Energy Strategy MasterClass

Ramin Forouzandeh | Aug 17-18, 2022

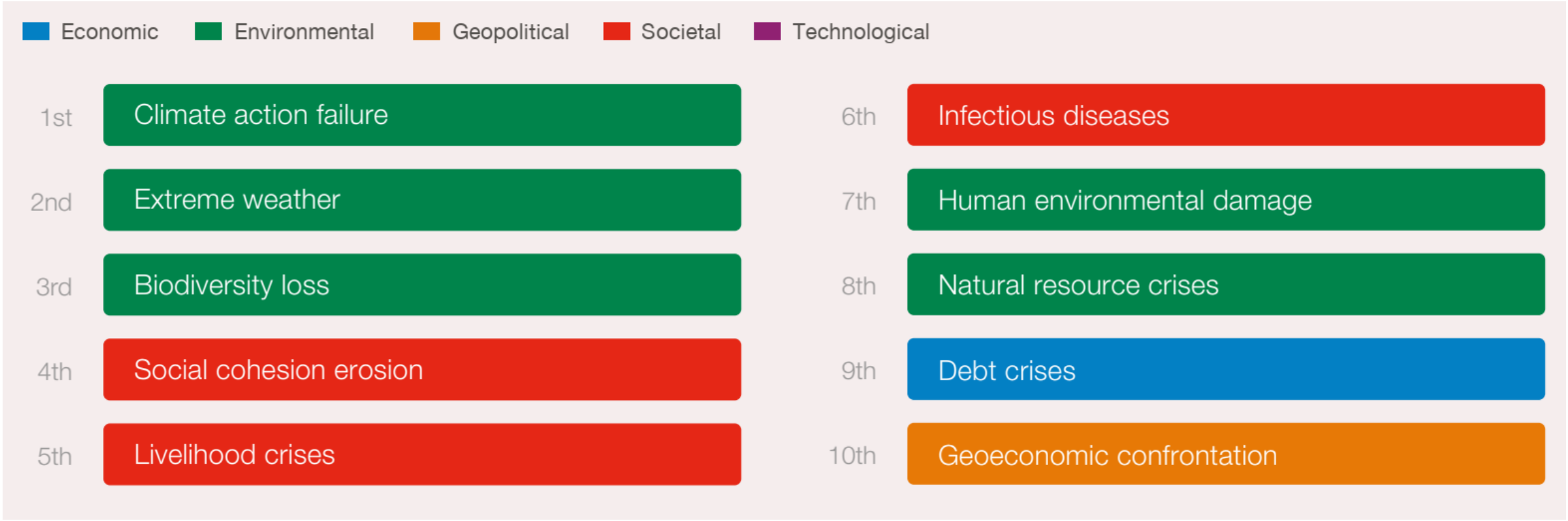
PetroView

موسسه مطالعات انرژی سبحان

The Energy Cake

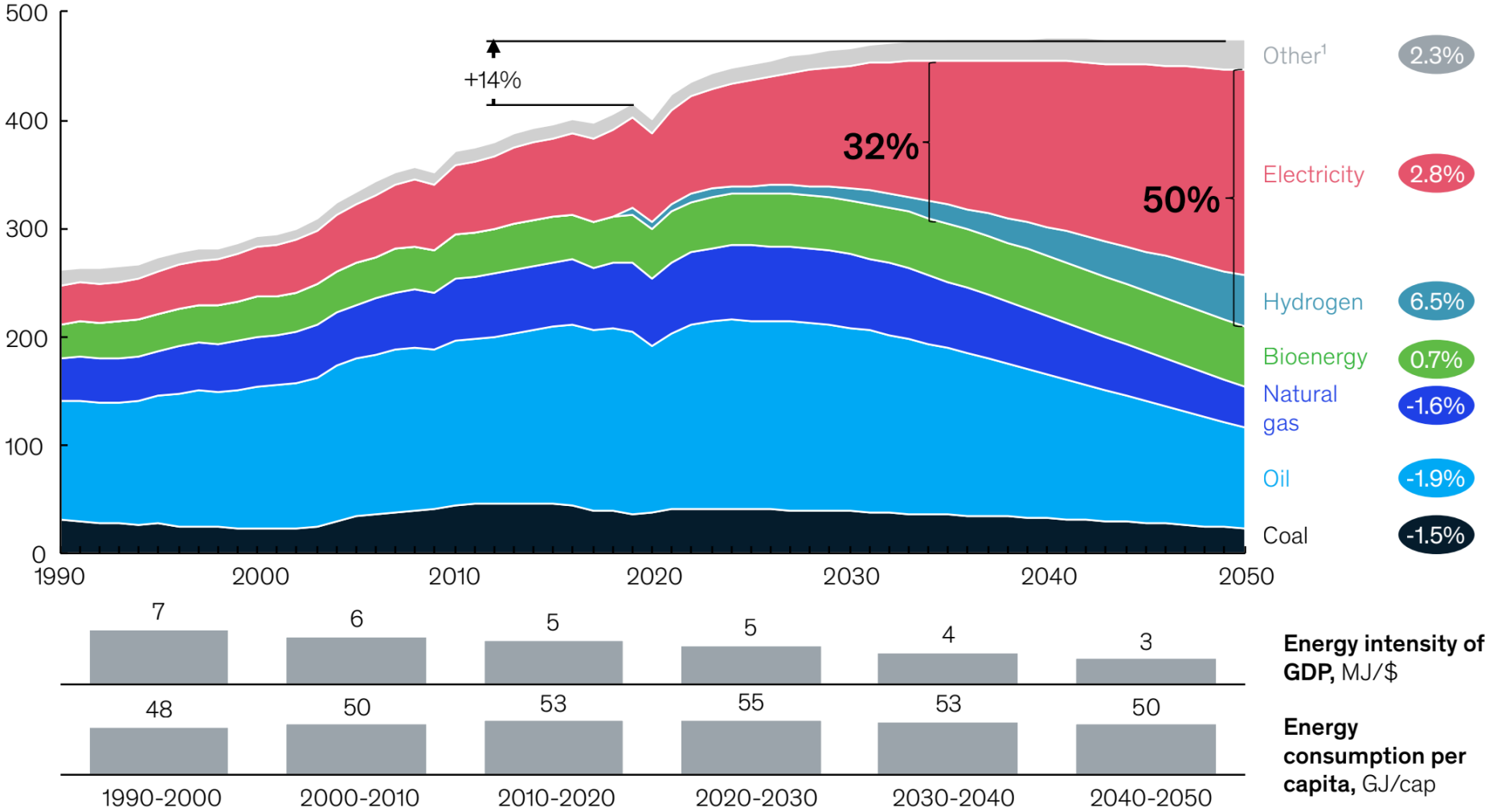
To provide an overview of key energy demand and supply figures by region and product

The Most Severe Risks On A Global Scale Over The Next 10 Years



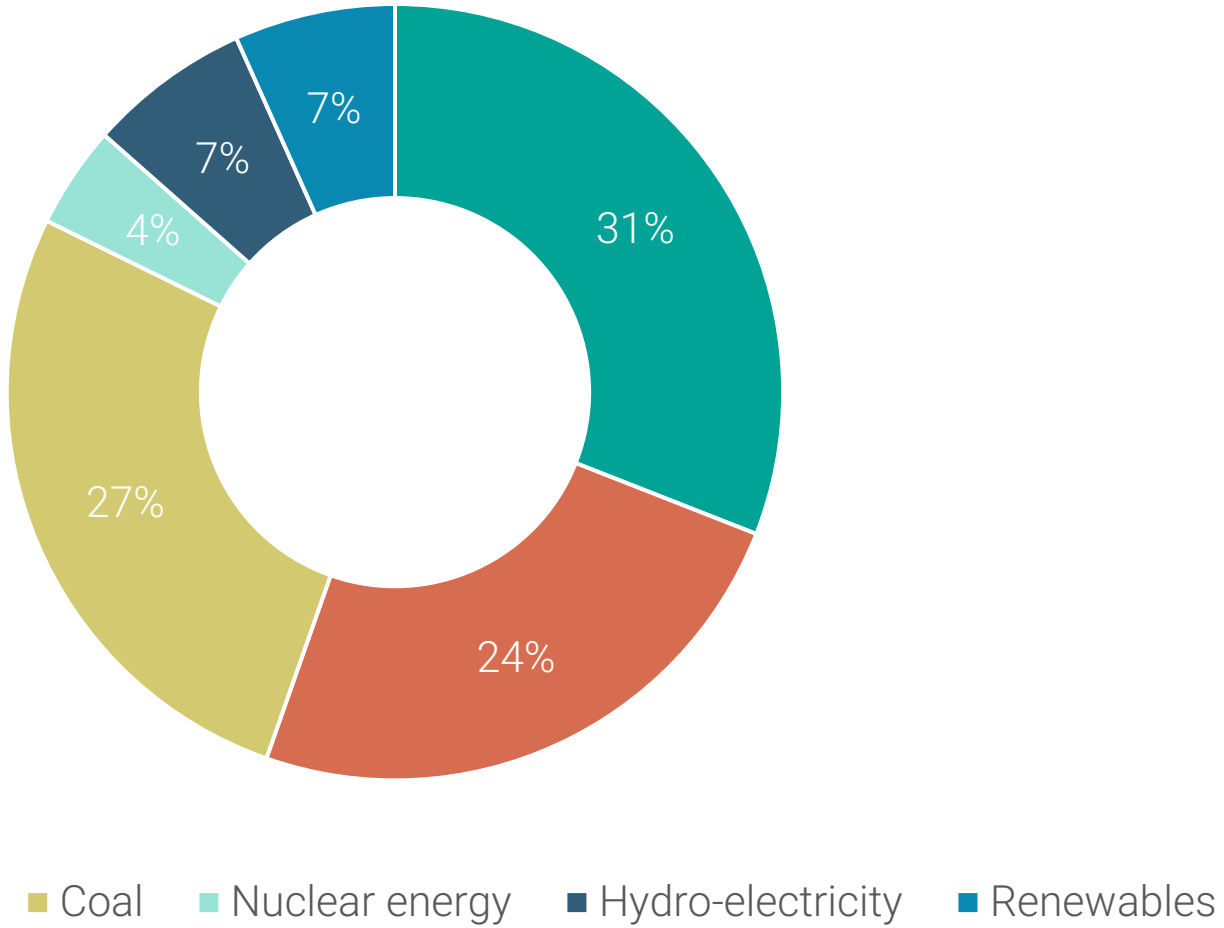
WEF Global Risks Report 2022

Final Energy Consumption by Fuel Under Further Acceleration Scenario (Million TJ)



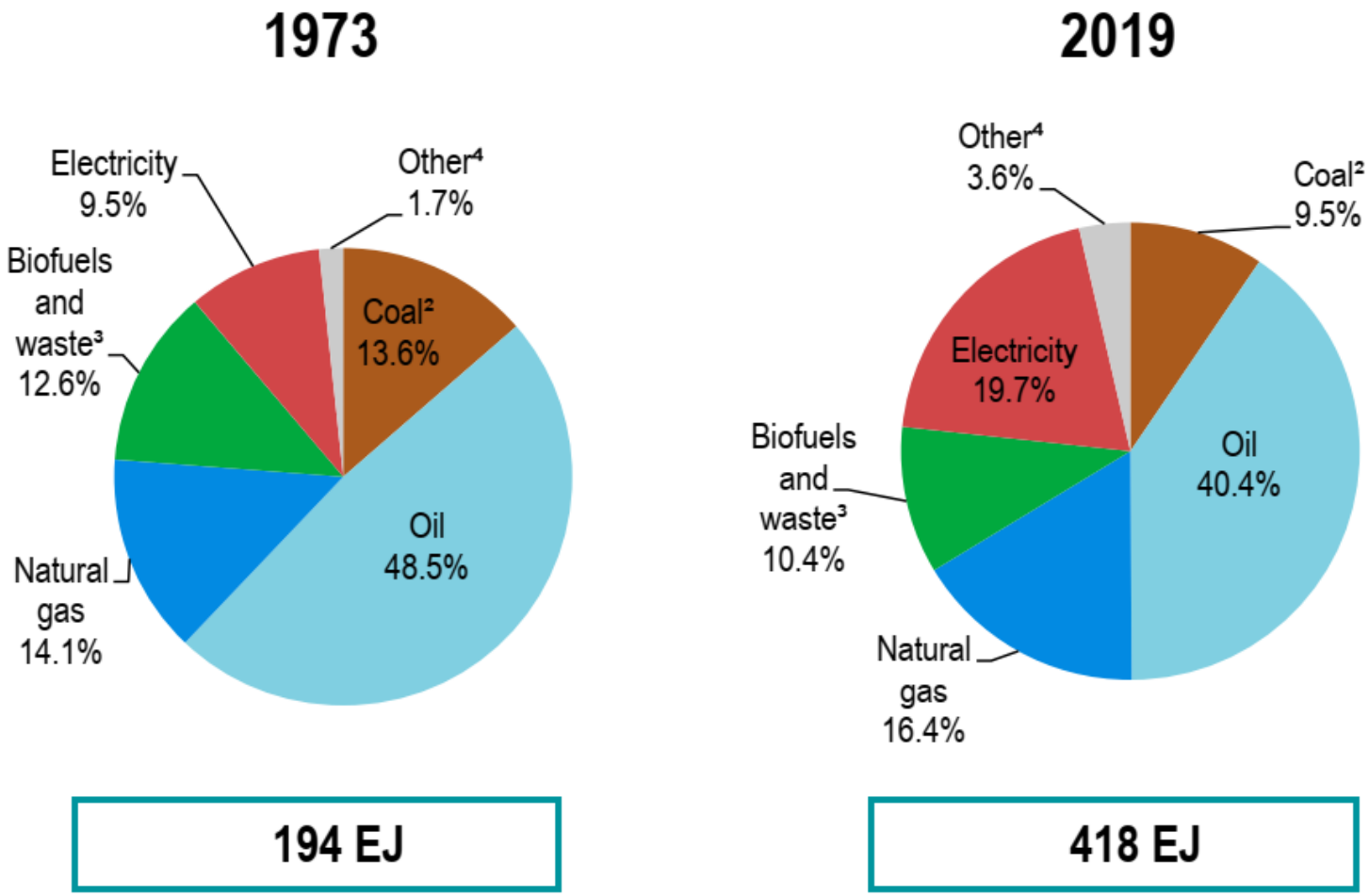
McKinsey Global Energy Perspective 2022

Primary Energy Consumption by Fuel (Exajoules)



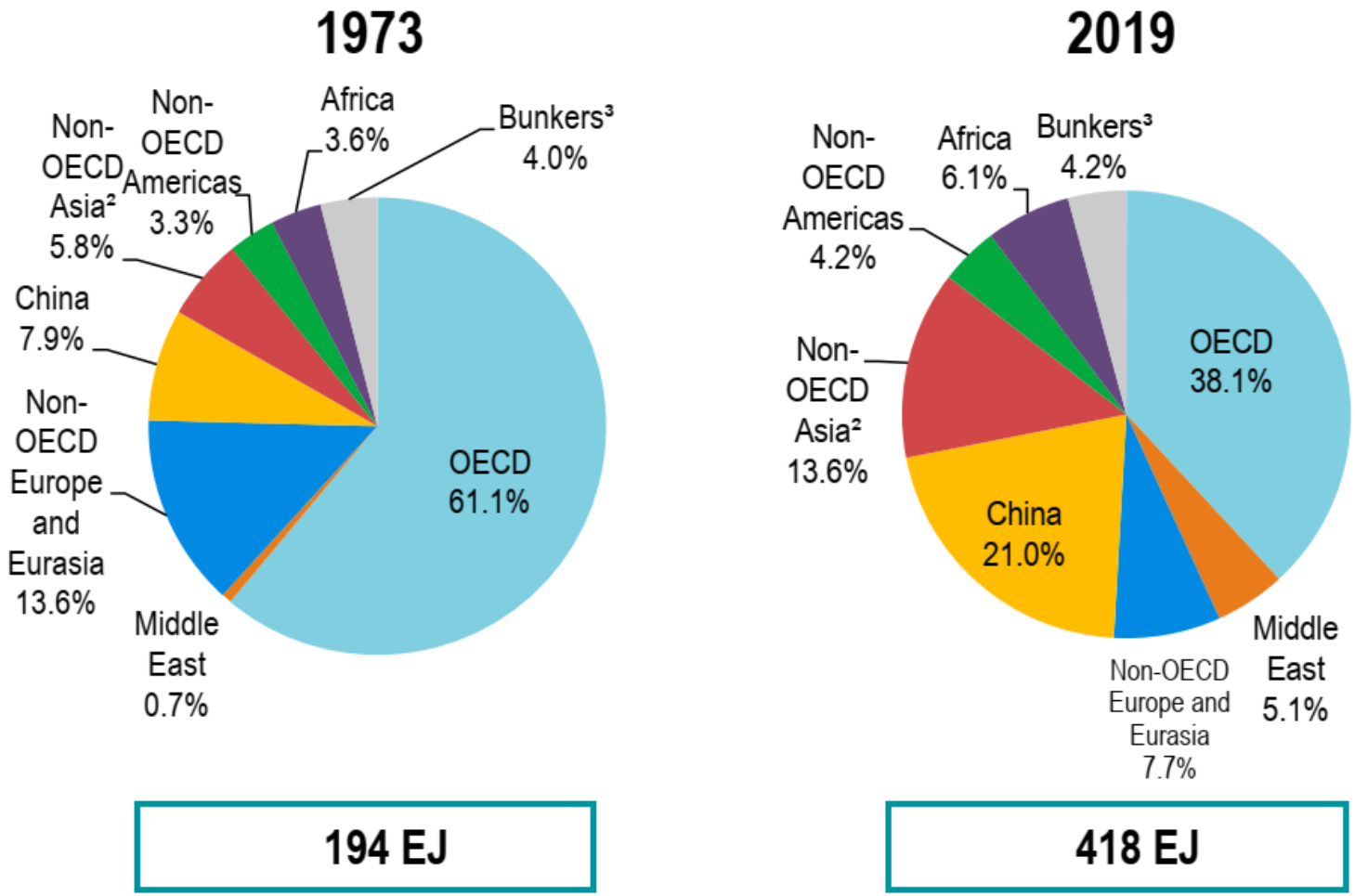
BP Statistical Review of World Energy 2022

