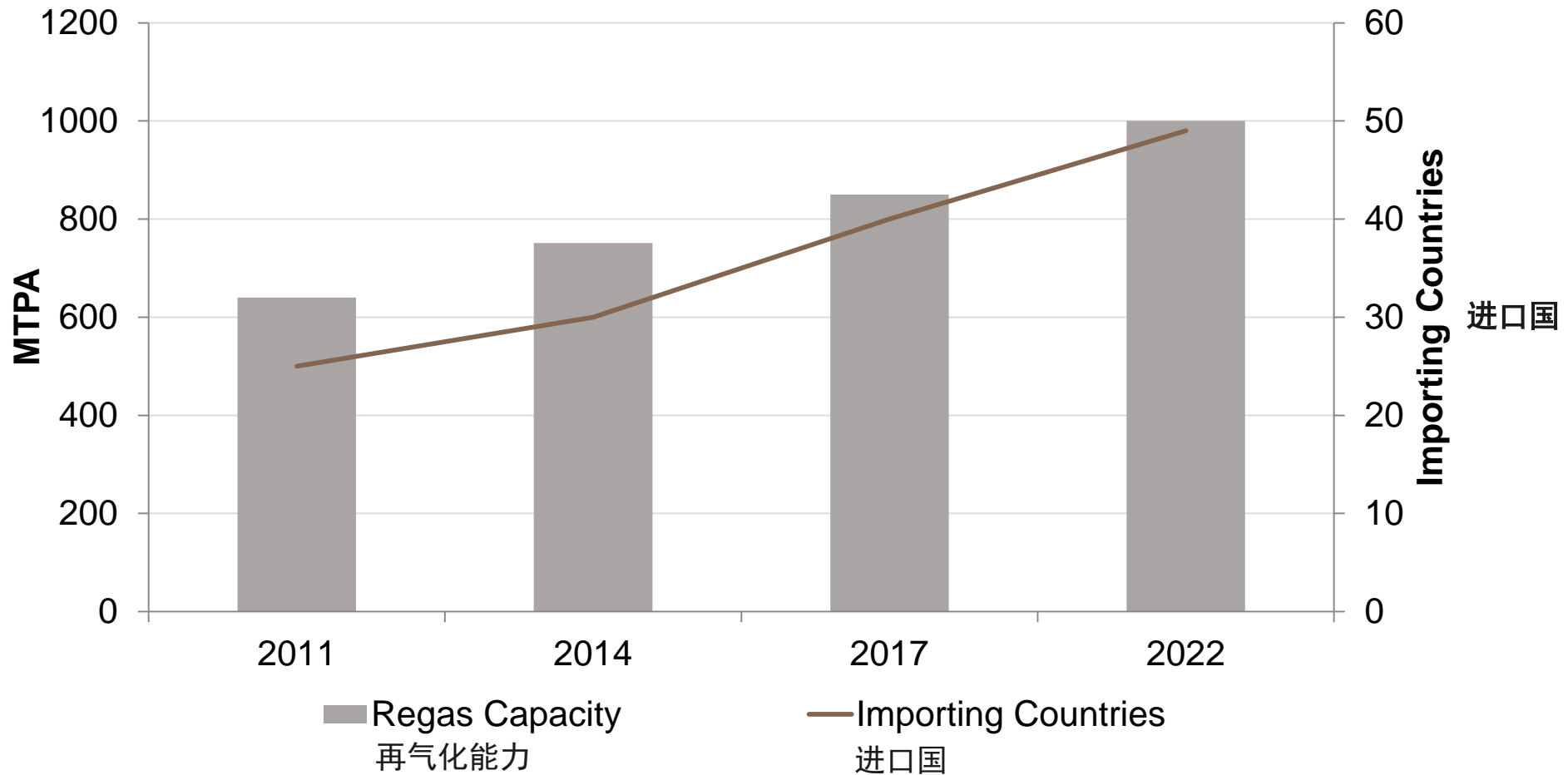
# Asian LNG imports are expanding 亚洲液化天然气进口正在扩大



- Japan and Korea historically have led the way in Asia, but have experienced little growth recently and have low growth prospects going forward 日本和韩国历史上一一直在亚洲领先，但近期经历的增长很少，未来增长前景不佳
- China has seen massive growth quickly, becoming the second largest importer 中国迅速实现了大规模增长，成为第二大进口国
- Developing nations of South and Southeast Asia are poised to lead the next round of growth in the global LNG industry 南亚和东南亚的发展中国家有望引领全球液化天然气行业的下一轮增长

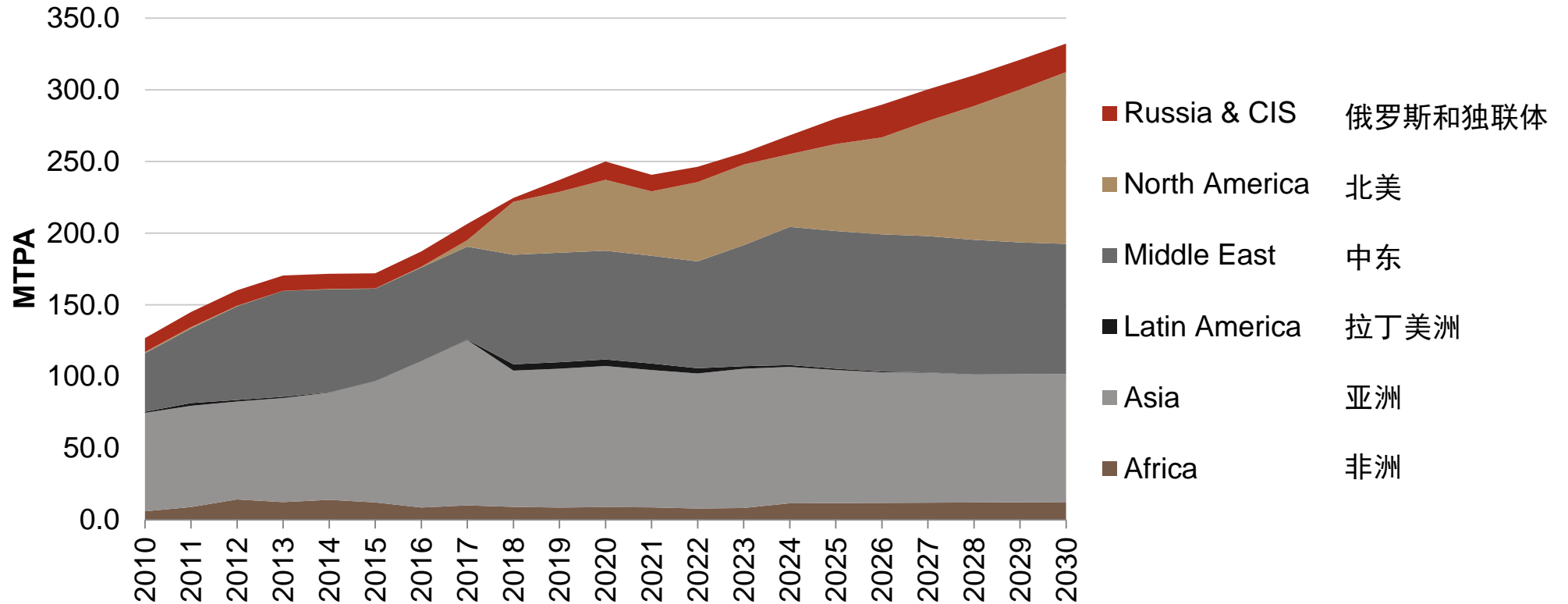
# Import Tipping Point? 导入临界点?