World Total Final Consumption by Source



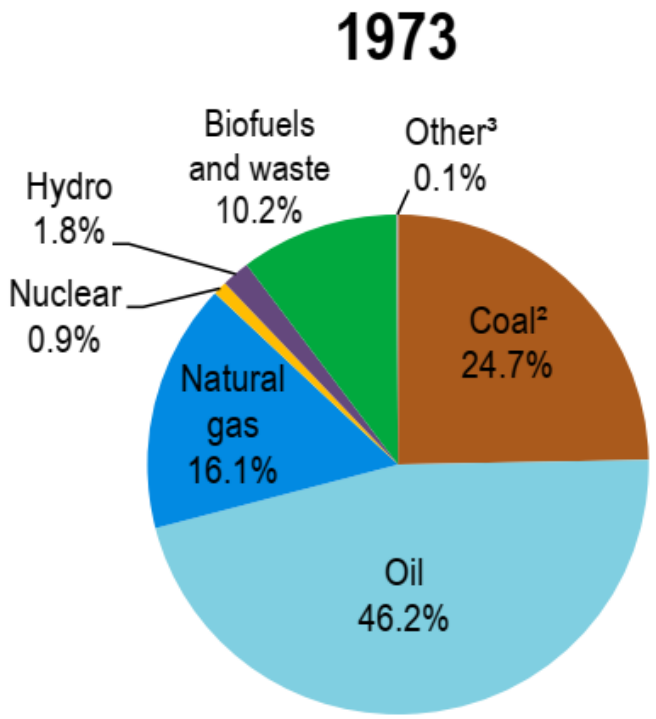
IEA key world energy statistics 2021

World Total Final Consumption by Region

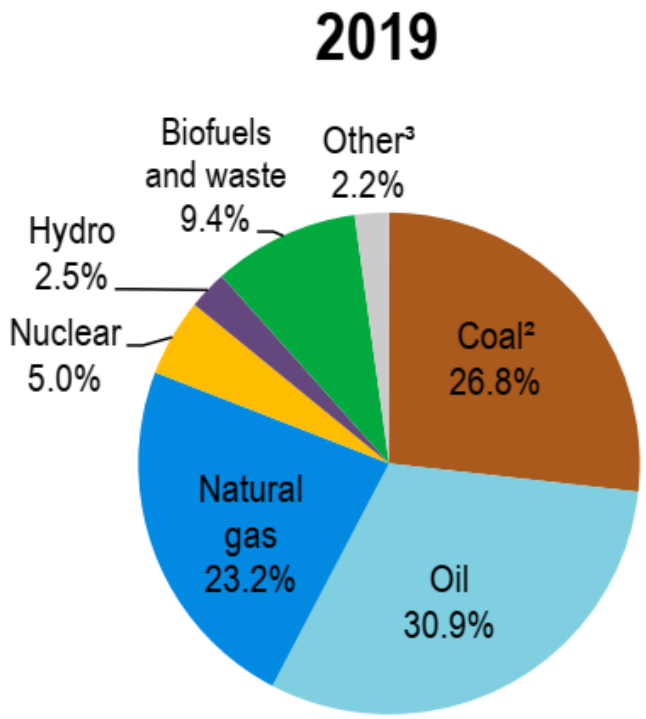


IEA key world energy statistics 2021

World Total Energy Supply by Source



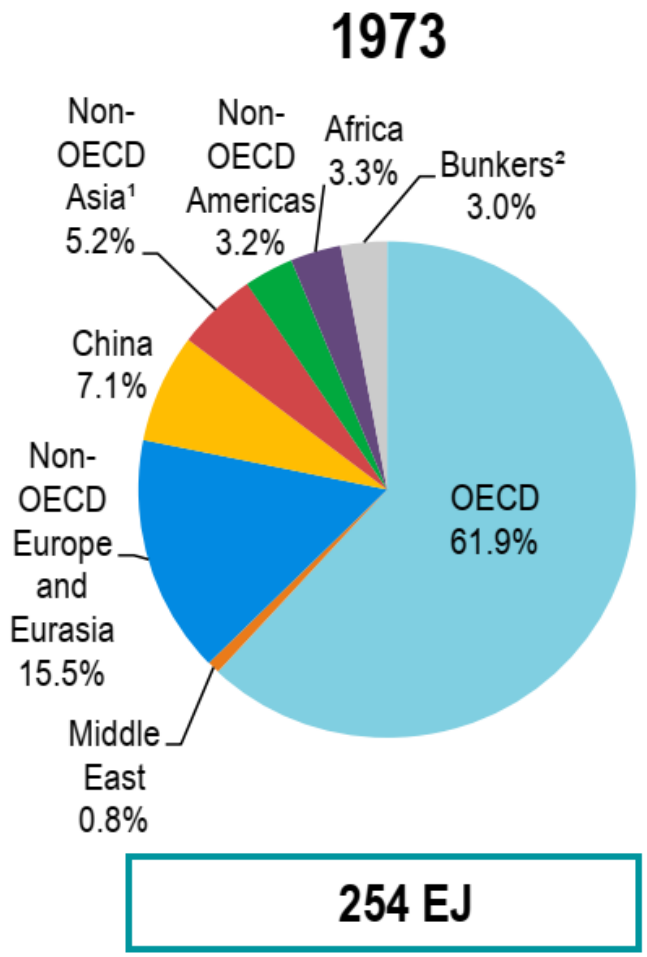
254 EJ

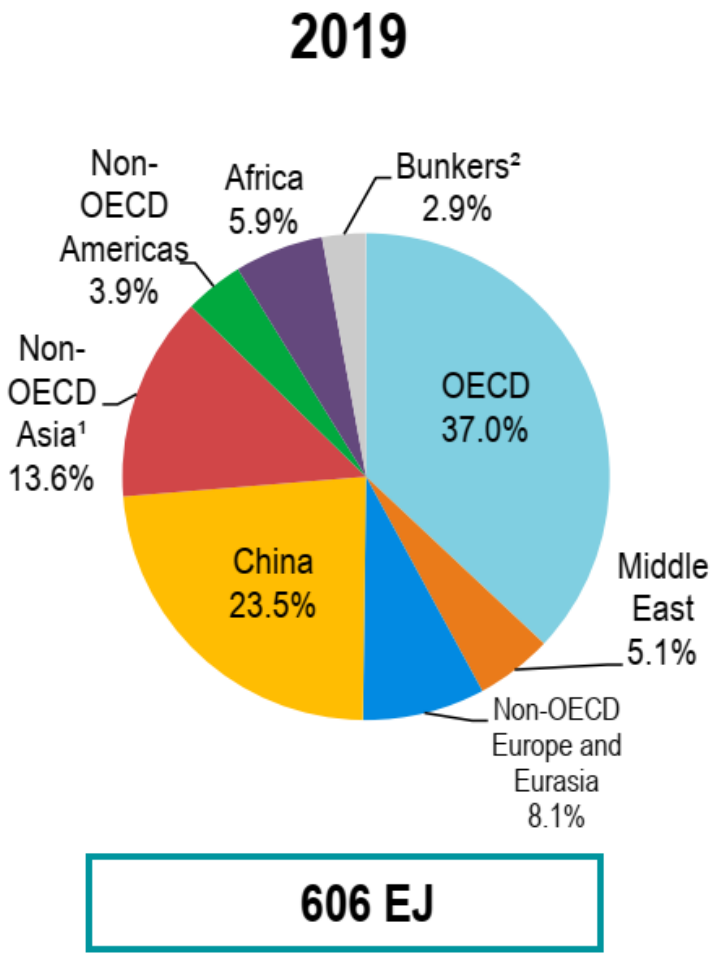


606 EJ

IEA key world energy statistics 2021

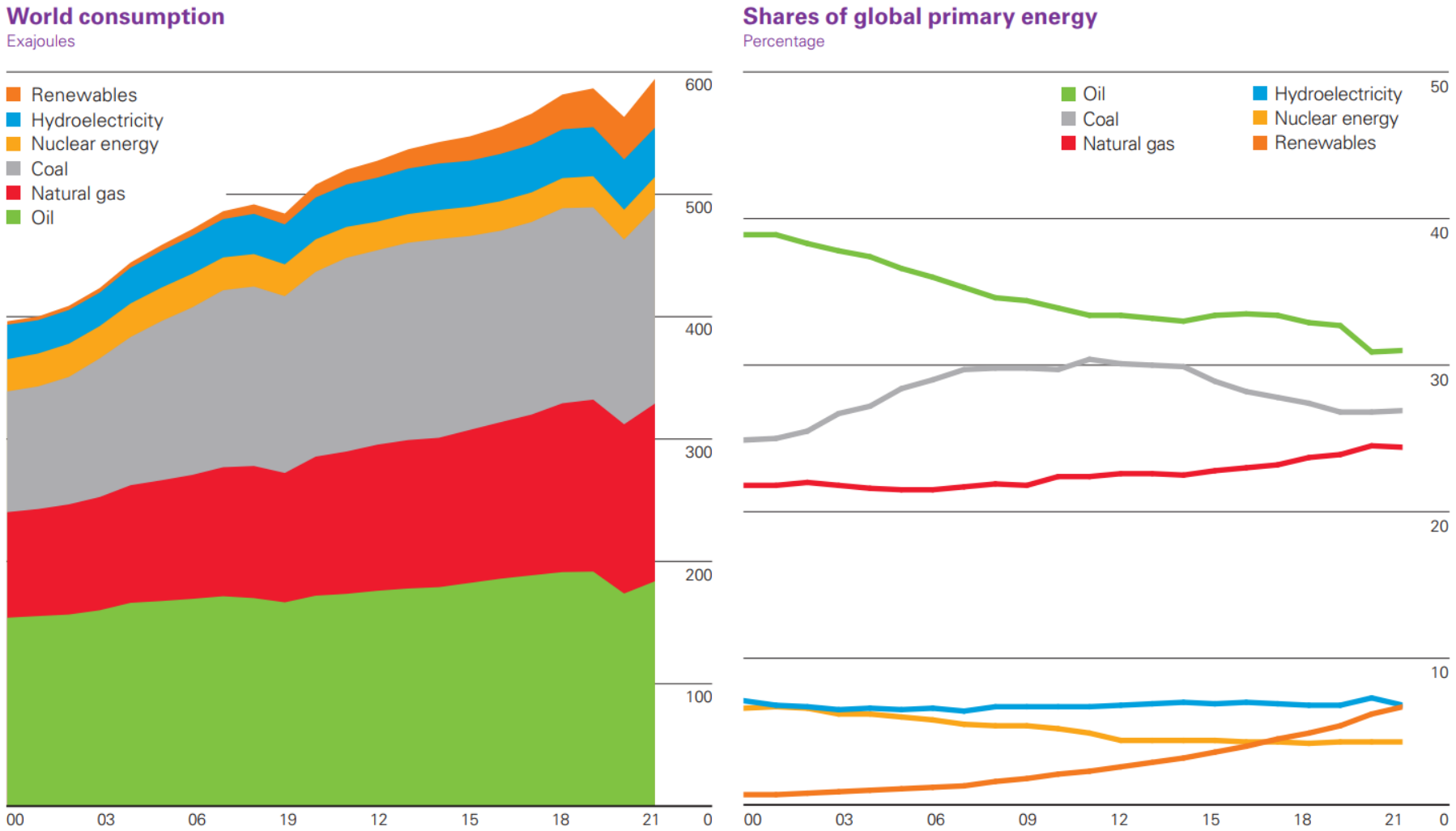
World Total Energy Supply by Region





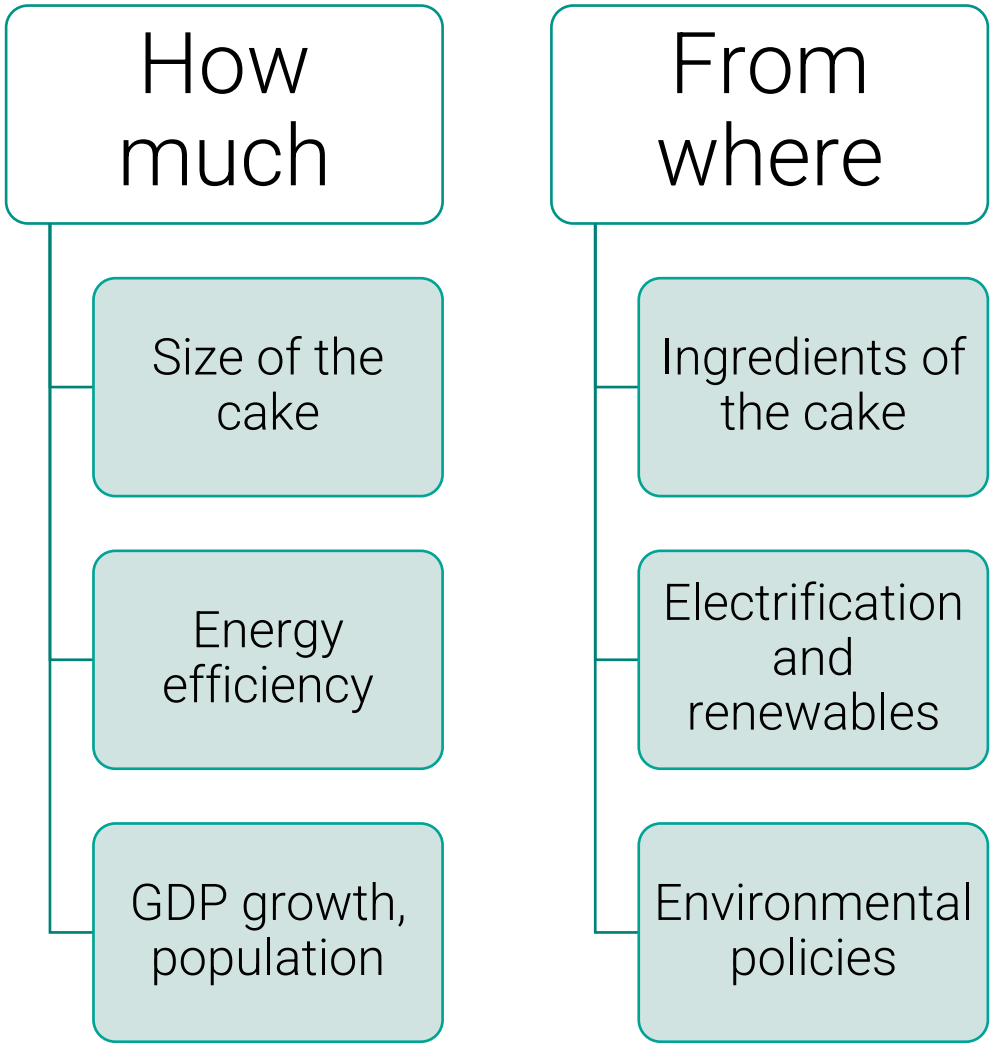
IEA key world energy statistics 2021

World Energy Consumption



BP Statistical Review of World Energy 2022

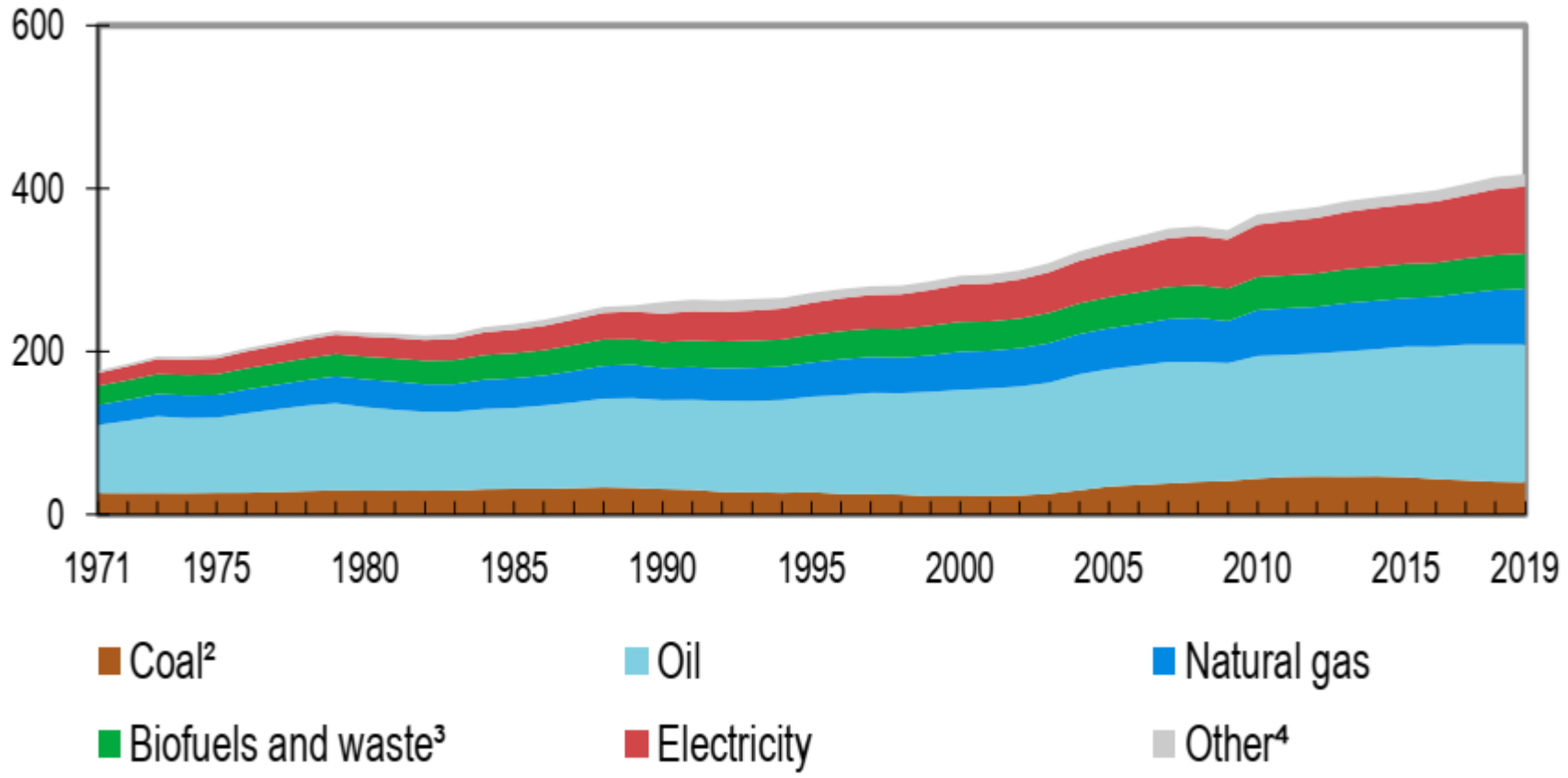
Two dimensions of the energy cake



Electrification

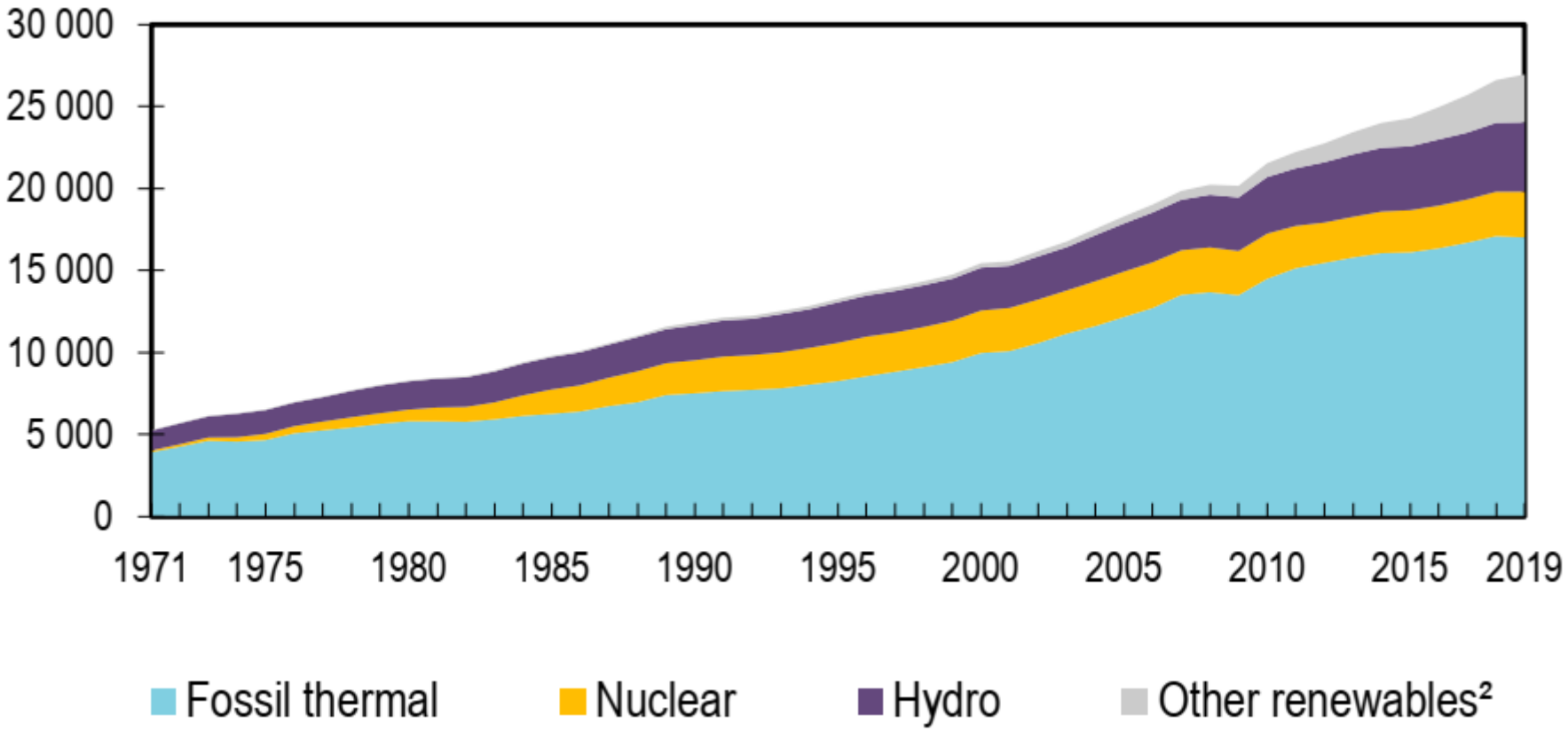
To understand the role of renewable power and electric vehicles

World Total Final Consumption by Source (EJ)



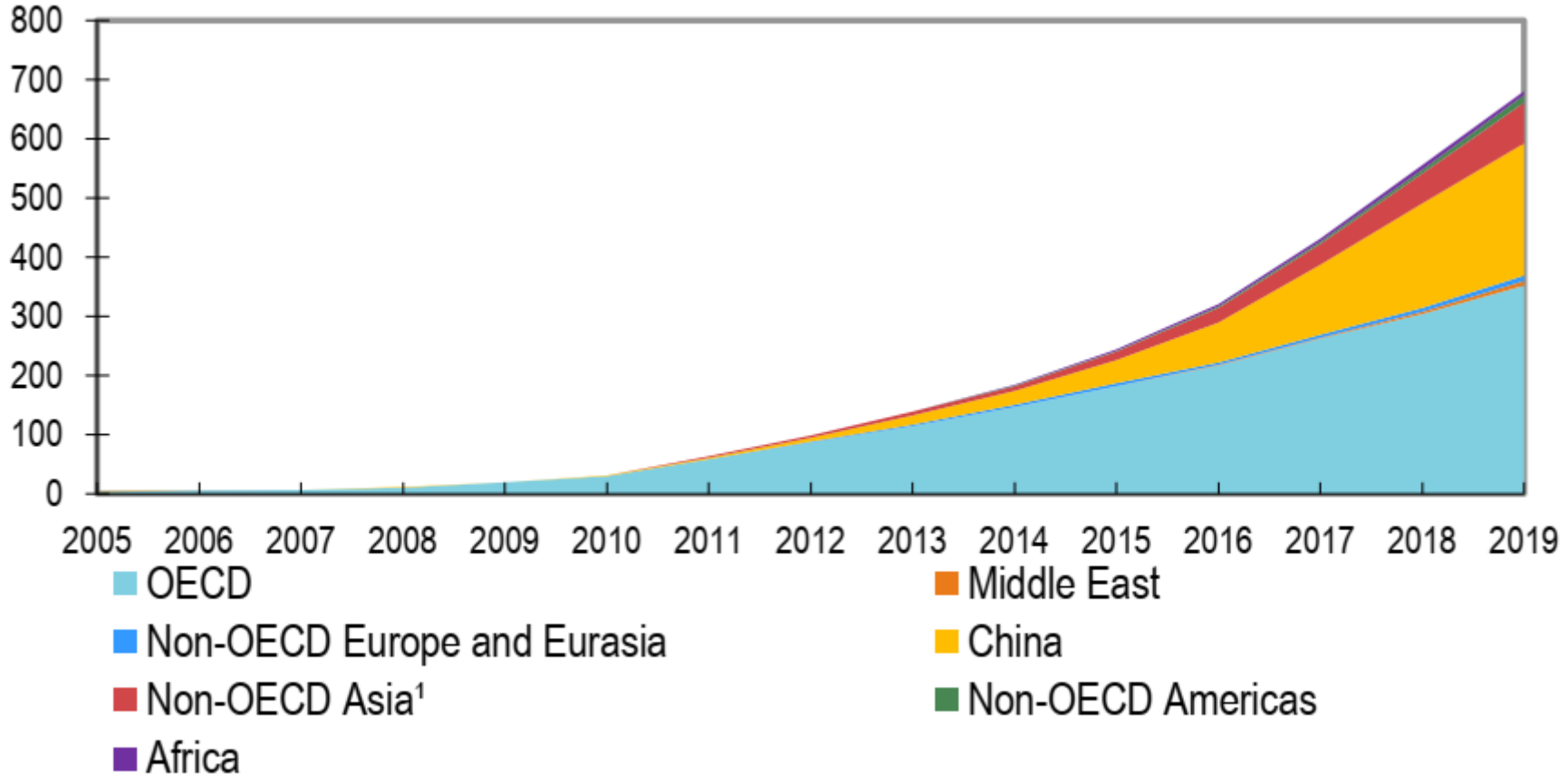
IEA key world energy statistics 2021

World Electricity Generation By Source (Twh)



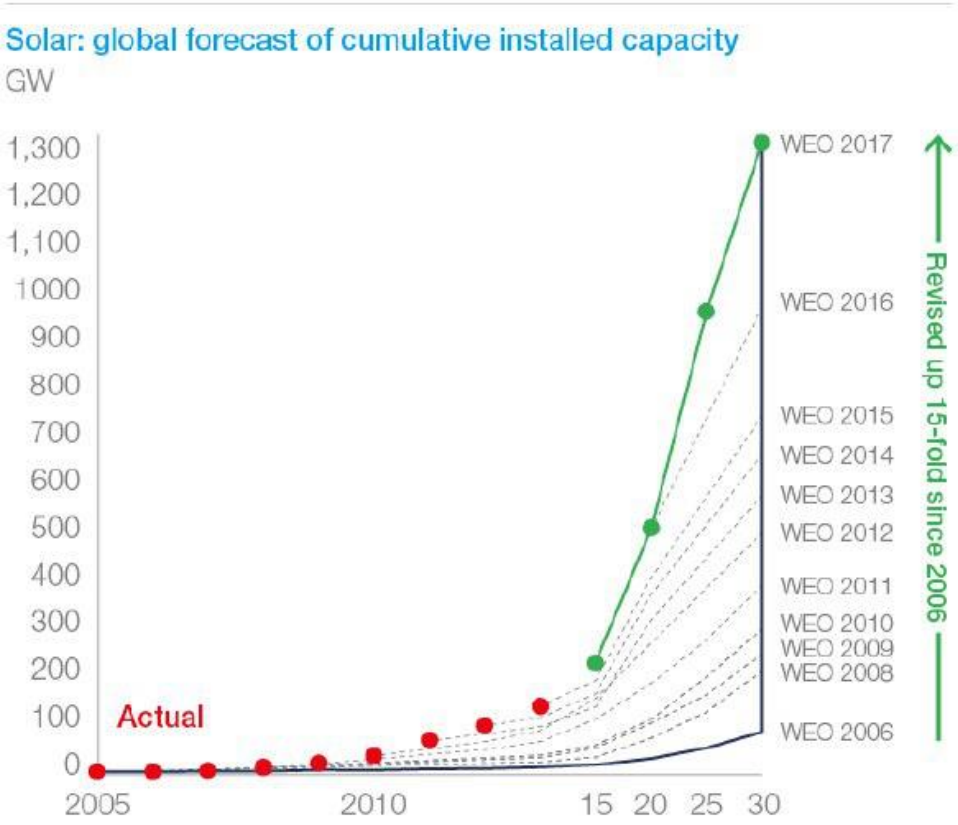
IEA key world energy statistics 2021

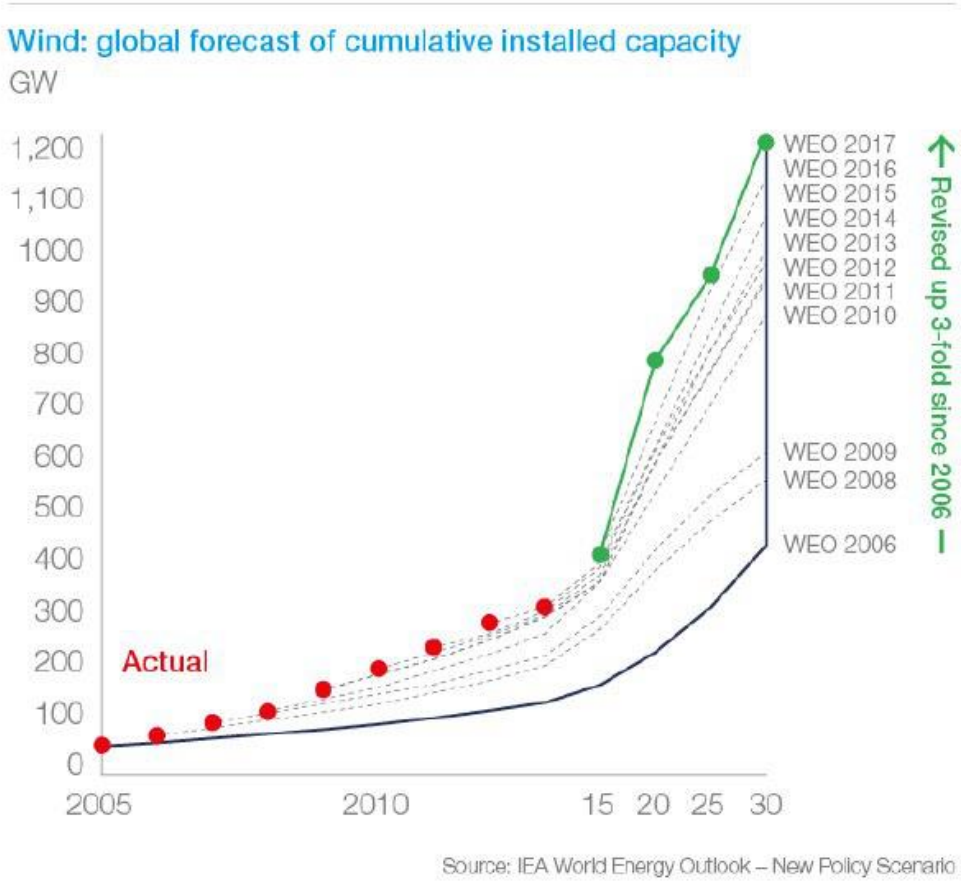
World Solar PV Electricity Production by Region (Twh)



IEA key world energy statistics 2021

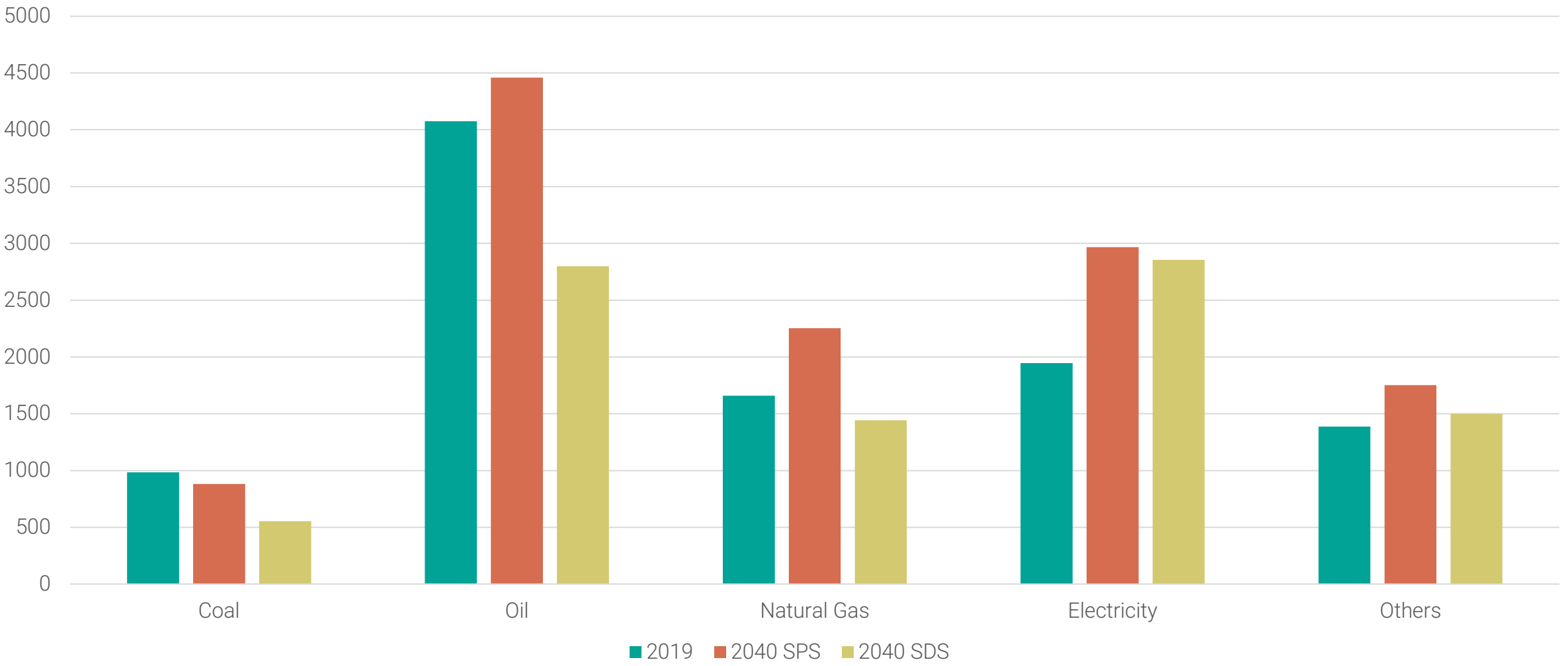
Underestimating Renewables





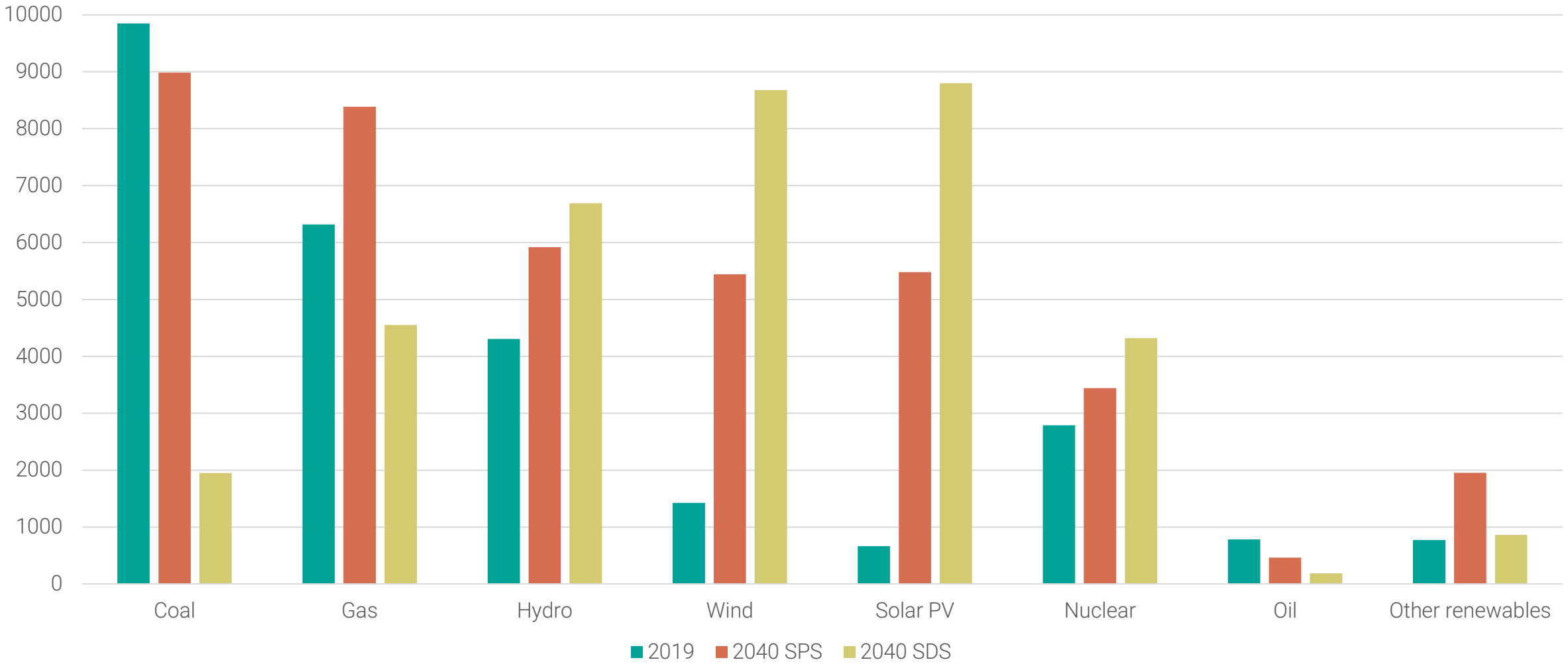
McKinsey What if the latest wind and solar auction results were the new reality of electricity prices?

Total Final Consumption (Mtoe)



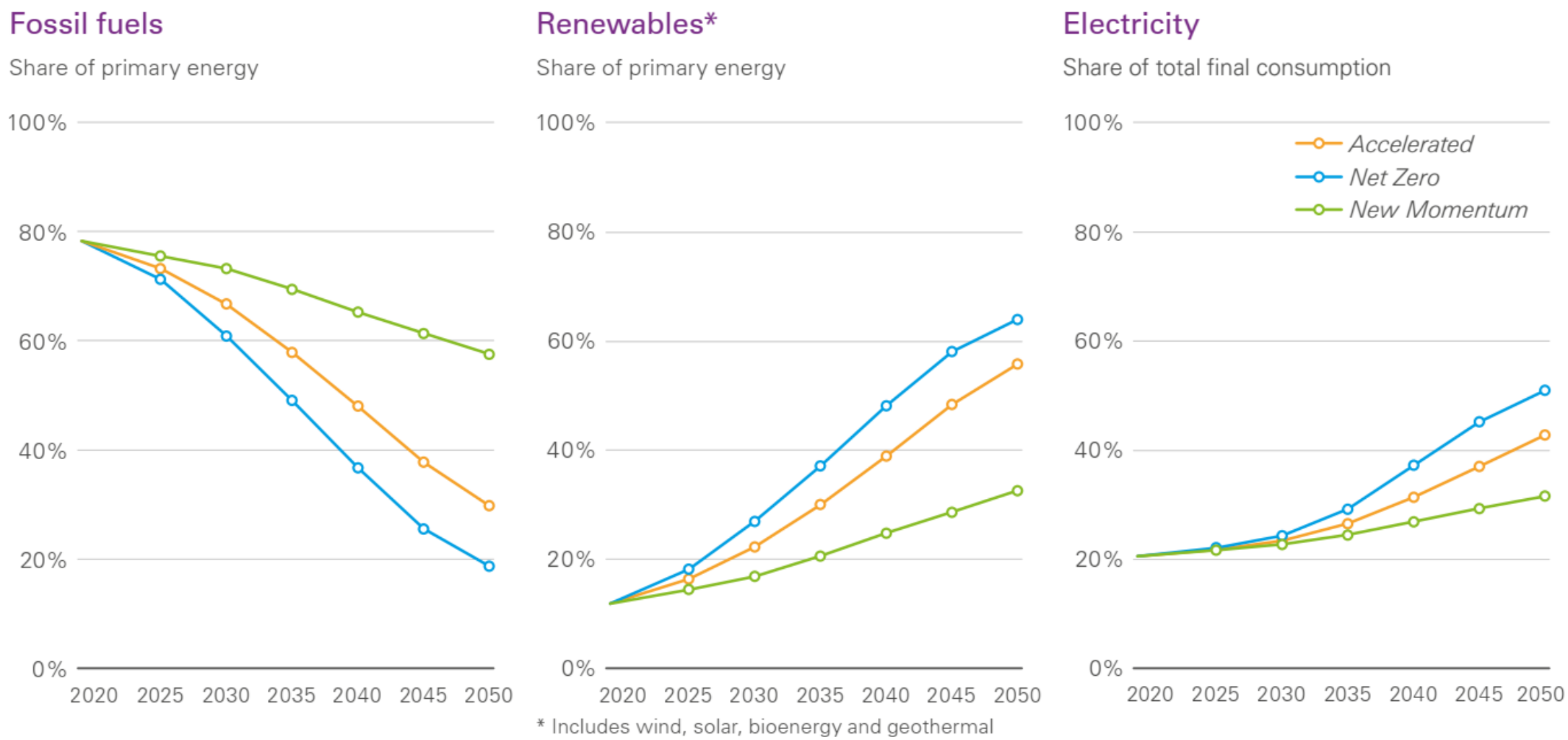
IEA World Energy Outlook 2021

Electricity Generation (TWh)