Regas technology cheaper, quicker to bring online than ever 再气化技术比以往更便宜，更快地上网



Source资料来源: GIIGNL, Stratas Advisors

# Asia will be competing for LNG imports 亚洲将竞争液化天然气进口

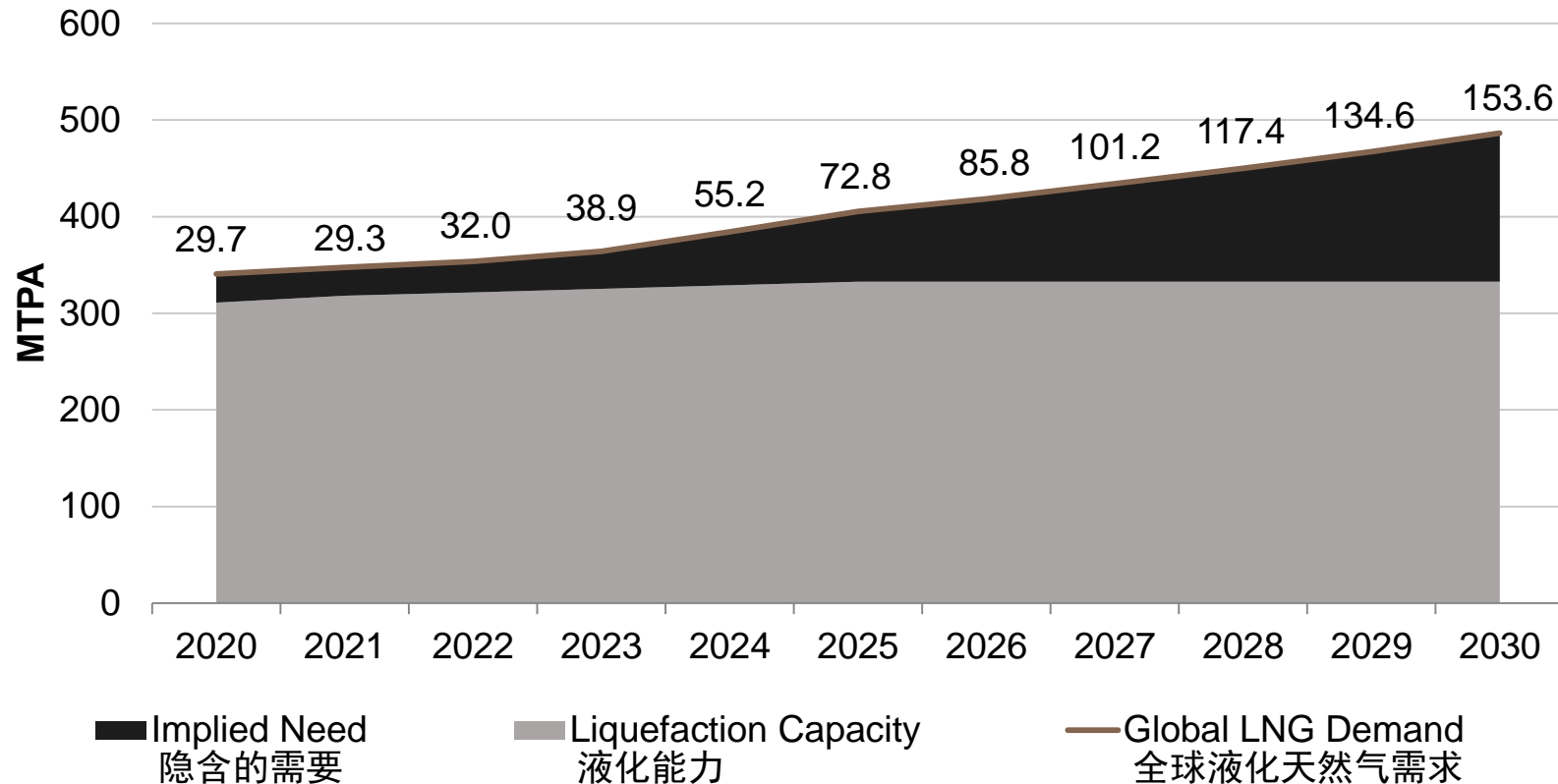


- Asia has historically been responsible for as much as 50% of its LNG needs; by 2030, Stratas Advisors expects that share to fall to about 30% 亚洲历史上一直负责其液化天然气需求的50%;到2030年, Stratas Advisors预计该份额将降至约30%
- Middle East, Russia will see incremental gains, but North America, specifically the U.S., will be needed to meet expected demand growth in the region 中东地区, 俄罗斯将出现增量增长, 但需要北美, 特别是美国, 以满足该地区的预期需求增长



# Liquefaction capacity needs are increasing 液化能力需求正在增加

Looking beyond current positive FIDs and construction 超越目前正面的最终投资决策和建设

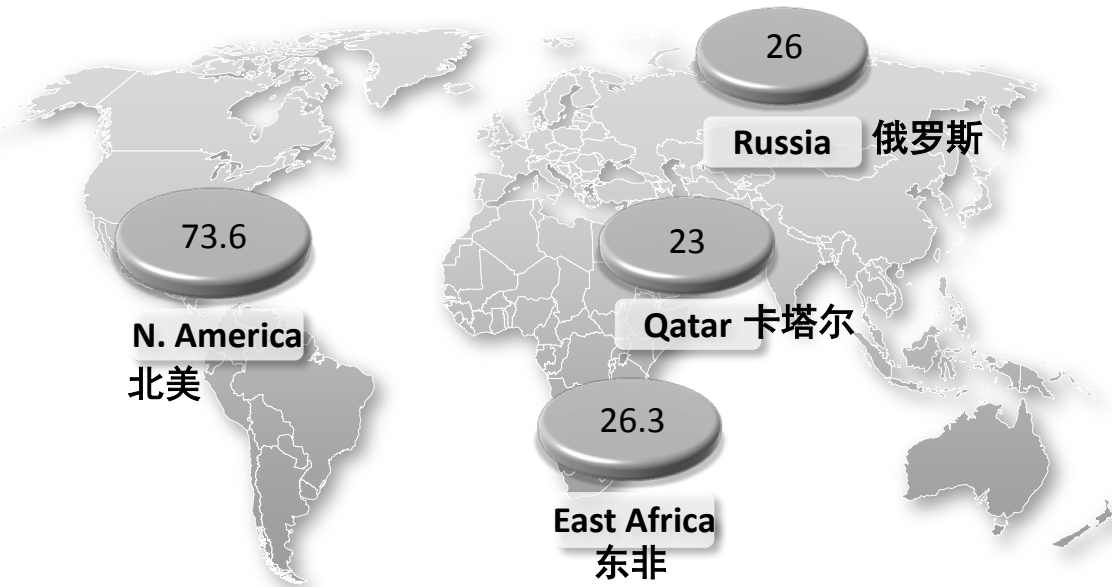


\*Does not factor in liquefaction retirements 不考虑液化退休

# Competing global liquefaction is centered around four players

## 竞争性的全球液化主要围绕四个参与者

Projects in development, not yet under construction 正在开发的项目尚未建设中



\*In MTPA of proposed capacity 计划能力

### North America 北美

- Regulatory backlog cleared in the US, now backers face commercial decisions 监管积压在美国被清除，现在支持者面临商业决策
- Canada facing its last and best major hope with Shell, Petronas in LNG Canada 加拿大液化天然气公司在加拿大液化天然气集团公司面临最新和最大的希望

### Russia 俄罗斯

- Sanctions from the West have slowed, but not altogether stopped development 来自西方的制裁已经放缓，但并未完全停止发展
- Northern Sea Route opens up access to Asia from Siberia 北海航线开通西伯利亚的亚洲通道

### East Africa 东非

- Mozambique moving ahead with onshore, floating solutions 莫桑比克继续推进陆上浮动解决方案
- Tanzania now into years of delays, mostly caused by regulatory issues 坦桑尼亚现在陷入多年的拖延，主要是由于监管问题

### Qatar 卡塔尔

- Moratorium on North Field development lifted in 2017 暂停北领域发展于2017年取消
- Expansion of 30% planned for completion by 2023-2025 计划在2023年至2025年期间扩建30%

# Industry Outlook Risk Assessment (to 2030)

## 行业展望风险评估（至2030年）

How will the industry close the looming supply gap? 该行业将如何缩小迫在眉睫的供应缺口？

*Likelihood:* 可能性

**LIKELY**

可能

North America adds 30 MTPA of capacity 北美增加了30 MTPA的容量

- US Gulf Coast has several brownfield projects and expansions, plus well-financed greenfield proposals 美国墨西哥湾沿岸有几个棕地项目和扩建项目，以及资金充足的绿地建设
- Regulatory backlog is cleared, meaning commercial terms and economics will be the main driver now 监管积压被清除，这意味着商业条款和经济效应将成为现在的主要推动力

*Likelihood:* 可能性

**POSSIBLE**

有可能

China, India hold to natural gas targets 中国，印度坚持天然气目标

- The targets will most likely remain in place, but whether they will be achieved is a different story 目标很可能仍然存在，但它们是否会实现是一个不同的故事
- India's target depends largely on supporting gas and LNG infrastructure, not terminal infrastructure 印度的目标主要取决于支持天然气和液化天然气基础设施，而非终端基础设施

*Likelihood:* 可能性

**VERY LIKELY**

很可能

Qatar executes on 100 MTPA total promise 卡塔尔执行100 MTPA总承诺

- Qatar Petroleum has historically kept costs low and has seen excellent returns on its investment in the last 20 years 卡塔尔石油公司历来保持低成本，并在过去20年中获得了良好的投资回报
- Obvious governmental support expected to push this project through to completion 政府的明显支持有望推动这一项目的完成

# Industry Outlook Risk Assessment (to 2030)

## 行业展望风险评估（至2030年）

How will the industry close the looming supply gap? 该行业将如何缩小迫在眉睫的供应缺口？

*Likelihood:* 可能性

**UNLIKELY**

不可能

Canada becomes a significant LNG exporter 加拿大成为重要的液化天然气出口国

- With one major BC proposal and a small floating one remaining, hopes are dwindling fast 随着不列颠哥伦比亚省的一项主要建议和剩余的小型浮动建议，希望正在迅速减少
- Eastern Canada has slight hope to add an unlikely source of exports for the country 加拿大东部有一点希望为该国增加不太可能的出口来源

*Likelihood:* 可能性

**VERY LIKELY**

很可能

Russia, East Africa add 15 MTPA each 俄罗斯，东非每个增加15个MTPA

- Coral FLNG has been approved and two trains in Mozambique are expected with confidence 珊瑚大型浮式液化天然气已获批准，预计对莫桑比克的两个生产线充满信心
- Russia is moving in both Siberia and Sakhalin Island to add export capacity 俄罗斯正在西伯利亚和萨哈林岛两地增加出口能力

*Likelihood:* 可能性

**UNLIKELY\*\***

不可能

Spot prices jump in 2024-2025 timeframe 现货价格在2024-2025时间段内跳涨

- Given the timing of Qatar's brownfield expansion, an extra 25 million tonnes should help the market in the short-term 考虑到卡塔尔棕地扩张的时机，额外的2500万吨将在短期内帮助市场
- \*\*With that in mind, predicting events like the Fukushima disaster in Japan that can shock spot prices is impossible 考虑到这一点，预测像日本福岛灾难的事件可能会震惊现货价格是不可能的*

# Price-setting and contracting practices are evolving 定价和承包做法正在发生变化

## Technological Achievements 技术成就



## Hub Indexing 集线器索引

- To avoid huge margin mismatches, contracts moving away from multi-year oil linkages 为了避免巨额利润不匹配，合同摆脱了多年的石油联系
- Henry Hub becoming more popular for indexation globally 亨利中心在全球范围内越来越受到指数化的欢迎
- Other gas hubs could emerge in Asia to set regional prices 其他天然气中心可能会出现在亚洲，以确定区域价格

## Contracting Trends 合同趋势

- Spot trade has risen significantly, spurred on by China and an increasingly liquid market 在中国和市场日益流动的推动下，现货交易大幅上涨
- Inflexible contract terms going by the wayside – destination clauses, oil-linkage, 20-year agreements 不灵活的合同条款将被搁置 - 目的地条款，石油联系，20年协议



# Questions Moving Forward 存在的问题



## Political Considerations 政治考虑

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- Monitoring the trade ties between Russia and China, India and Iran 监测俄罗斯与中国，印度和伊朗之间的贸易关系
- How active will Trump administration be in supporting more U.S. LNG, and what effect will the trade war have? 特朗普政府在支持更多美国液化天然气方面有多积极，贸易战会产生什么影响？

## Liquefaction FIDs 液化最终投资决策

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- Will importers in Asia and elsewhere begin to think longer-term before it's too late? 亚洲和其他地方的进口商是否会在为时已晚之前开始进行长期思考？
- Are brownfield expansions more than a short-term solution? 棕地扩张不仅仅是短期解决方案吗？

## Emissions Targets and Regulations 排放目标和法规

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- IMO shipping regulations – how many shipowners will switch to LNG for fuel? 国际海事组织海运法规 - 有多少船东将改用液化天然气作为燃料？
- Will other major consumers follow aggressive gas energy mix targets set by India, China? 其他主要消费者是否会遵循中国和印度制定的积极的天然气能源组合目标？



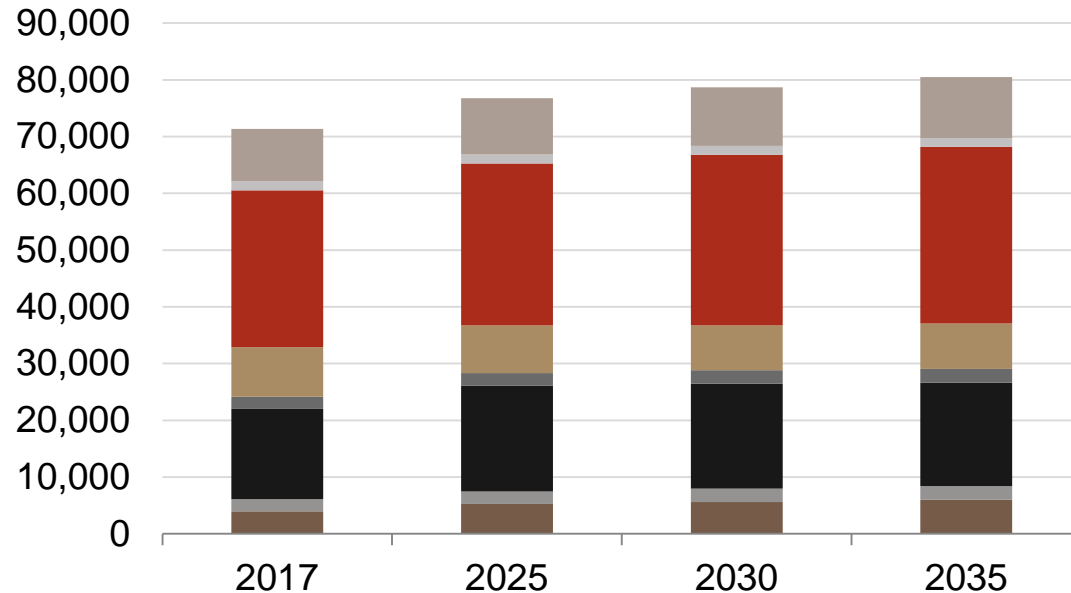
## Other Hydrocarbon Flows 其他油气流动

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# Global Crude Demand Will Grow 全球原油需求将增长