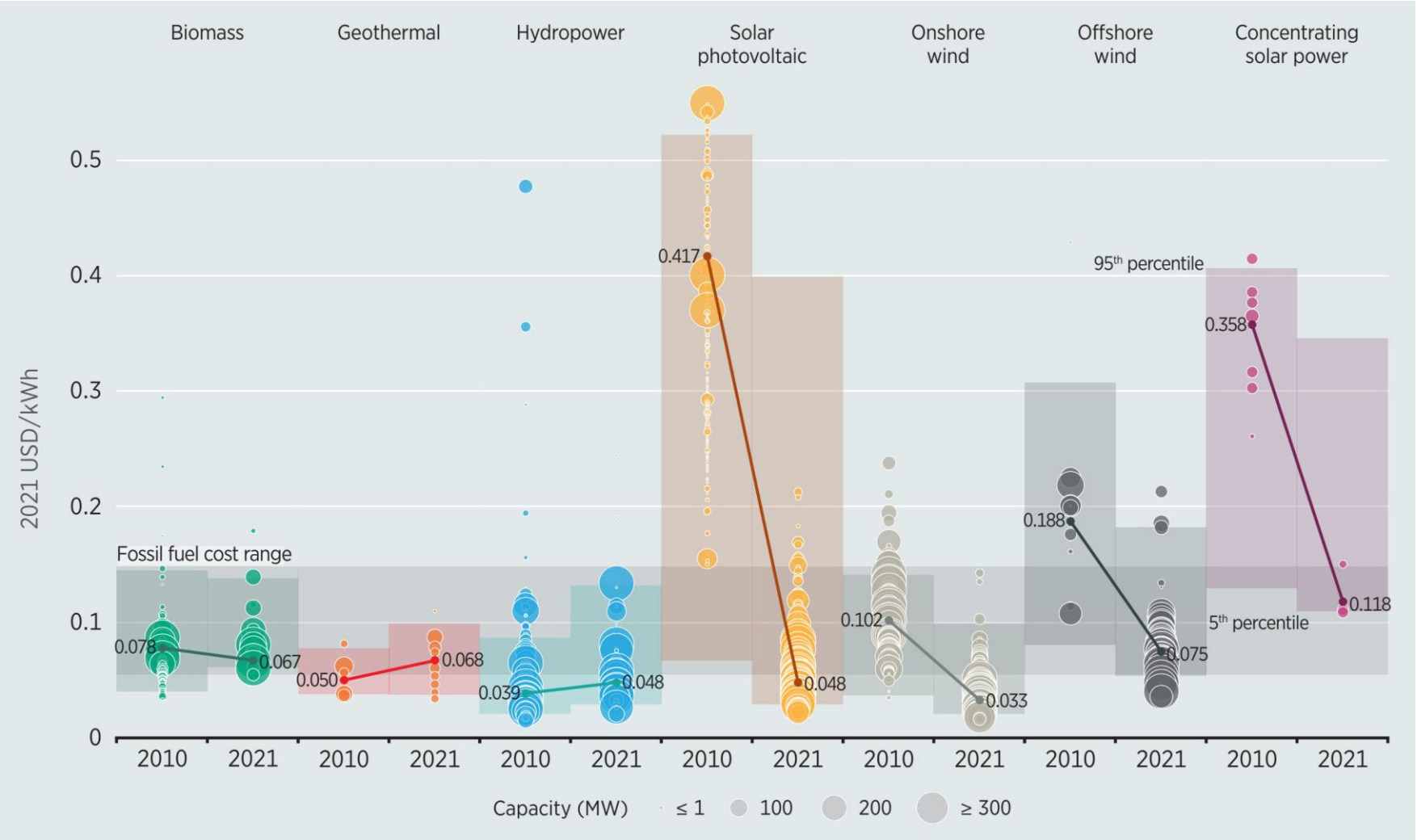
IEA World Energy Outlook 2021

Gradual Shift in Energy Demand



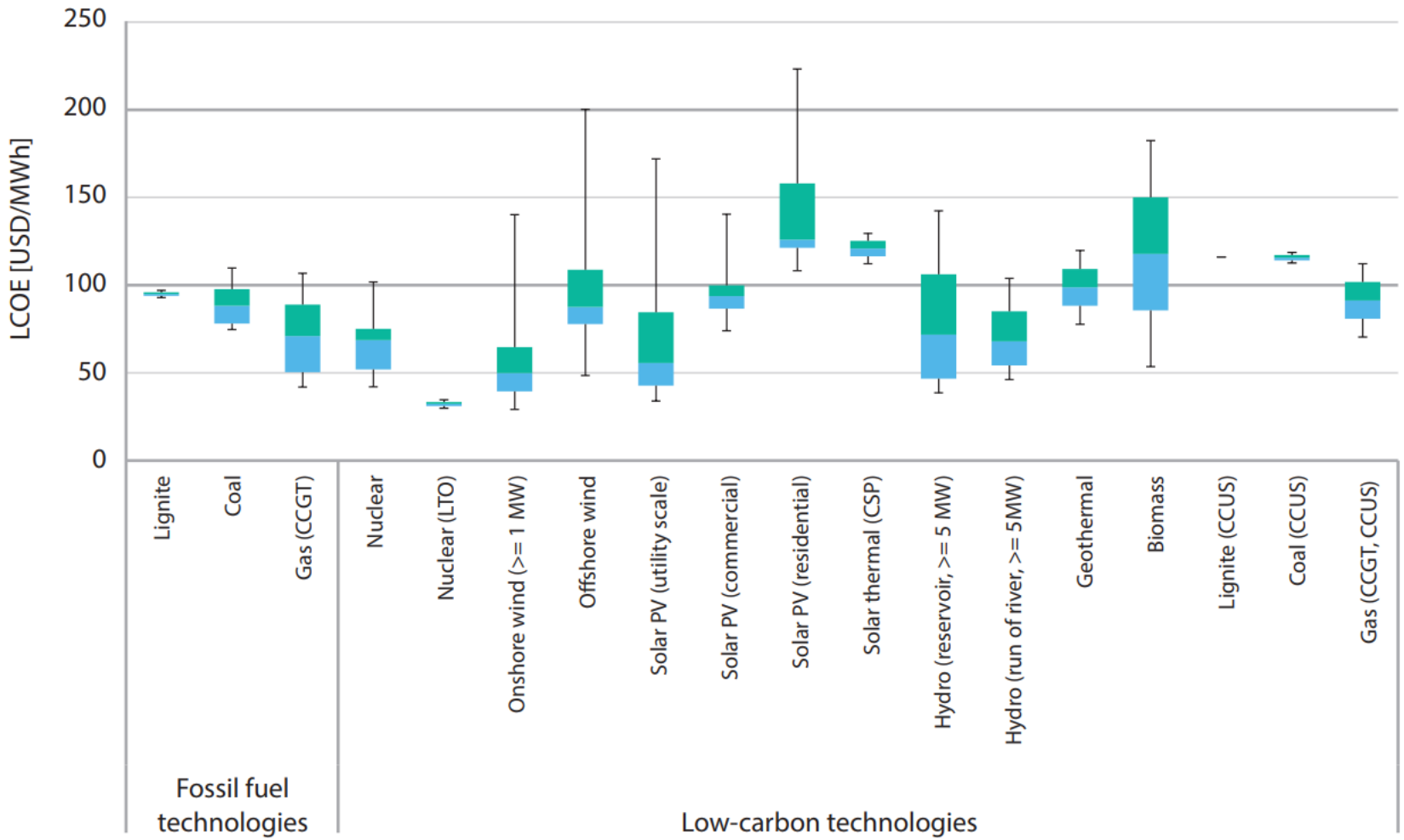
BP World Energy Outlook 2022

Global LCOEs from Utility-scale Power Generation Technologies



IRENA Renewable Power Generation Costs in 2021

LCOE by Technology

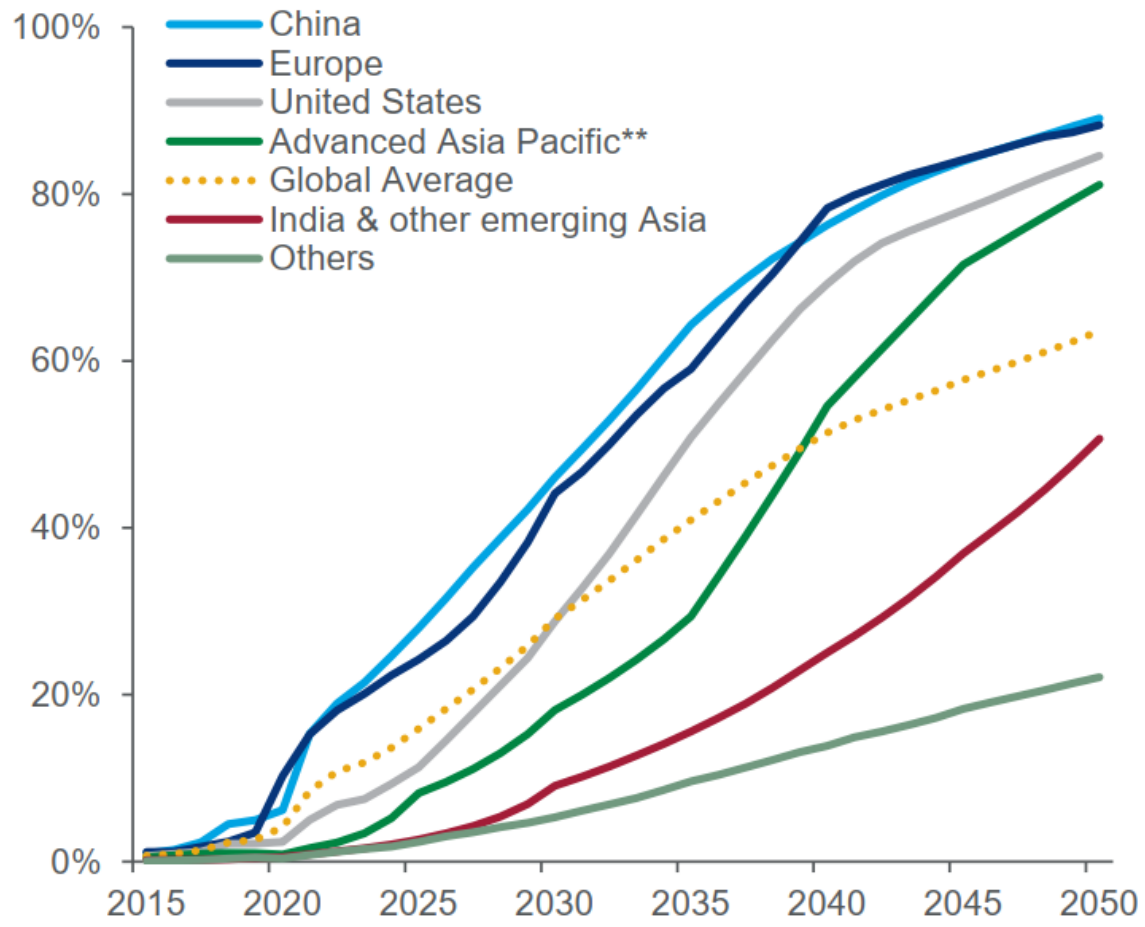


IEA Projected Costs of Generating Electricity 2020

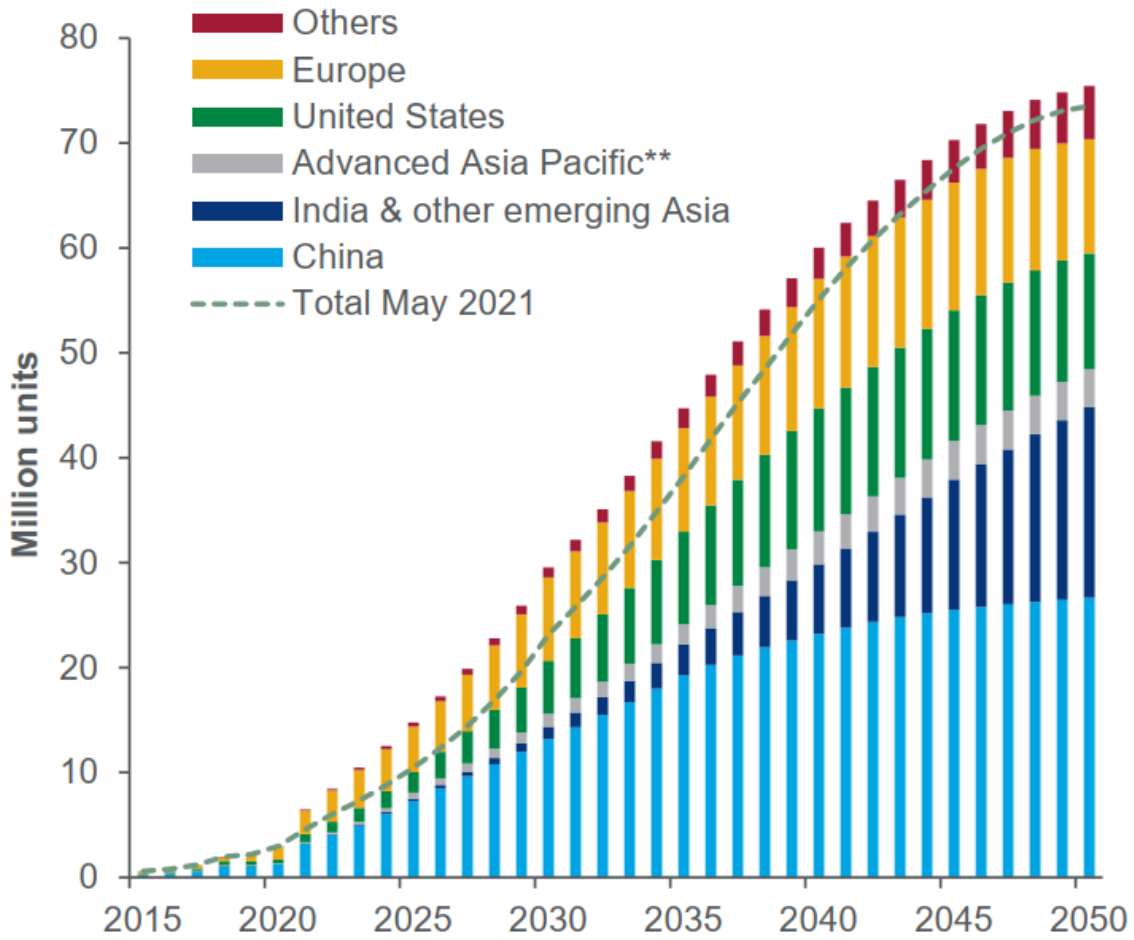
Key Metrics

Global EV Sales

EV* share of light vehicles sales



Global EV* sales



Wood Mackenzie Macro Oils long-term November 2021 outlook to 2050

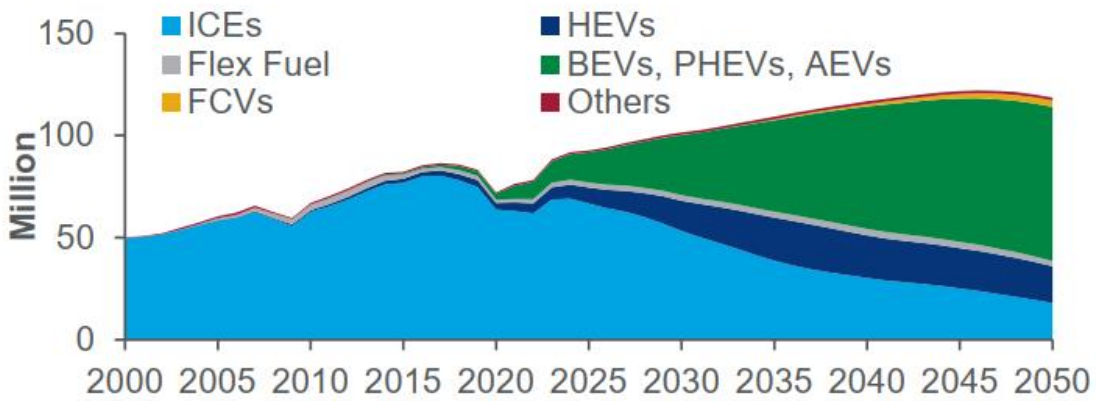
The Key Differences Between Electric Cars

- AEV: All-Electric Vehicle. Run only on electricity, either from a battery (BEV) or a fuel cell (FCEV).
- BEV: Battery Electric Vehicle. A PEV that uses only a battery and electric motor to power the EV.
- EV: A generic term for a vehicle that gets some or all of its power from an electric motor. Sometimes used to mean PEV, BEV, AEV, FCEV, and occasionally HEV.
- FCEV: Fuel Cell Electric Vehicle. An AEV that is powered by a fuel cell rather than a battery. These are not covered in this resource kit, which addresses only PEVs.
- HEV: Hybrid Electric Vehicle. These vehicles do not plug in, but have a large battery on board that is charged by the vehicle's braking. The energy stored by this battery assists the ICE in moving the car, significantly improving the gas mileage.
- PEV: Plug-in Electric Vehicle. An EV that plugs in to an external source to charge an on-board battery that provides the electricity for the electric motor.
- PHEV: Plug-in Hybrid Electric Vehicle. PHEVs use both an ICE and an electric motor with a battery that recharges by plugging into an external source.