2017-2035

Units | MBPD



■ Condensate Sweet   ■ Condensate Sour   ■ Light Sweet  
 ■ Light Sour   ■ Middle Sweet   ■ Middle Sour  
 ■ Heavy Sweet   ■ Heavy Sour

凝析油甜  
轻酸质原油  
重甜质原油

凝析油酸  
中甜质原油  
重酸质原油

轻甜质原油  
中酸质原油

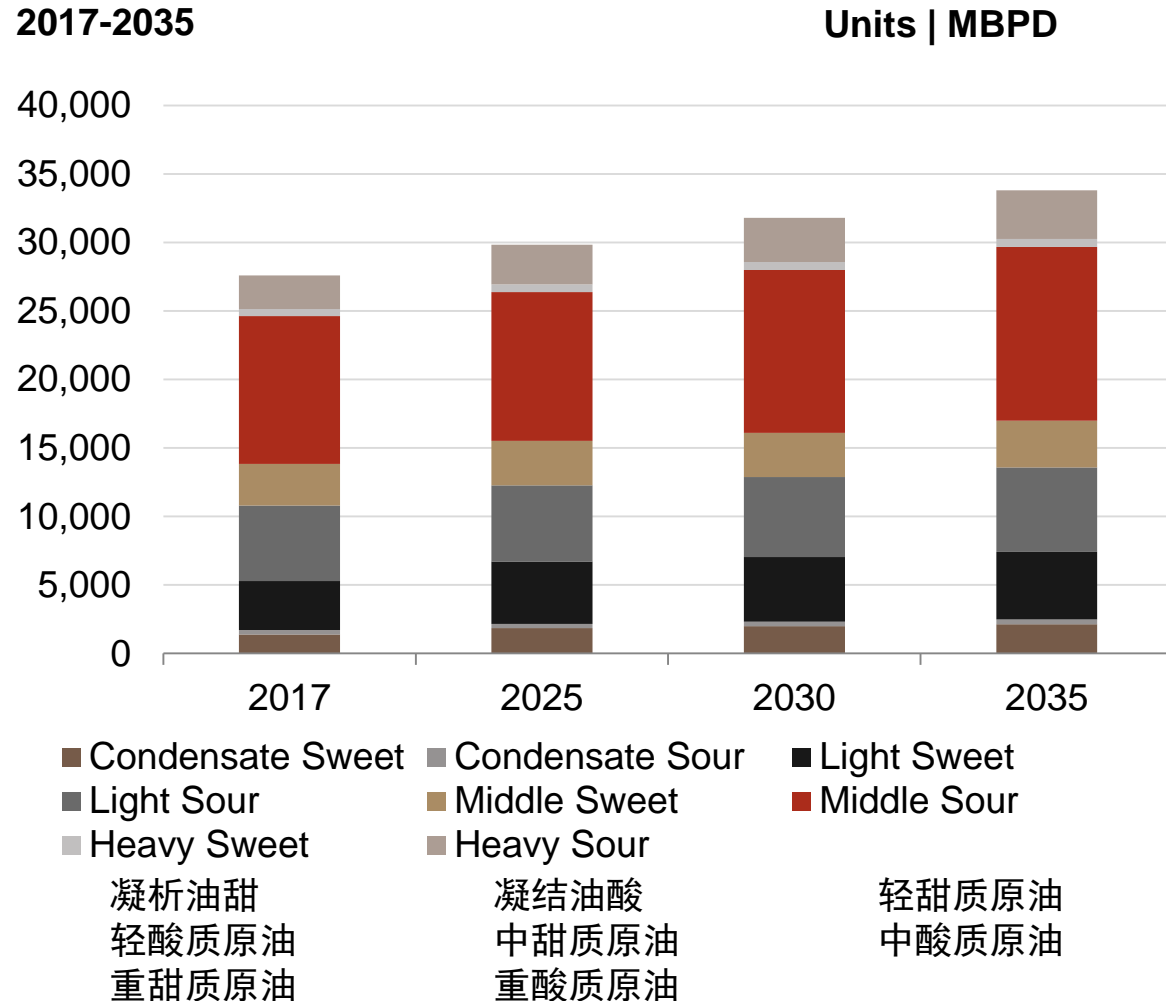
Source资料来源: Stratas Advisors

- Crude demand to grow by 15 MMBPD (2014-2040) 原油需求增长 15 MMBPD (2014年-2040年)
- The crude demand growth will be met mainly by... 原油需求增长将主要通过.....
- ...increases in Medium Sour and Light Sweet... 增加中酸质原油和轻甜质原油...
- ...and to a lesser degree by Heavy Sour 而重酸质原油在较小程度上



# Asia Crude Oil Demand Will Increase Significantly

## 亚洲原油需求将大幅增加



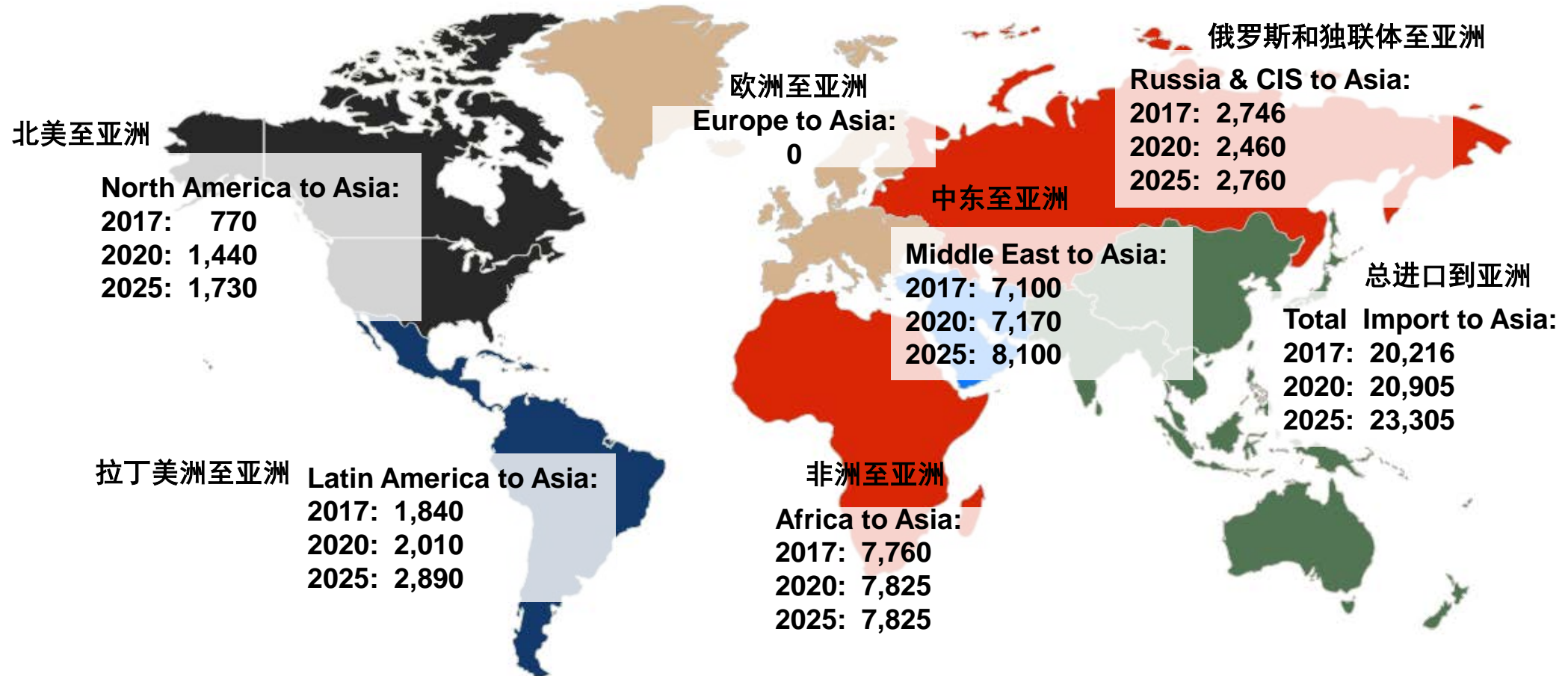
Source资料来源: Stratas Advisors

- Crude demand to grow by 6 MMBPD 原油需求增长6 MMBPD
- Medium Sour demand will increase by nearly 2 MMBPD 中酸质原油需求将增加近2 MMBPD
- Heavy Sour each will increase by around 1 MMBPD 每个重酸质原油将增加约1 MMBPD
- Light Sweet will increase by some 1.3 MMBD 轻甜质原油将增加约1.3 MMBD

# Crude Trade Flows to Asia Will Also Increase

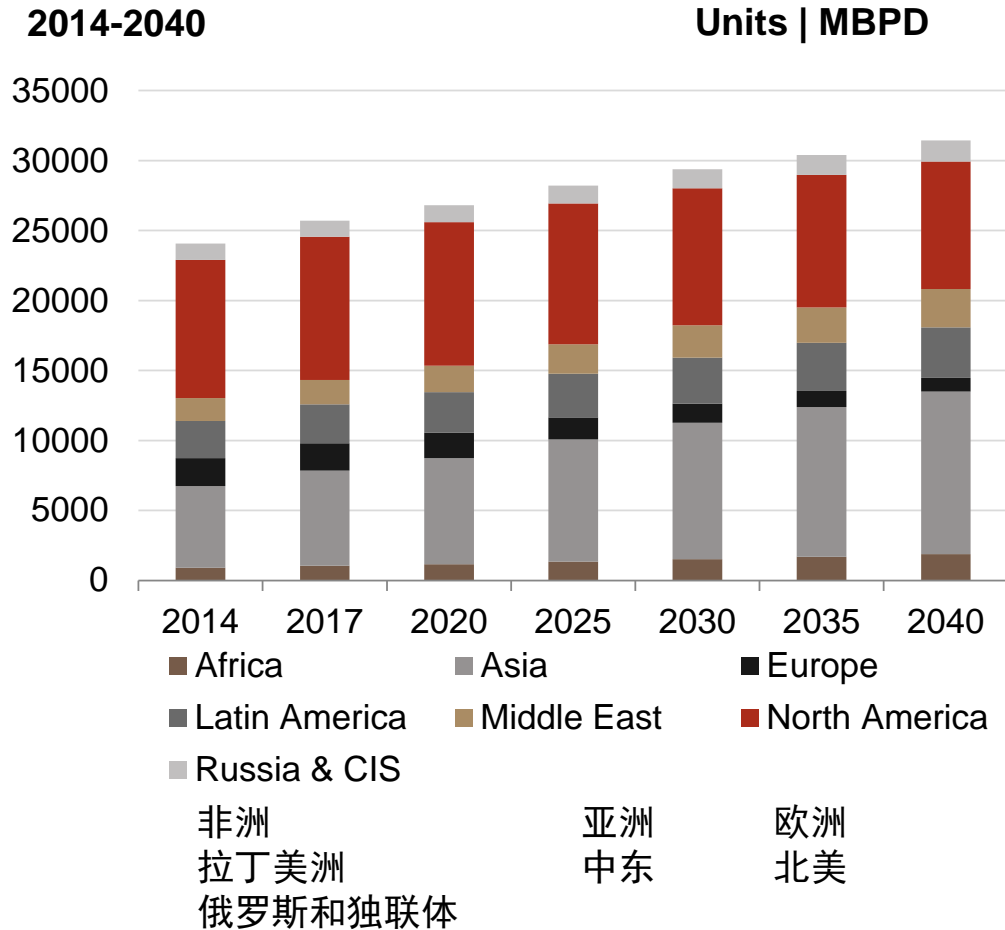
## 亚洲原油贸易流量也将增加

Units | MBPD



# Global Gasoline Demand Will be Supported by Asia

## 全球汽油需求将得到亚洲的支持

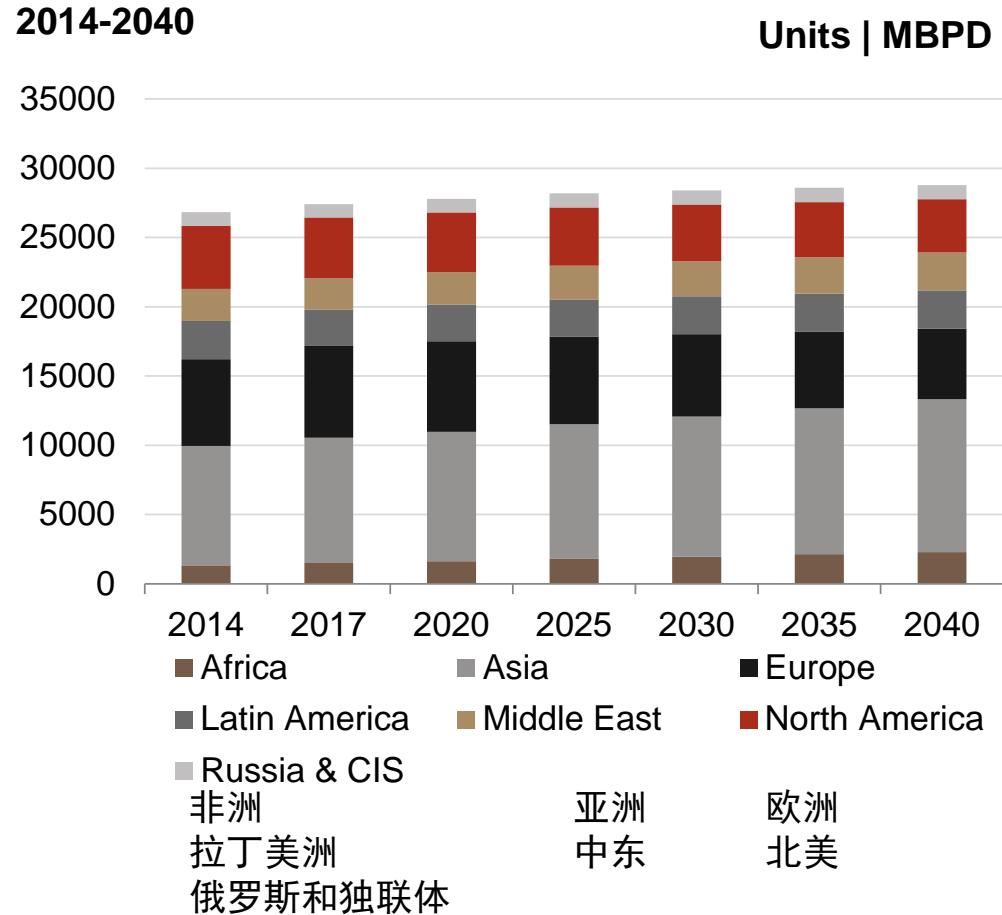


Source资料来源: Stratas Advisors

- Asia demand to grow by 6 MMBPD 亚洲需求增长6 MMBPD
- Demand grow by 1 MMBPD in each region Africa, Middle East and Latin America 非洲，中东和拉丁美洲各地区的需求增长1 MMBPD
- Global Gasoline demand will grow by some 9 MMBPD 全球汽油需求将增长约9 MMBPD