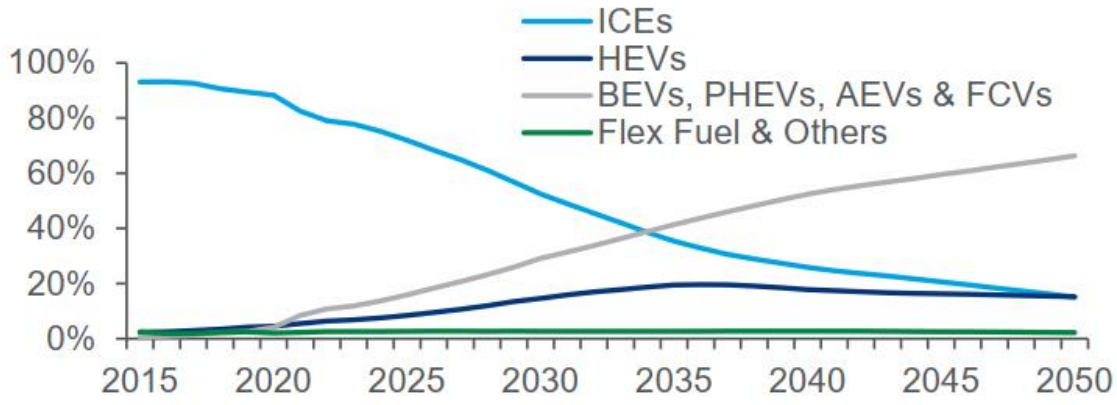
https://openroadautogroup.com/

Light Vehicles Sales and Stock

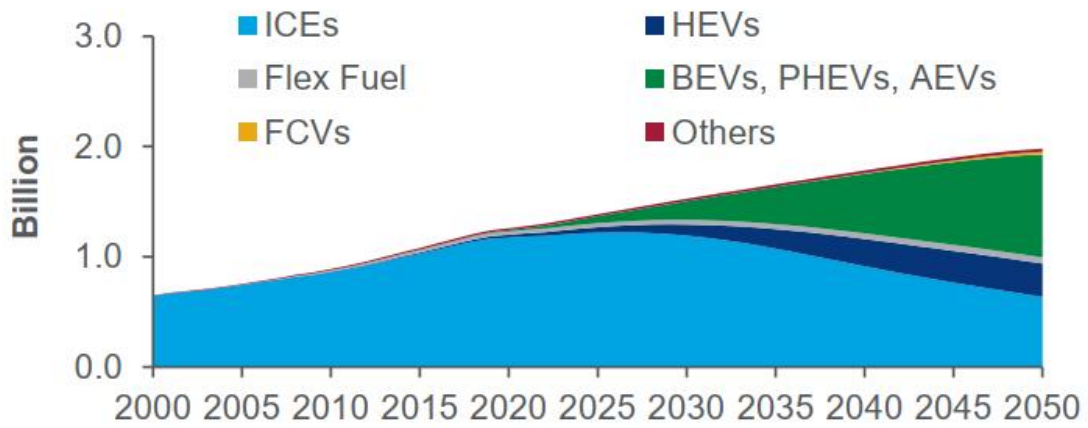
Global light vehicles sales



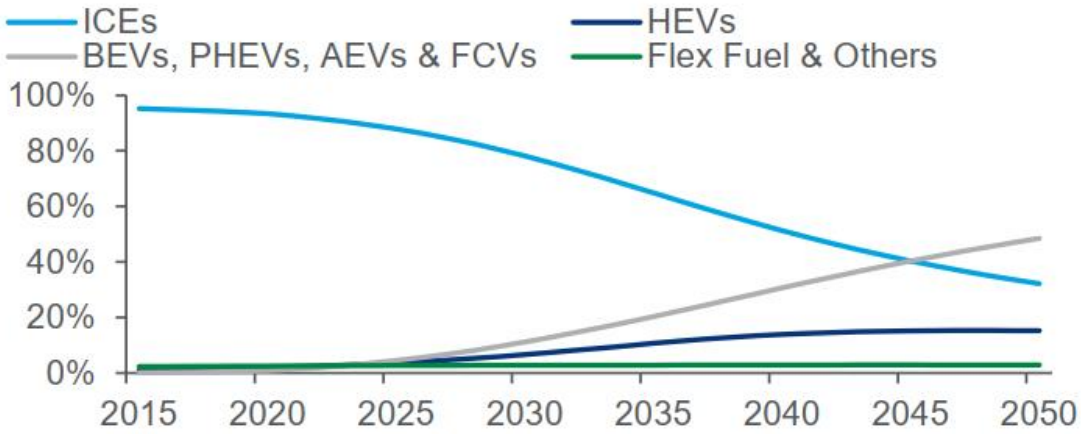
Share% in light vehicles sales



Global light vehicles stock

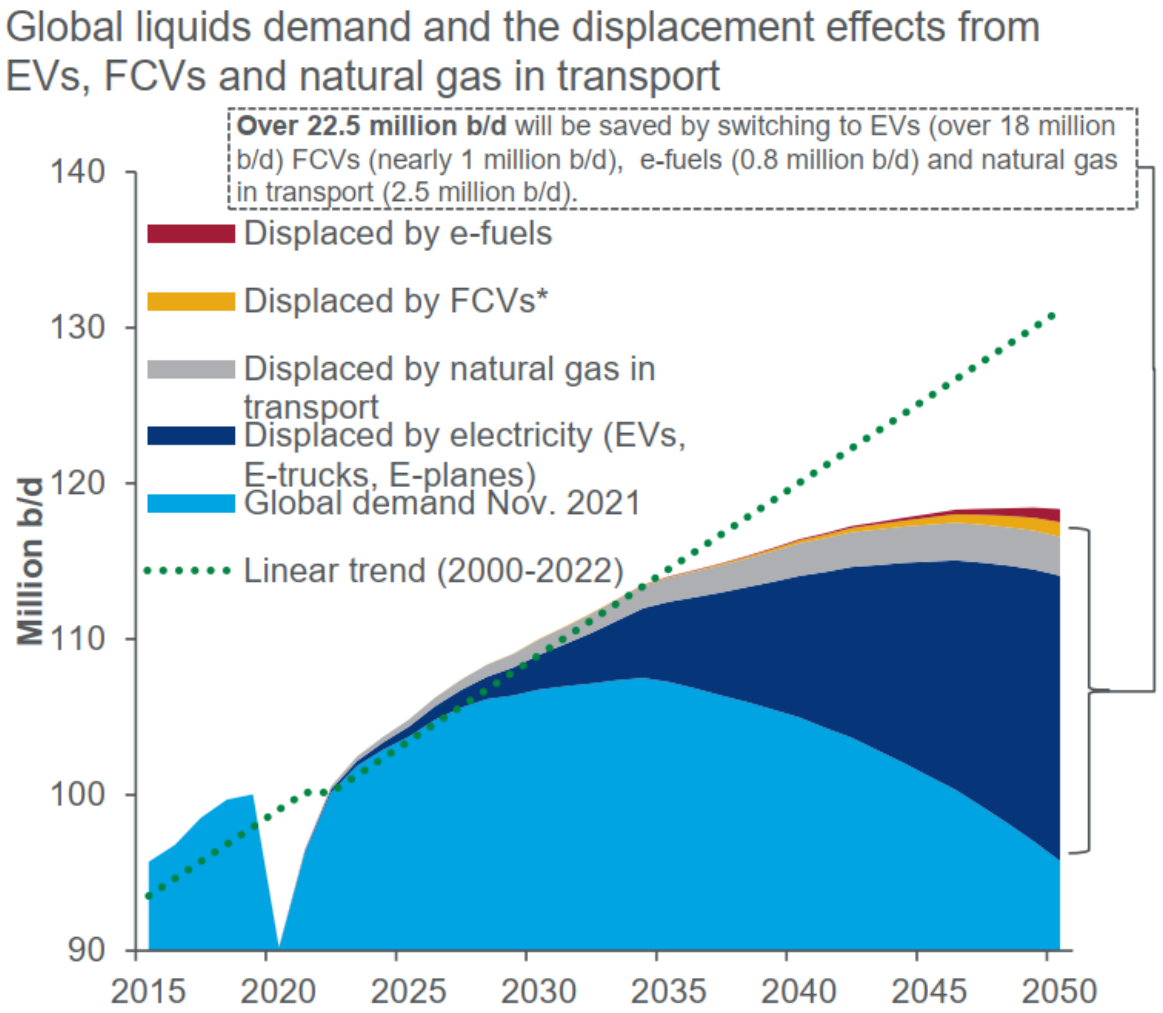


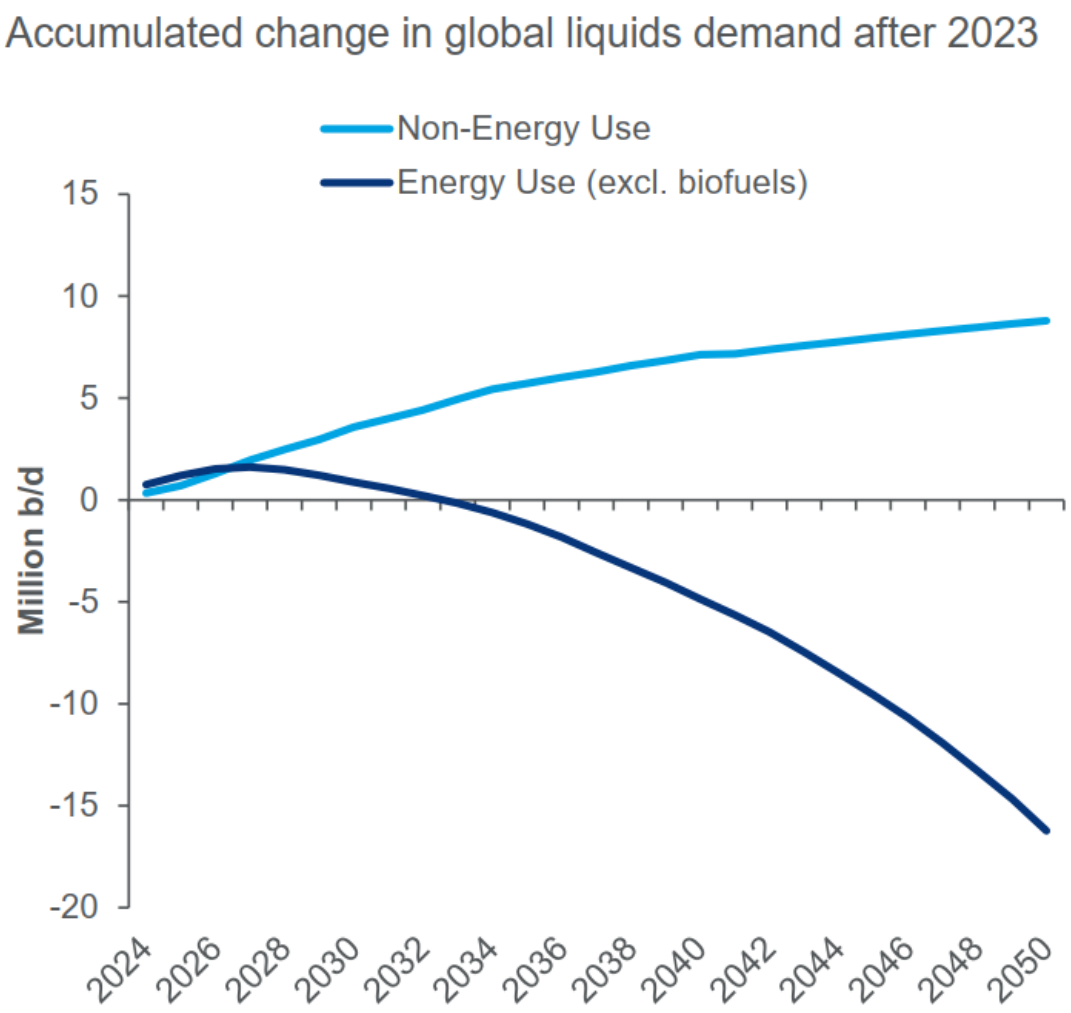
Share% in light vehicles stock



Wood Mackenzie Macro Oils long-term November 2021 outlook to 2050

The Displacement Effects from EVs, FCVs and Natural Gas in Transport

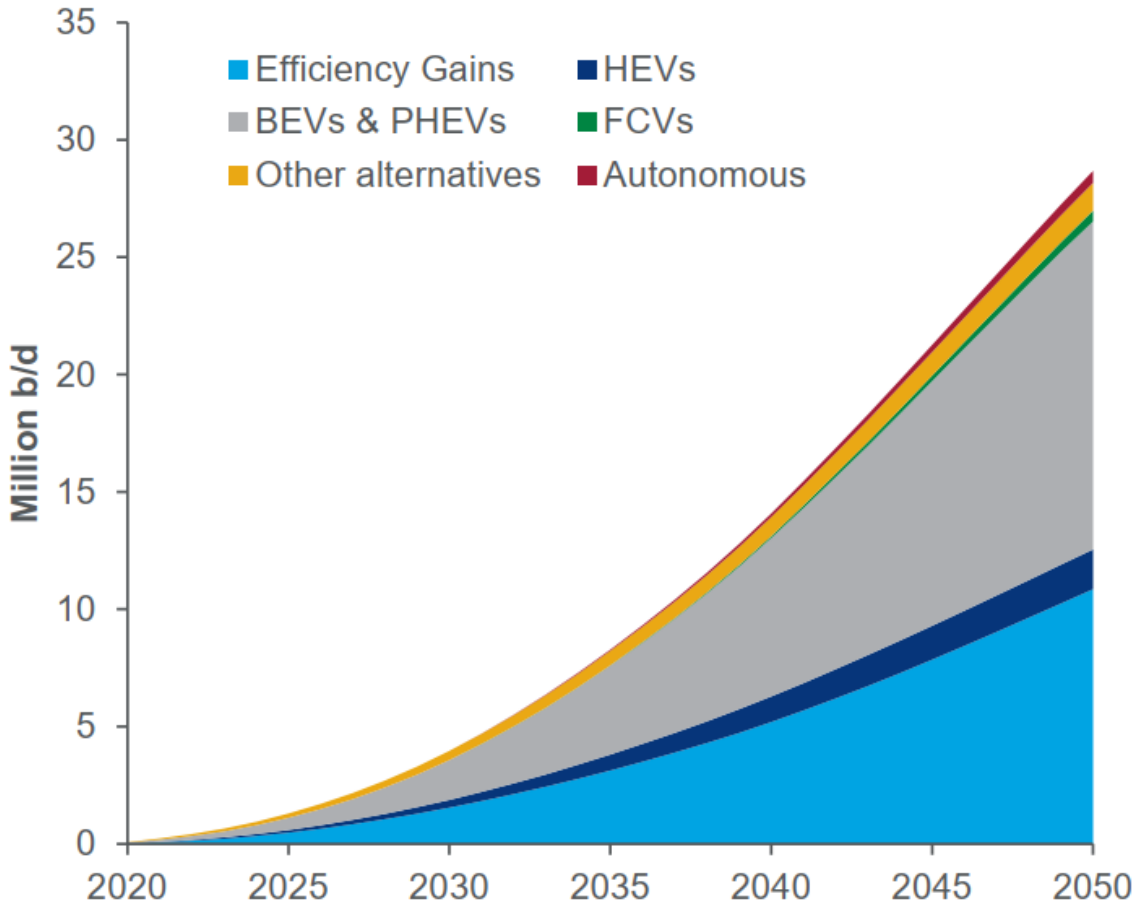




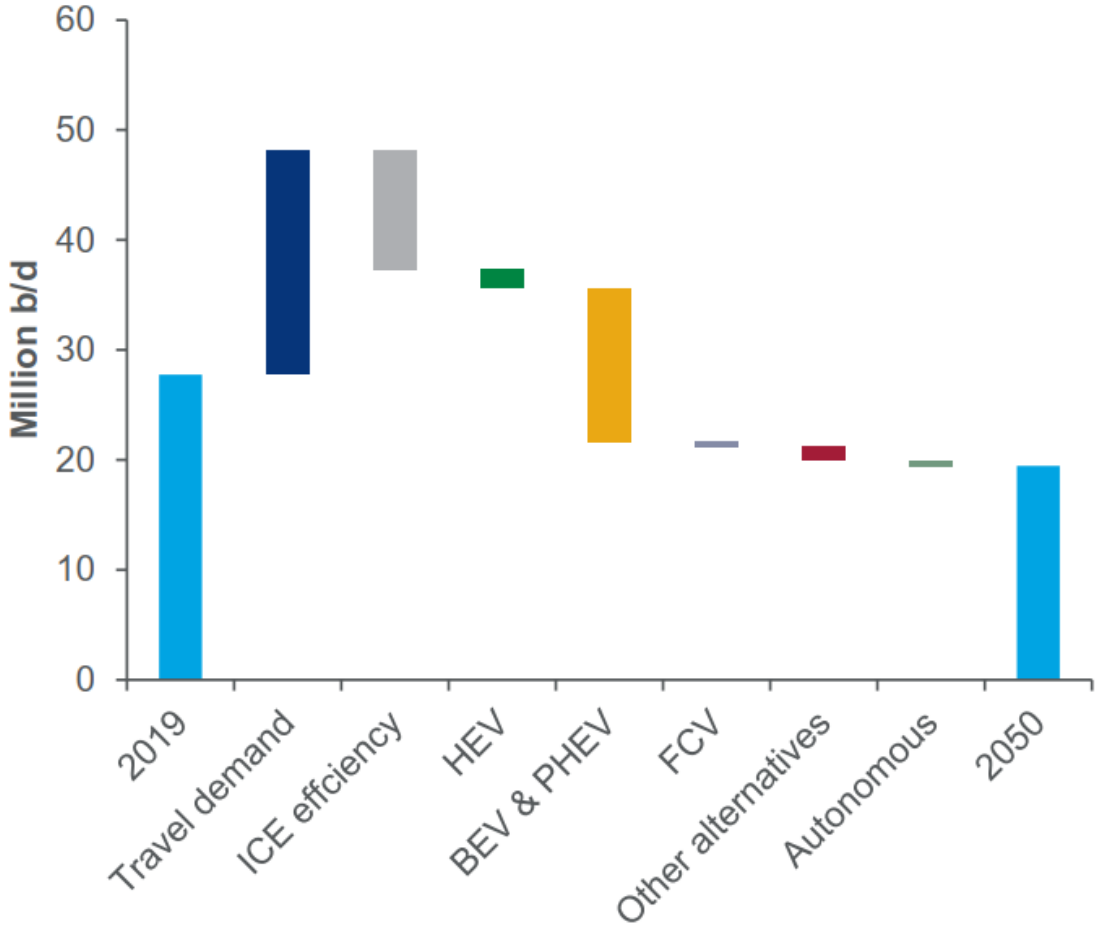
Wood Mackenzie Macro Oils long-term November 2021 outlook to 2050

Changes in Liquids Demand from Light Vehicles

Oil saved in the global light vehicles sector



Global liquids demand for light vehicles

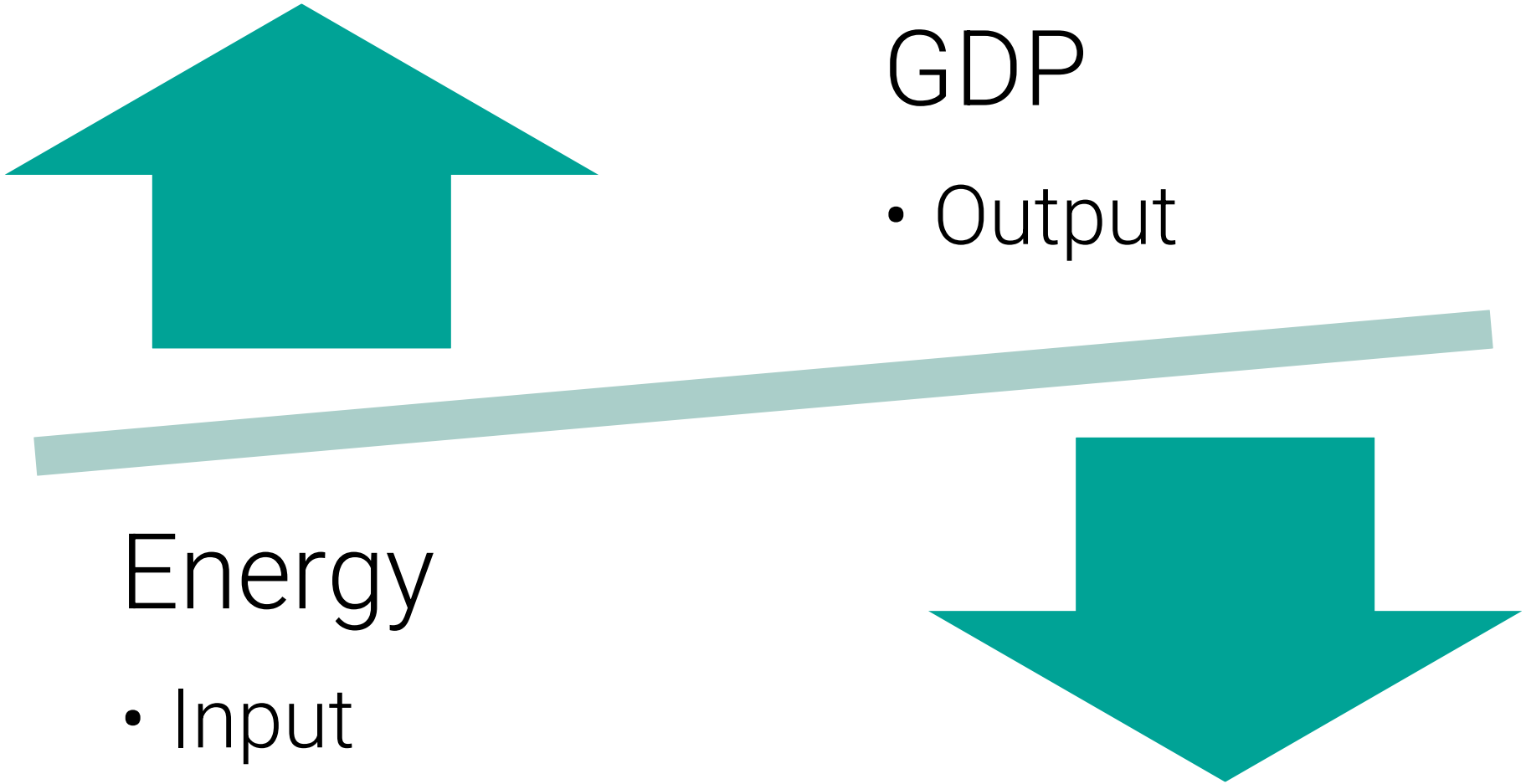


Wood Mackenzie Macro Oils long-term November 2021 outlook to 2050

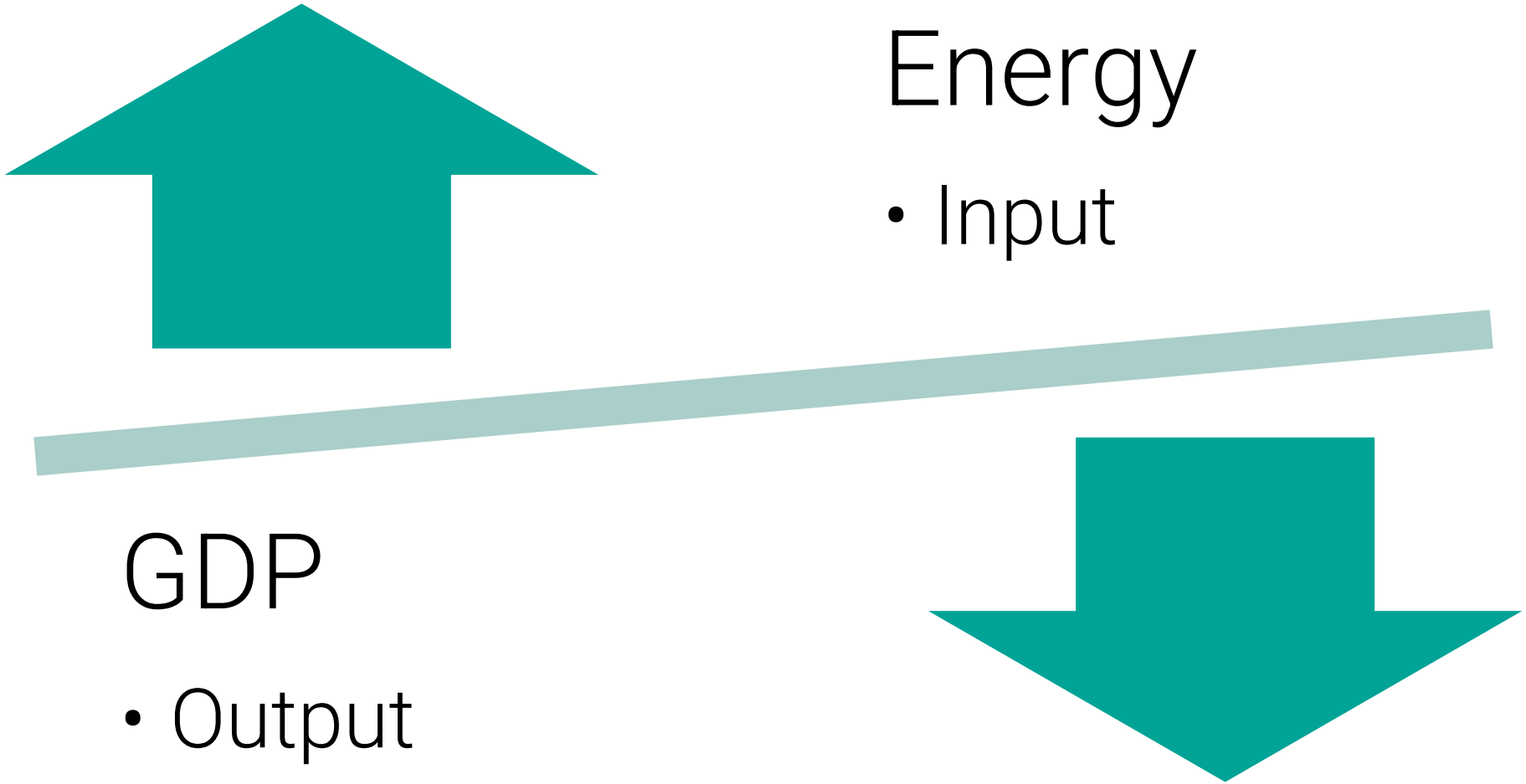
Efficiency

To provide an overview of scale and importance of energy efficiency in energy transition

Productivity Increase



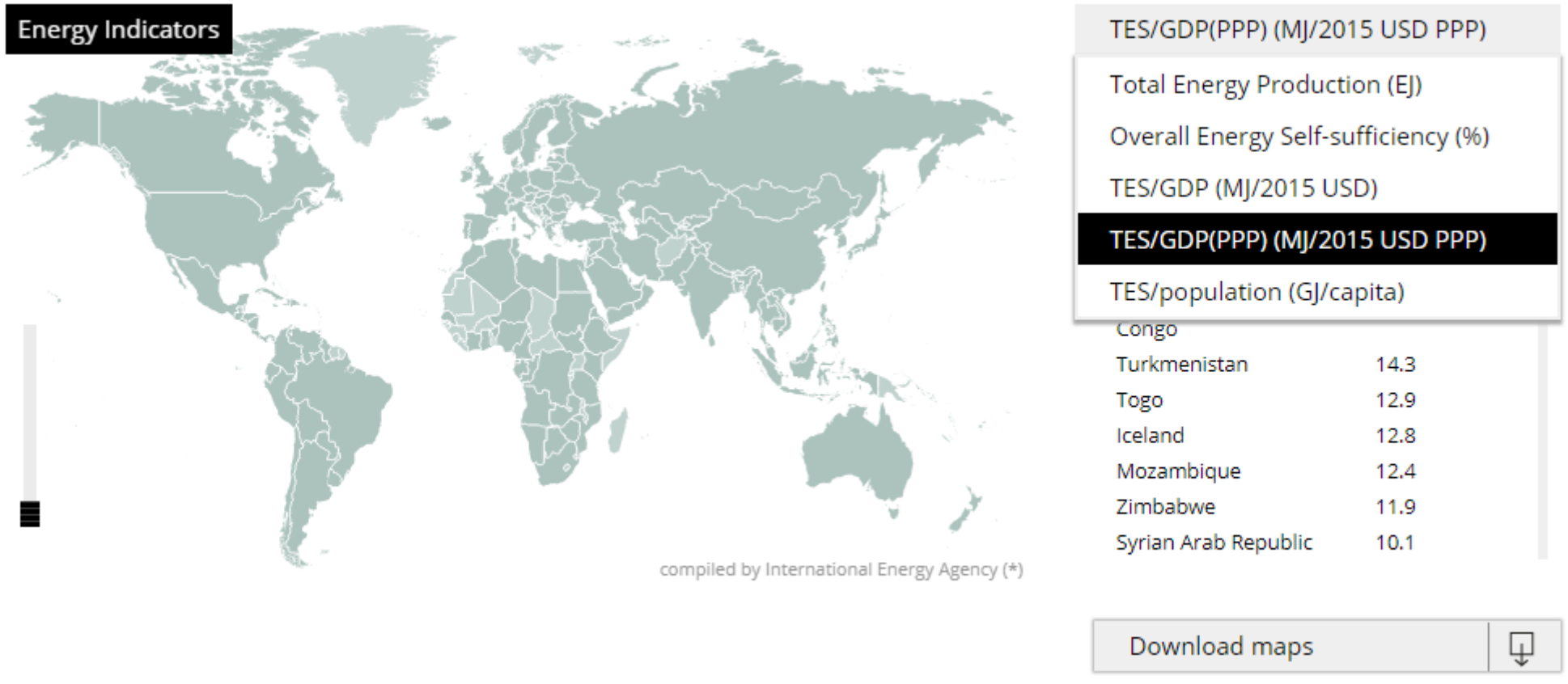
Energy Intensity



Energy Efficiency and Energy Intensity

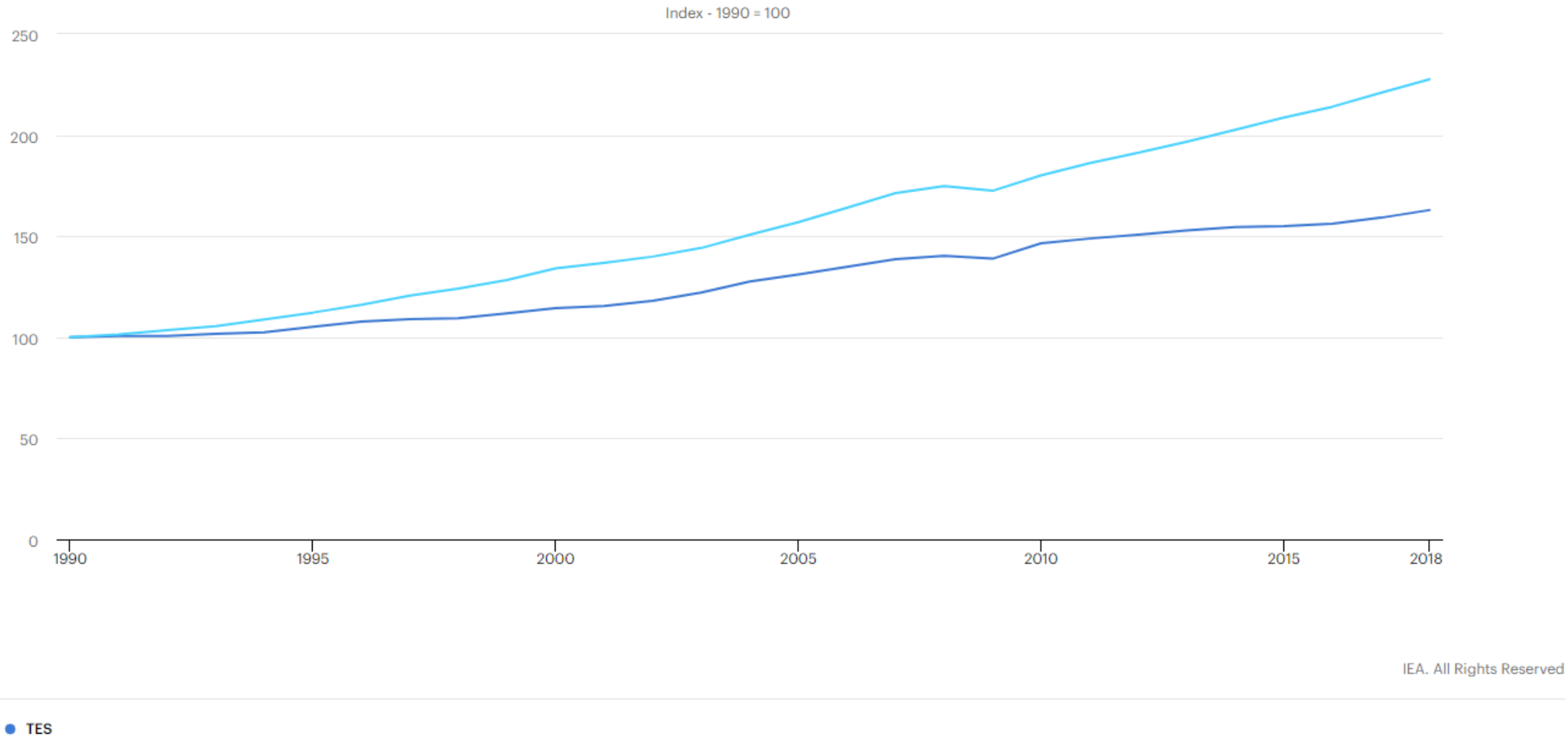
- Energy Intensity is measured by the quantity of energy required per unit output or activity, so that using less energy to produce a product reduces the intensity.
- Energy Efficiency improves when a given level of service is provided with reduced amounts of energy inputs or services are enhanced for a given amount of energy input.
- Declines in energy intensity are a proxy for efficiency improvements, provided:
  - a) energy intensity is represented at an appropriate level of disaggregation to provide meaningful interpretation, and
  - b) other explanatory and behavioral factors are isolated and accounted for.