# Global Diesel Demand Will Grow at a Slower Pace

## 全球柴油需求将以较慢的速度增长



Source资料来源: Stratas Advisors

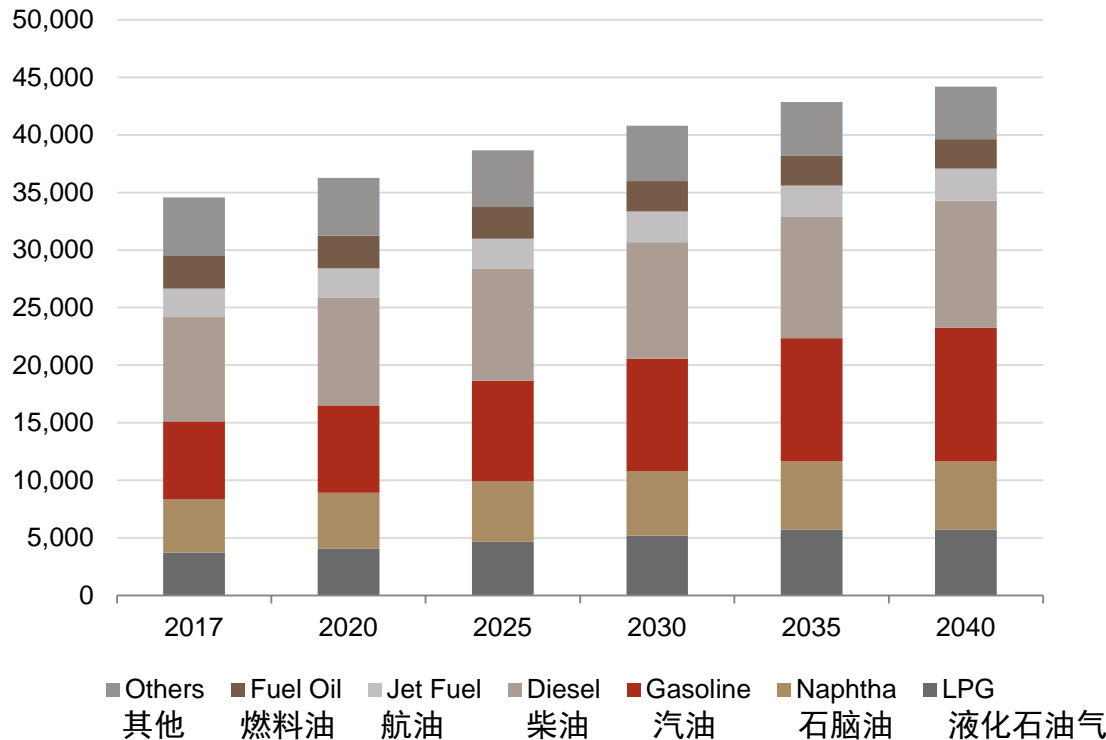
- Global diesel demand increase by 2 MMBPD 全球柴油需求增加2 MMBPD
- Asia diesel demand to grow by 2.5 MMBPD 亚洲柴油需求增长2.5 MMBPD
- Africa demand to increase by 1 MMBPD 非洲需求增加1 MMBPD

# Asia Oil Product Demand Will be Substantial

## 亚洲石油产品需求将大幅增加

2017-2040

Units | MBPD

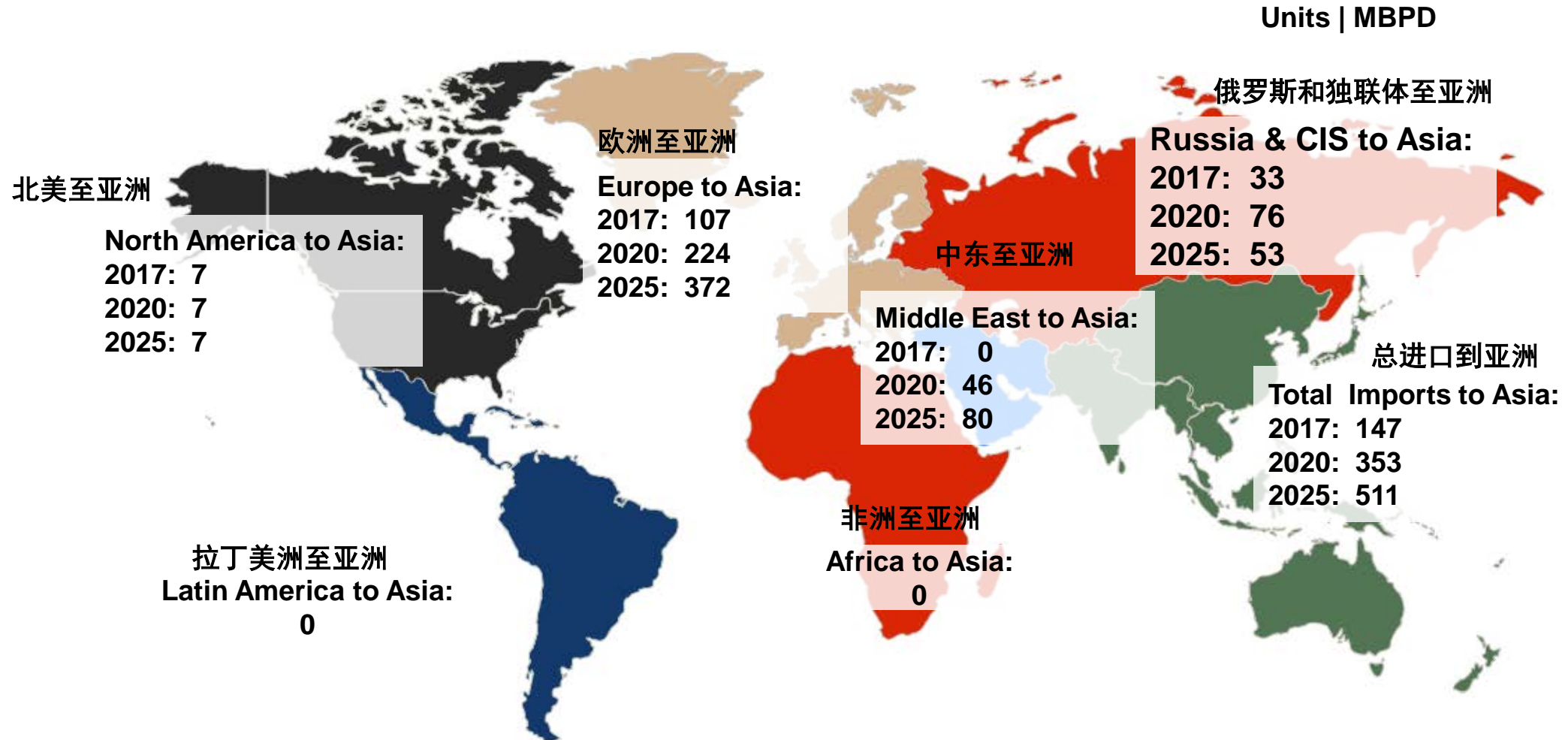


Source资料来源: Stratas Advisors

- Oil product demand to grow by 9.6 MMBPD 石油产品需求增长9.6 MMBPD
- Gasoline will lead overall demand growth increasing by 4.8 MMBPD 汽油将引领整体需求增长4.8 MMBPD
- Diesel demand growth will be slower growing by 1.97 MMBPD 柴油需求增长将缓慢增长1.97 MMBPD
- LPG demand growth will be supported, in part, from petrochemical demand 液化石油气需求增长将部分来自石化需求