IEA Energy Atlas



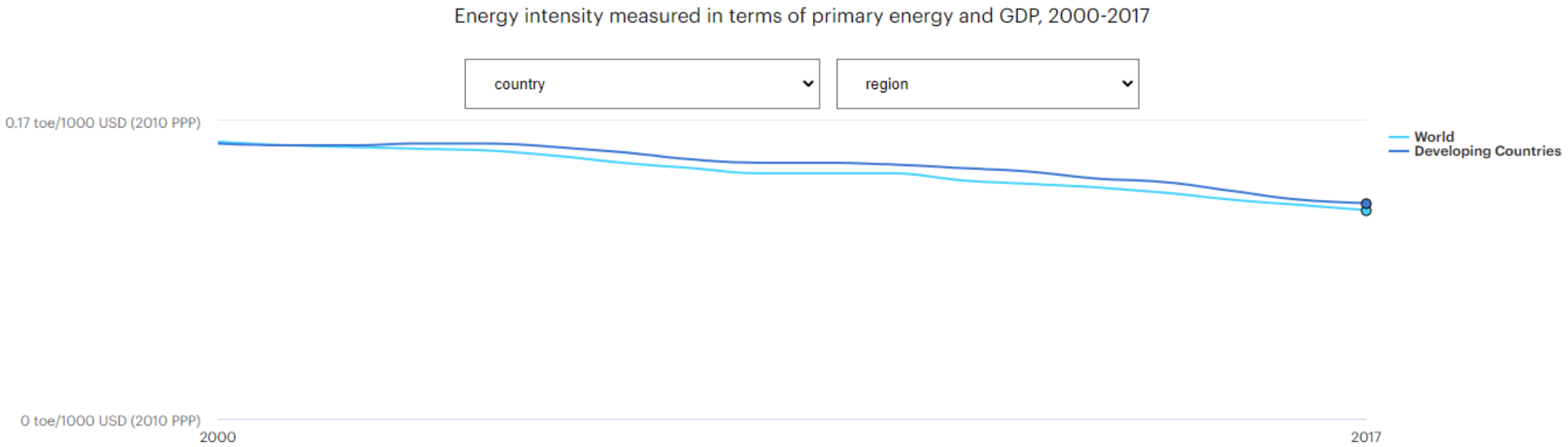
IEA Energy Atlas

World GDP and TES Trends, 1990-2018



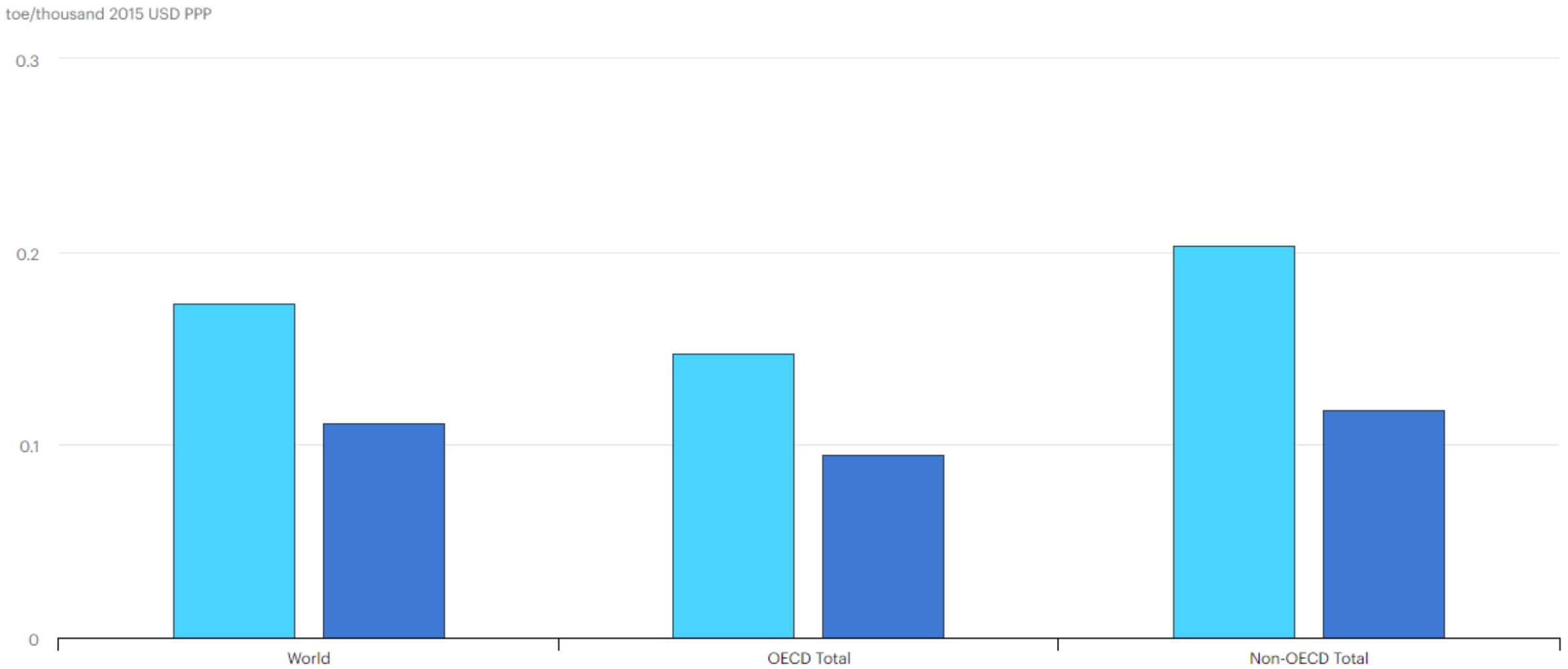
IEA Energy Efficiency Indicators

Energy Intensity



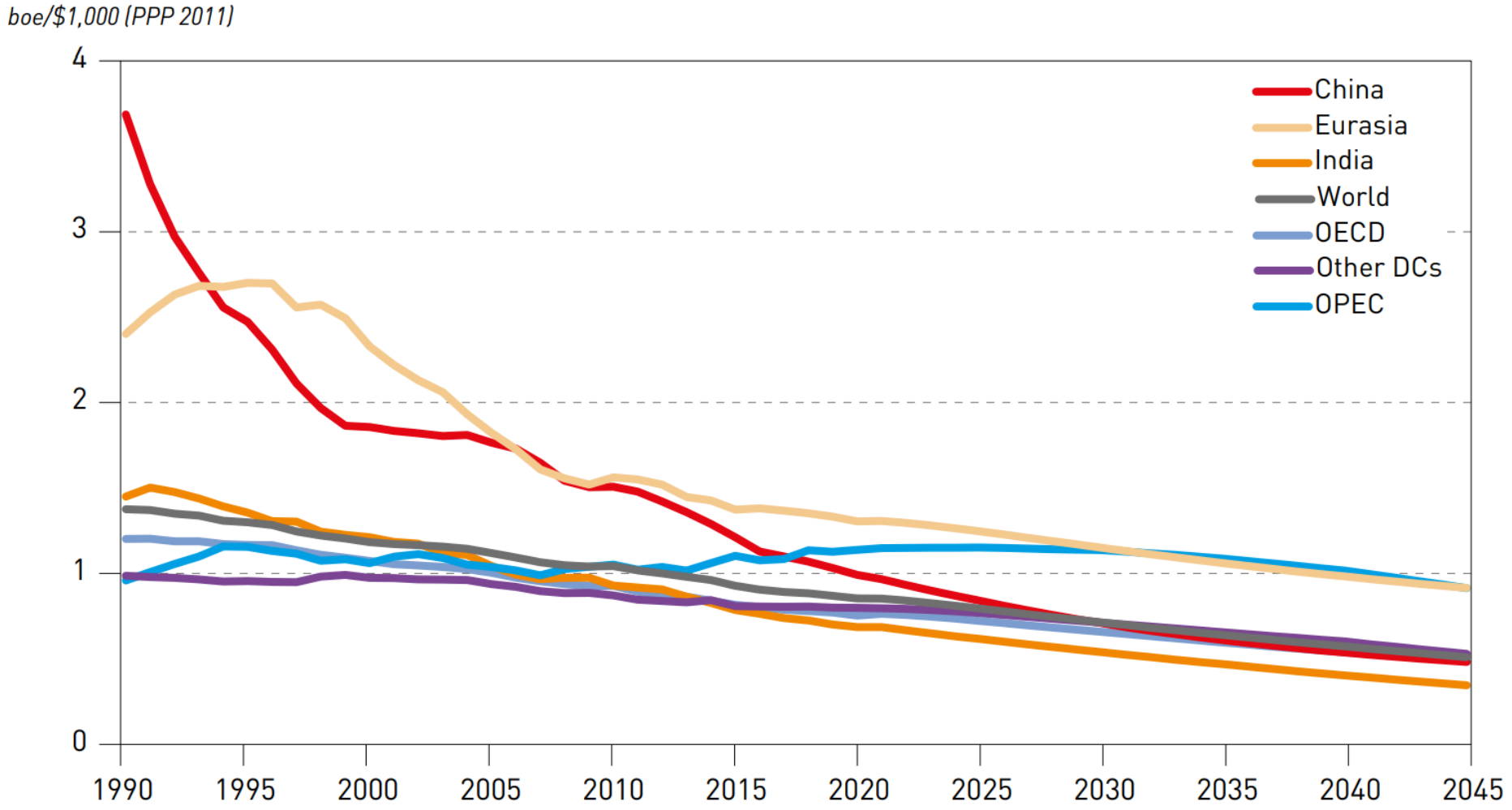
IEA Energy Efficiency Indicators

Global Energy Intensity, 1990 Compared to 2018



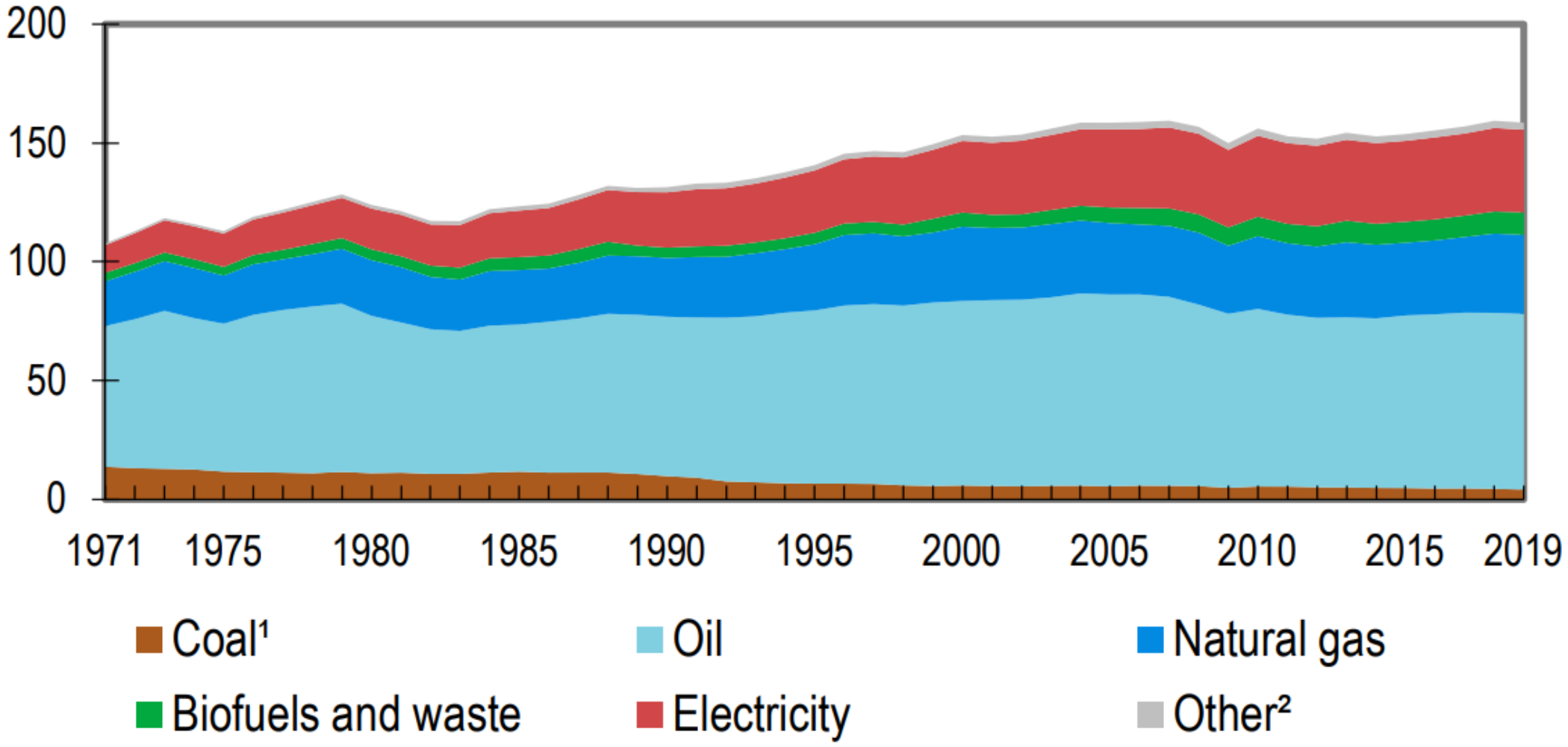
IEA Energy Efficiency Indicators

Energy Intensity



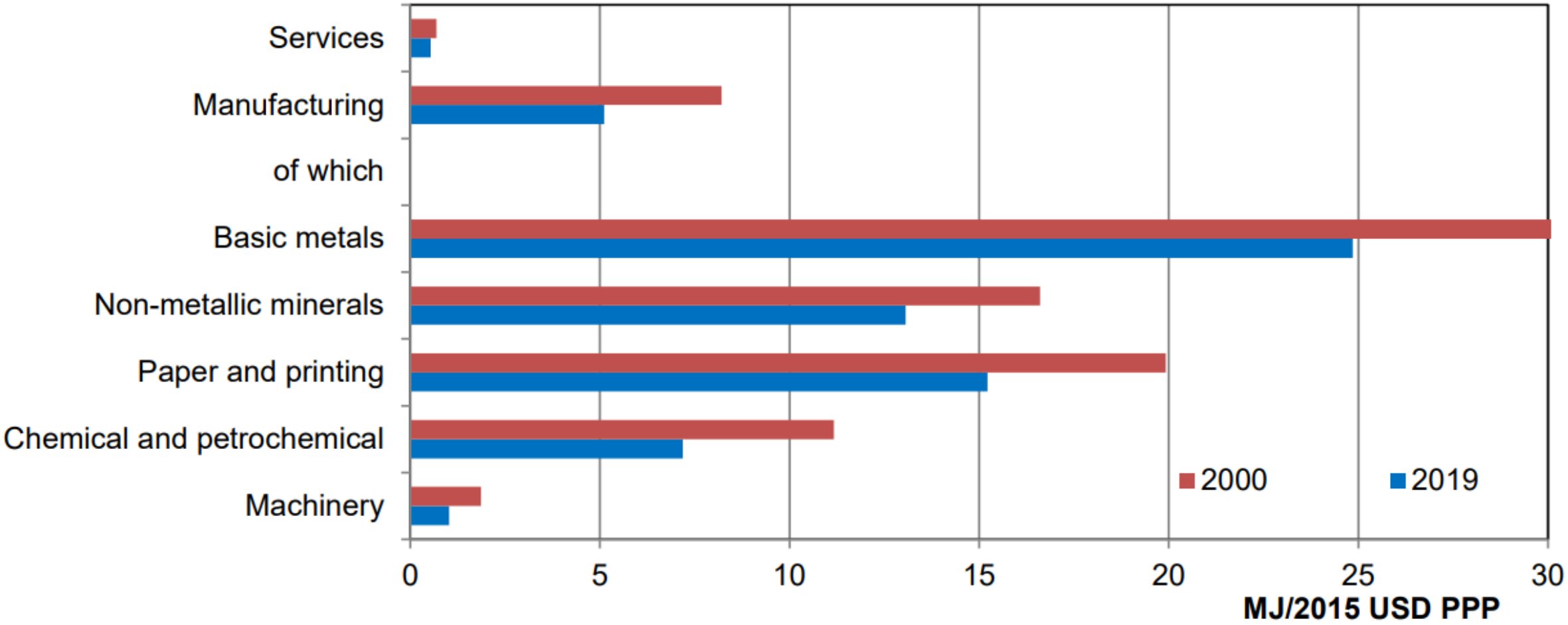
OPEC World Oil Outlook 2021

OECD Total Final Consumption by Source (EJ)



IEA key world energy statistics 2021

Services and Manufacturing in Selected IEA Countries: Energy Per Value Added



IEA key world energy statistics 2021

Peak Oil

To present two definitions of peak oil: the old and the new one

Peak Oil

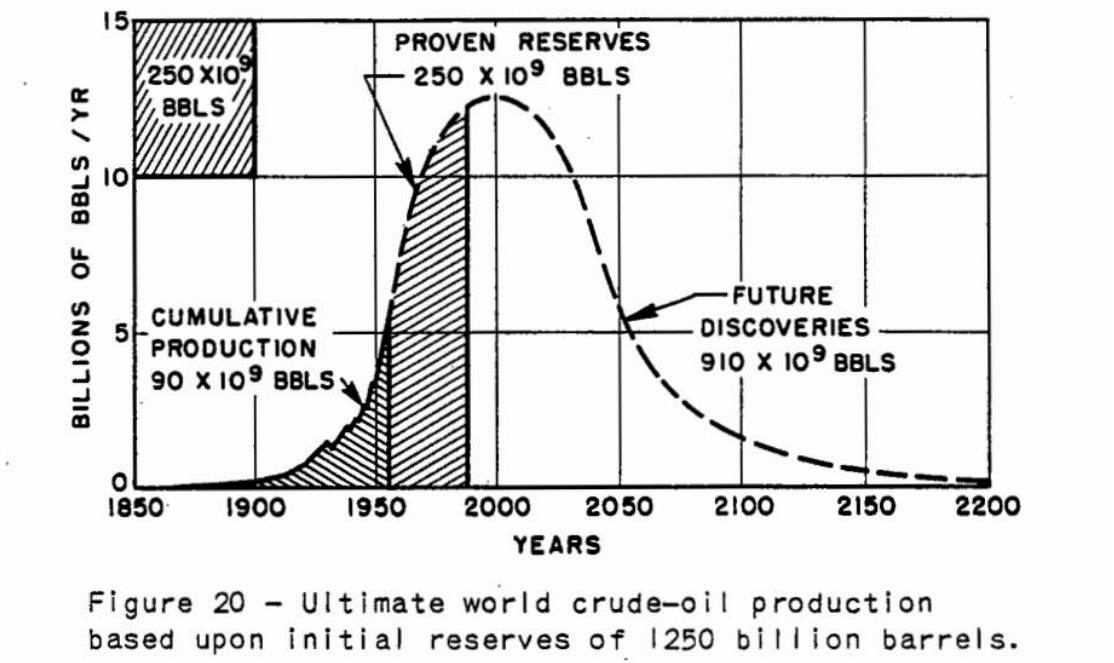


Figure 20 – Ultimate world crude-oil production based upon initial reserves of 1250 billion barrels.

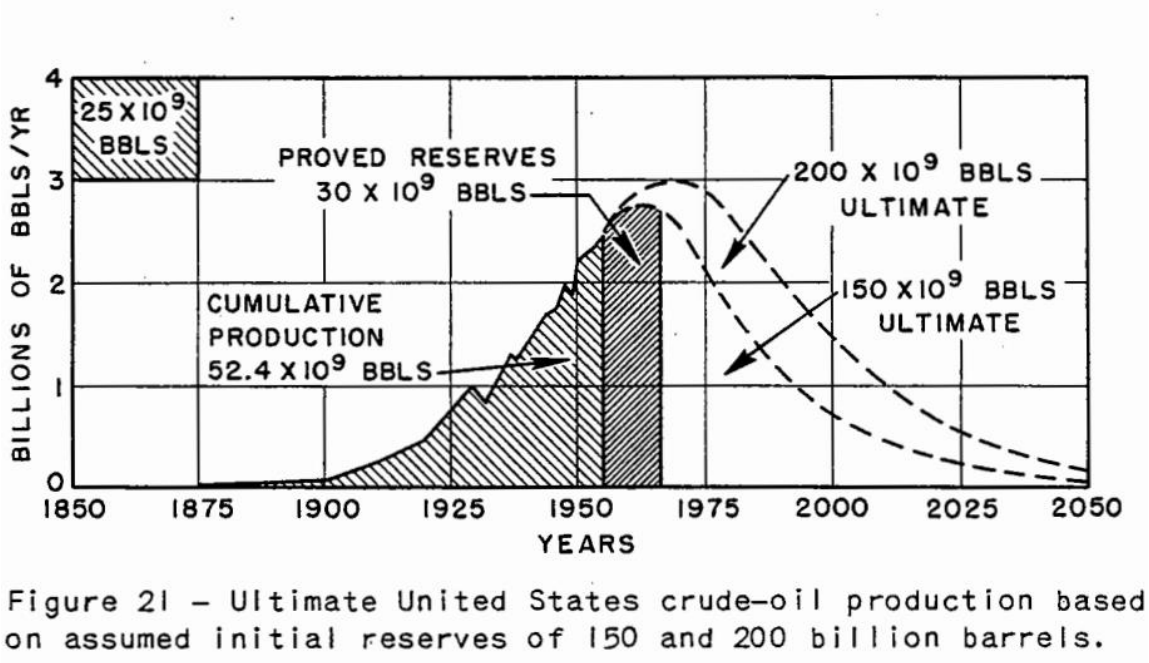
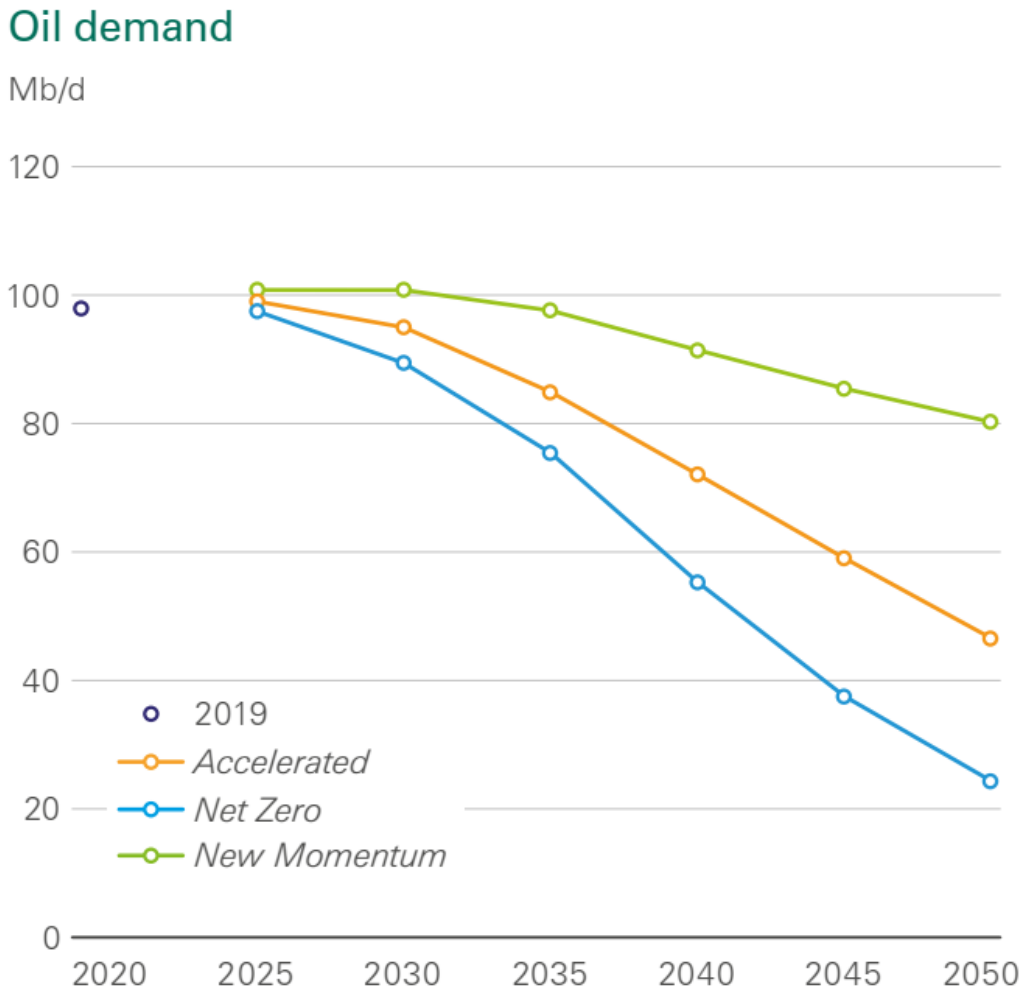
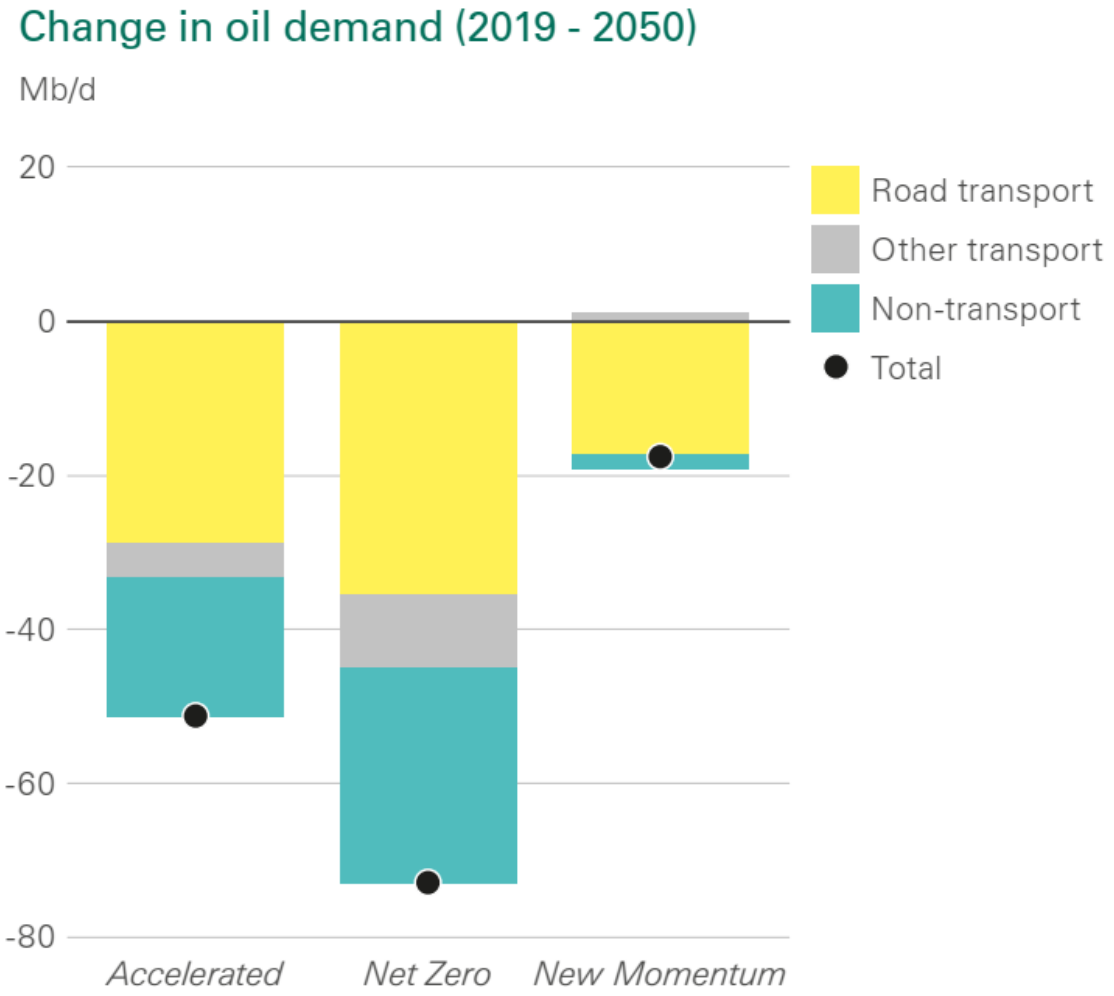


Figure 21 – Ultimate United States crude-oil production based on assumed initial reserves of 150 and 200 billion barrels.