# Gasoline Trade Flows to Asia Will Increase Significantly

## 汽油贸易流入亚洲将显著增加

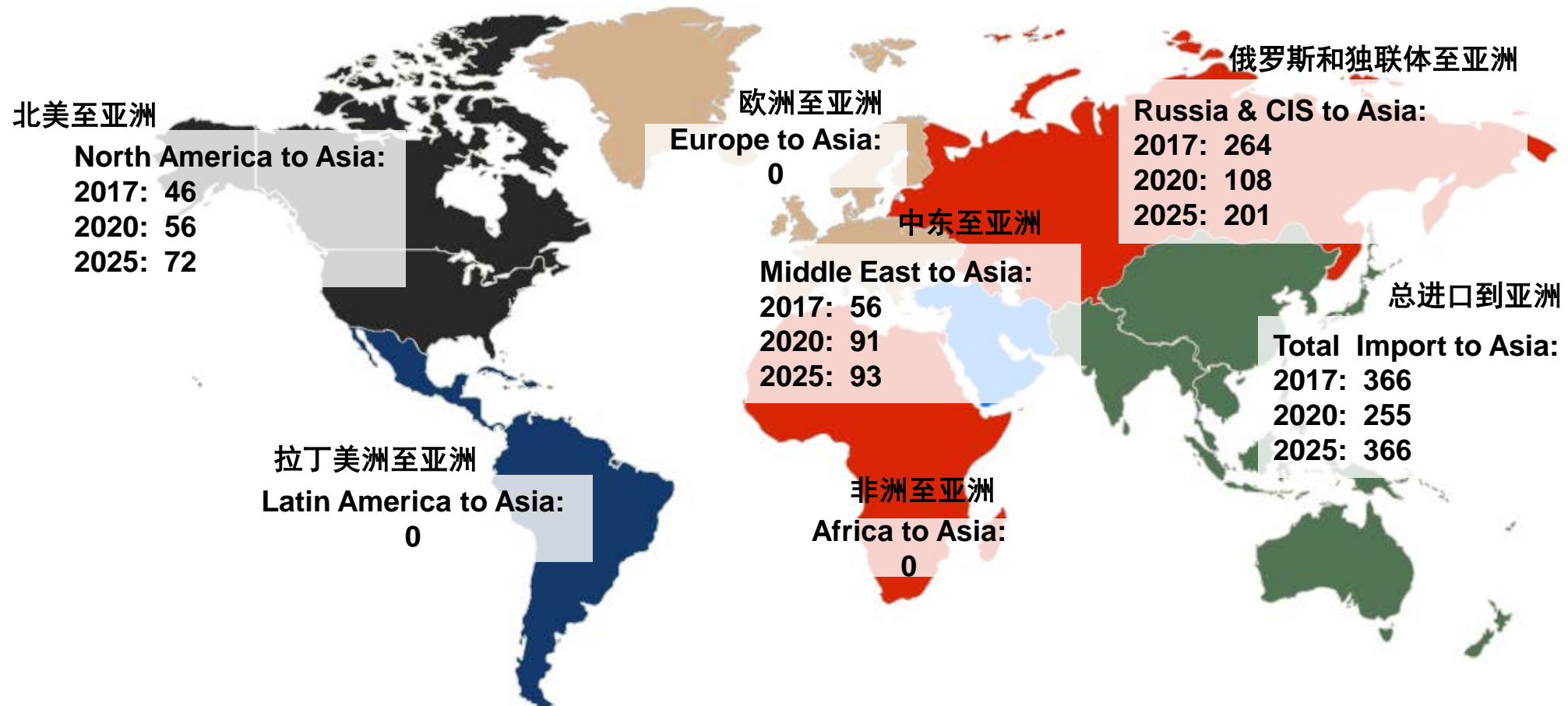




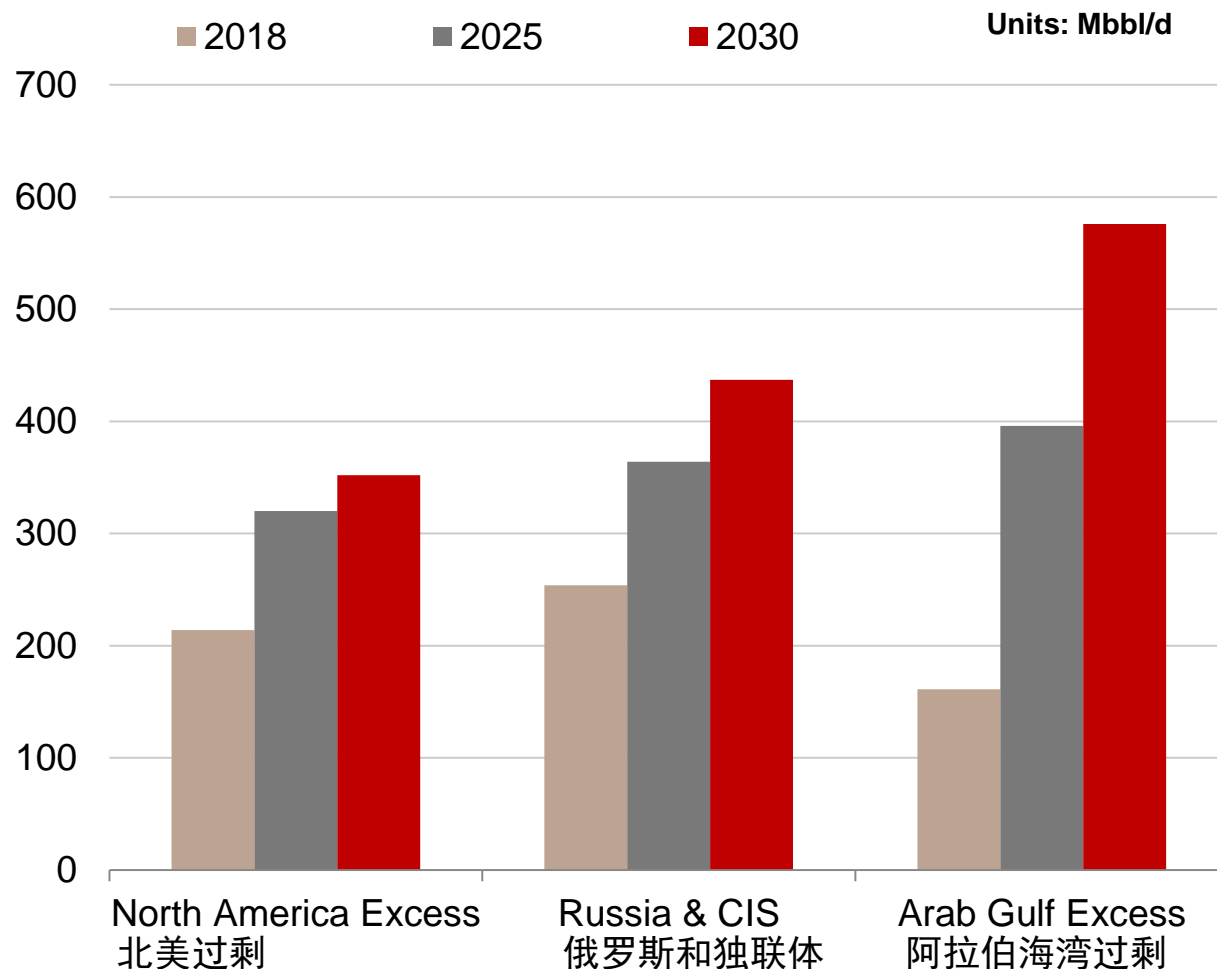
# Diesel Trade Flows to Asia Will Stay Stable

## 柴油贸易流向亚洲将保持稳定

Units | MBPD



# Regional Ethane Balances 区域乙烷平衡



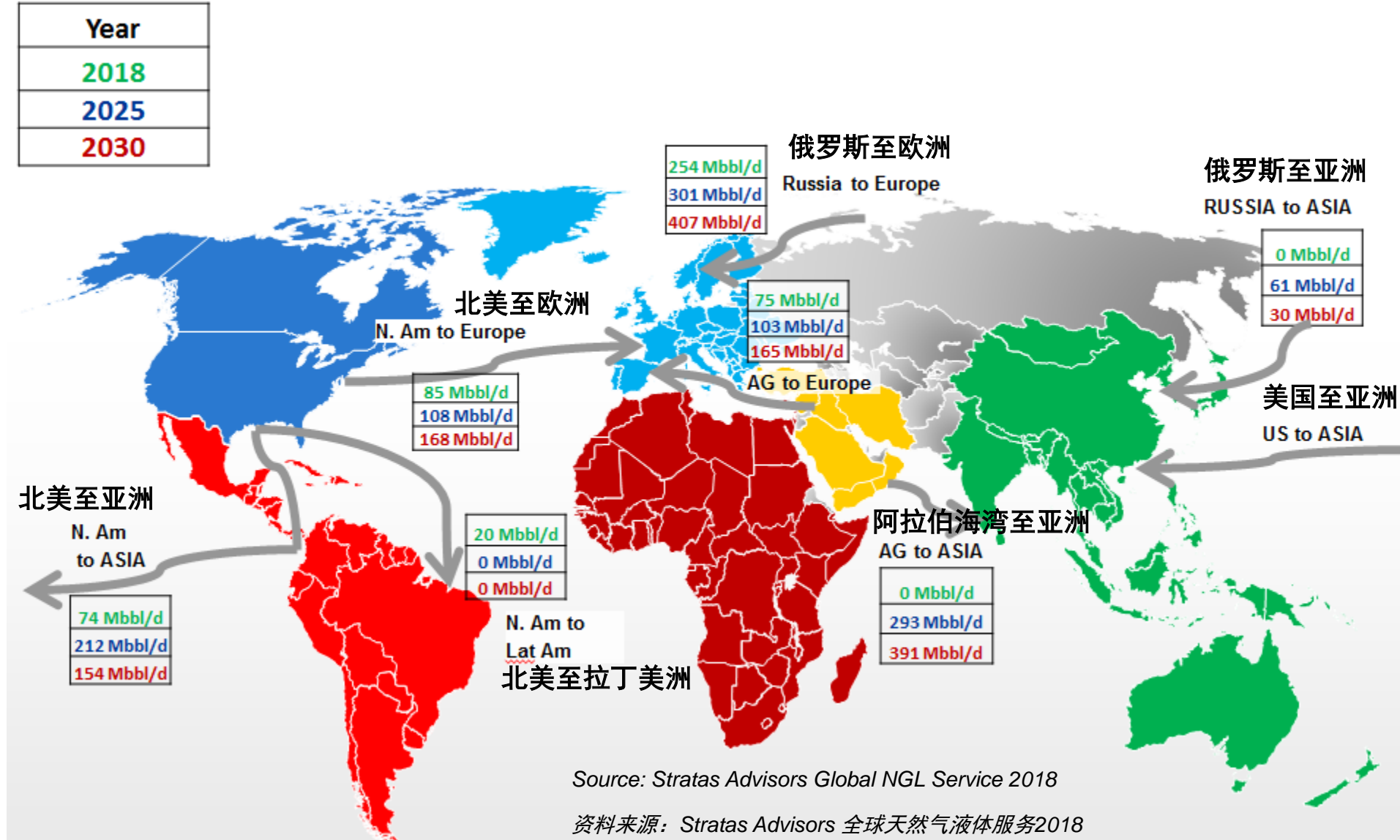
Source: Stratas Advisors Global NGL Service 2018

资料来源: Stratas Advisors 全球天然气液体服务2018

- In North America, domestic petrochemical plants are absorbing much of the output rather than being available for net outbound exports 在北美，国内石化厂正在吸收大部分产量，而非可用于净出口
- Of the three key regions shown, the Arab Gulf will have the most available ethane throughout the forecast period 在所示的三个关键区域中，阿拉伯海湾将在整个预测期内拥有最多的乙烷
- The Arab Gulf region is in close proximity to two key demand regions (Europe and Asia) 阿拉伯海湾地区紧邻两个主要需求地区（欧洲和亚洲）



# Global Ethane Net Trade Flows 全球乙烷净贸易流量





Key Takeaways 关键点

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# Key Takeaways 关键点

- The oil & gas landscape is changing – with the change being driven by four major themes – changing energy mix, shifting energy flows, evolving transportation sector and intensifying regulatory environment 石油和天然气格局正在发生变化 - 变化受四大主题驱动 - 能源结构的变化，能源流动的变化，交通运输业的发展以及监管环境的加剧
- The changes will require being proactive in a strategic manner for future success 这些变化需要积极主动地以战略方式取得未来的成功
- US shale-related production will increase -- and companies utilizing technological advancements and process improvements will allow them to be competitive in a lower-price environment 美国与页岩相关的生产将会增加 - 利用技术进步和工艺改进的公司将使他们在低价环境中具有竞争力
- Shale-related production, however, will not be sufficient to meet future incremental demand growth – offshore production and other production will be needed to fill the gap 然而，与页岩相关的生产将不足以满足未来的增量需求增长 - 需要海上生产和其他生产来填补这空白
- The portion of natural gas in the global energy mix will increase – and future natural gas demand will increasingly be serviced by supplies from North America, Russia, and the Middle East/ Africa 全球能源结构中天然气的比例将增加 - 未来天然气需求将越来越多地来自北美，俄罗斯和中东/非洲的供应
- The extent of natural gas demand, however, could be hampered by under-investment and delays in required liquefaction capacity 然而，天然气需求的程度可能因投资不足和所需的液化能力延迟而受到阻碍
- Crude exports to Asia will continue to increase with incremental needs being met by exports from North America, Latin America and Middle East 由于北美，拉丁美洲和中东的出口需求增加，对亚洲的原油出口将继续增加
- Asia will also be reliant on increased product exports – especially with respect to gasoline 亚洲也将依赖增加的产品出口 - 特别是在汽油方面
- Additionally, Asia will increasingly import NGLs – including ethane 此外，亚洲将越来越多进口天然气液体- 包括乙烷

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