Nuclear Energy and the fossil fuels by M. King Hubbert, 1956

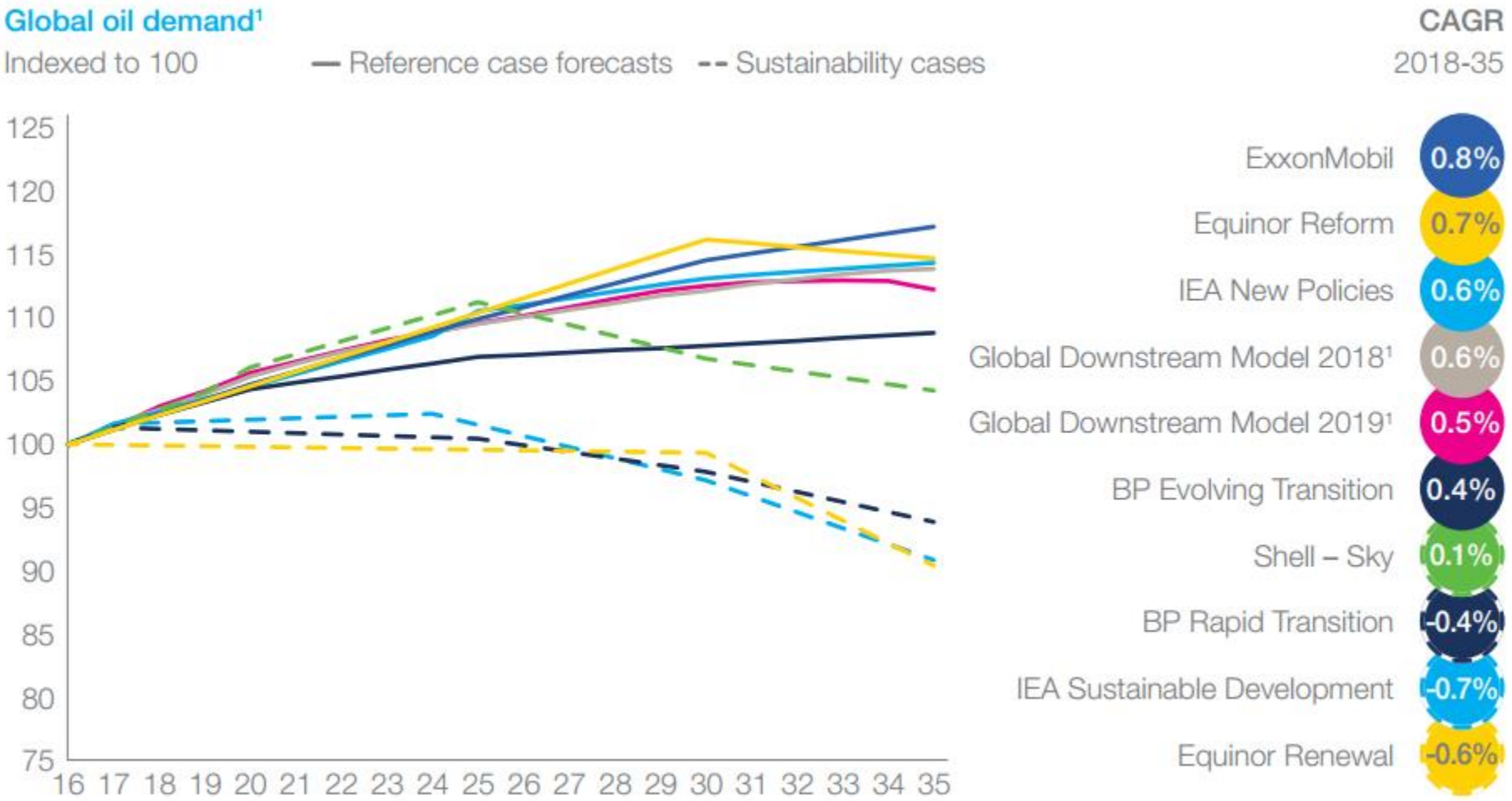
Oil Demand in Three Scenarios





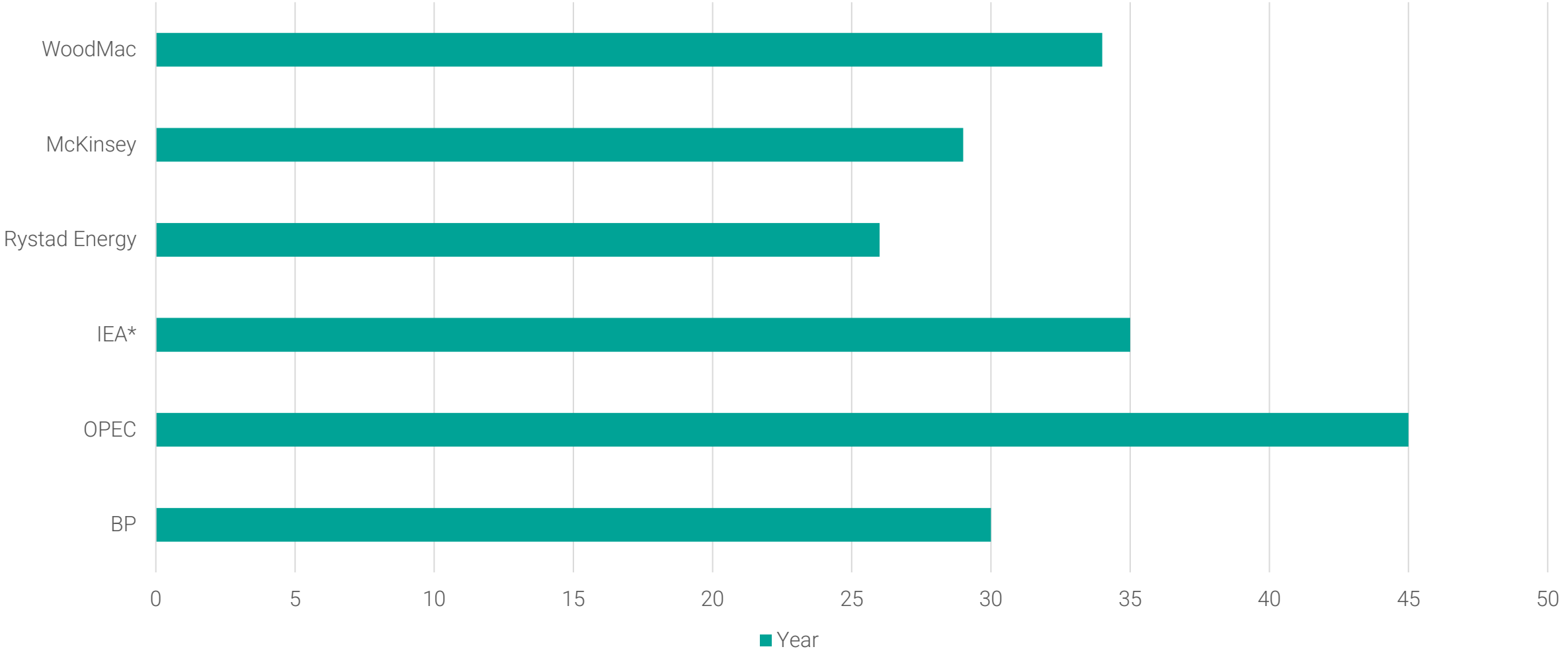
BP World Energy Outlook 2022

Peak Oil Scenarios



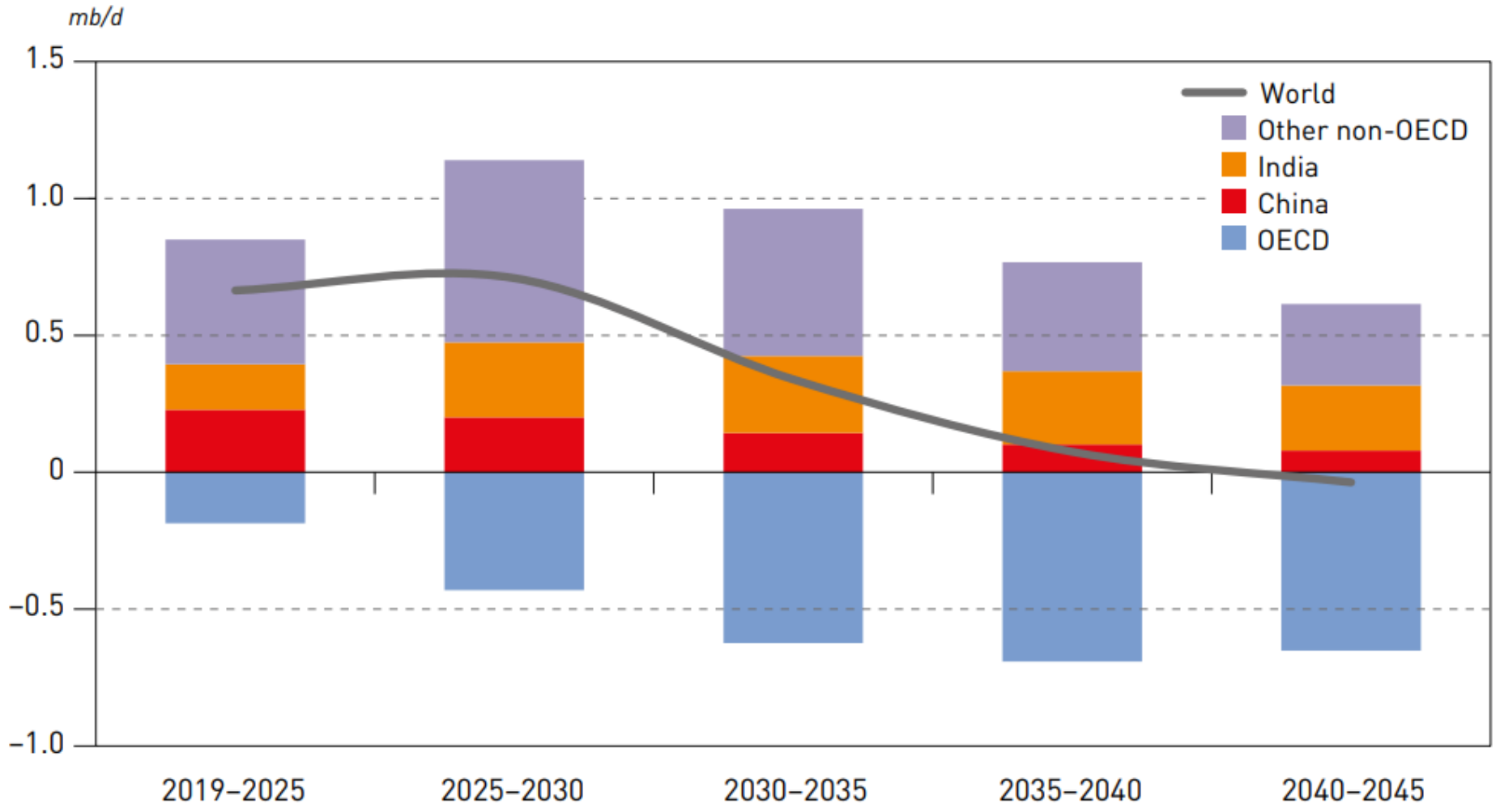
McKinsey

Peak Oil Demand Year (Base Case)



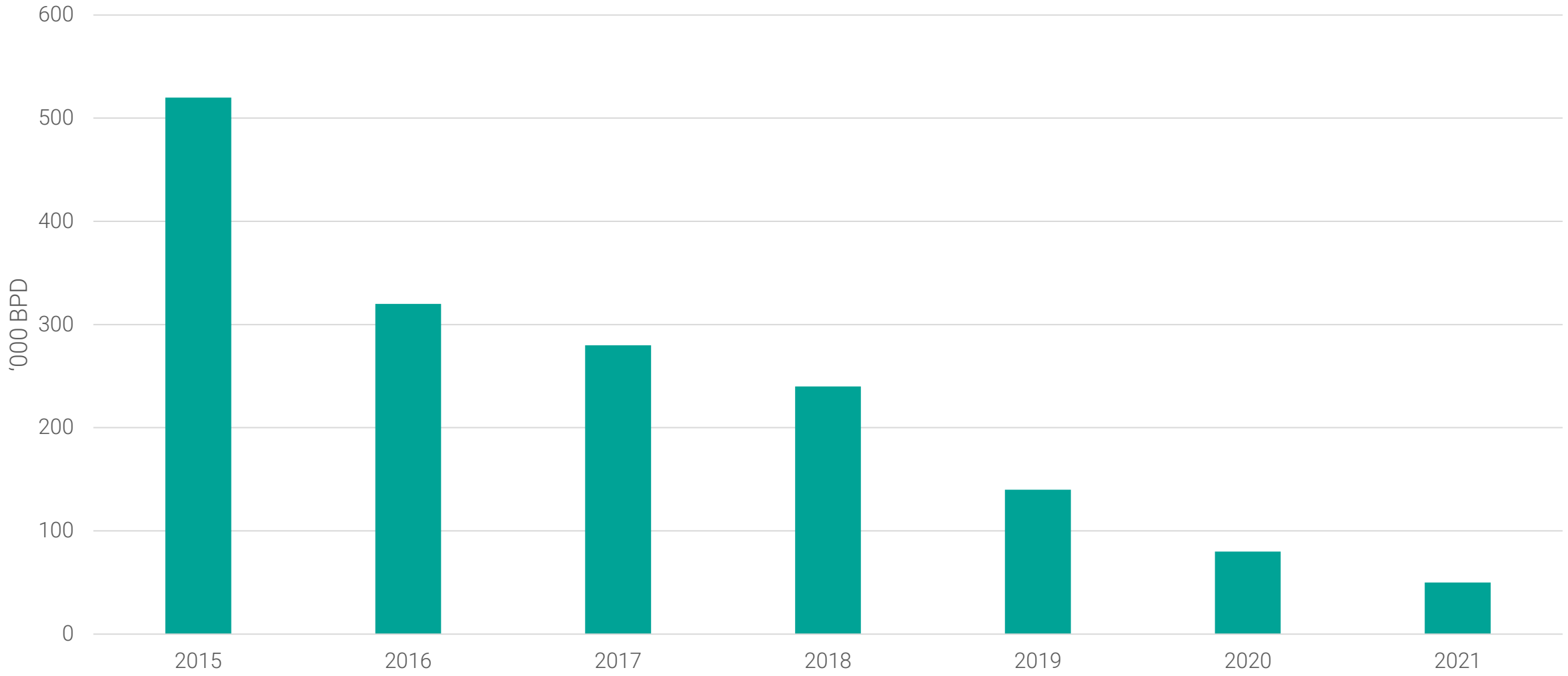
Companies' outlooks

Average Annual Oil Demand Growth



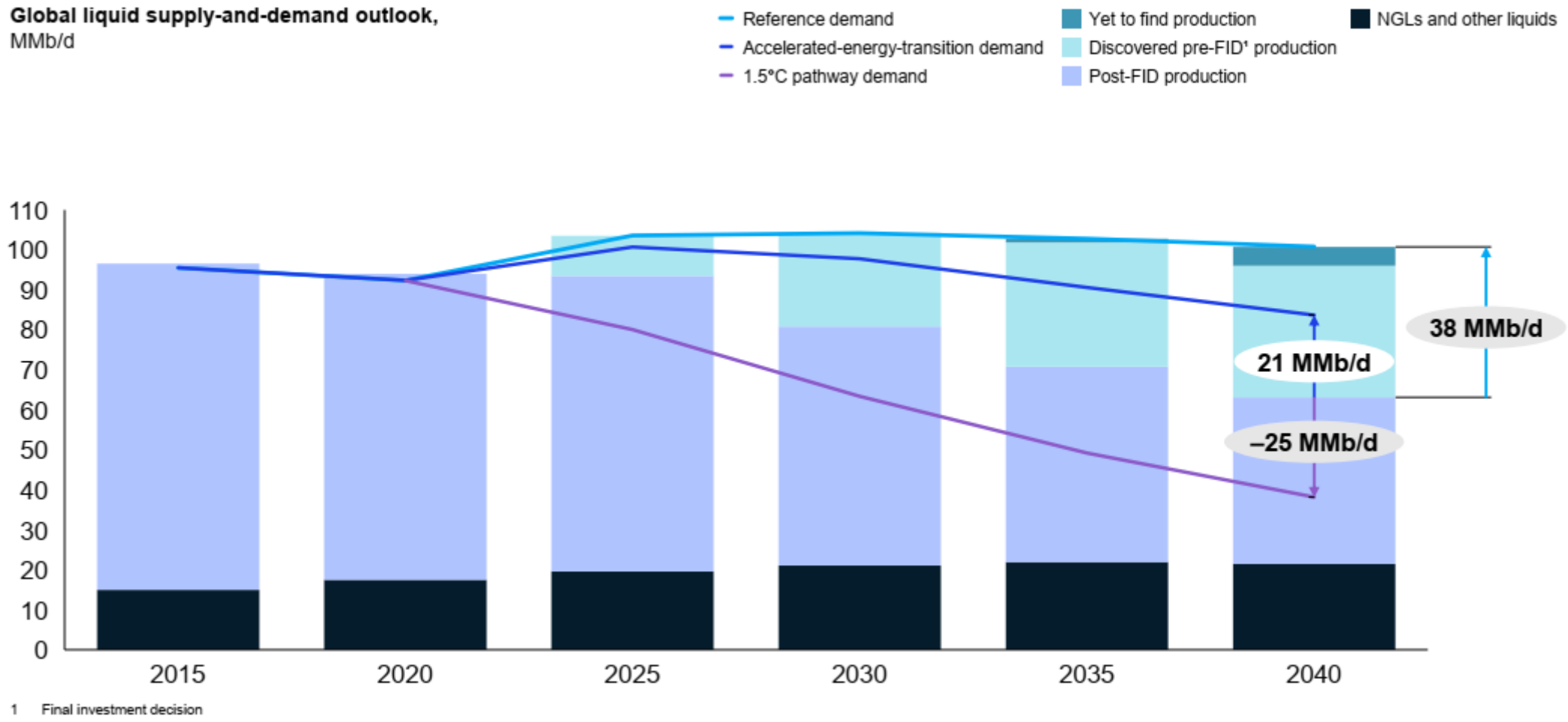
OPEC World Oil Outlook 2021

Average Annual Oil Demand Growth in OPEC WOO for Period 2035–2040



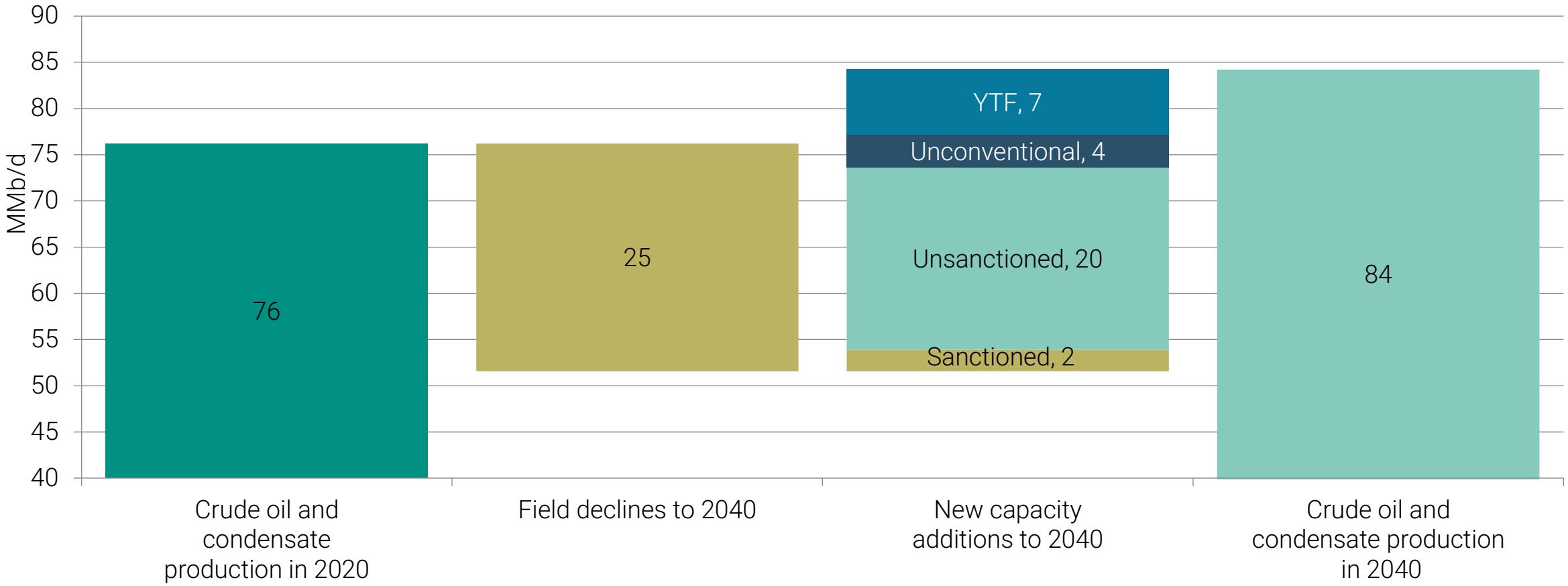
OPEC World Oil Outlook 2021

Required Investment



McKinsey global oil outlook to 2040

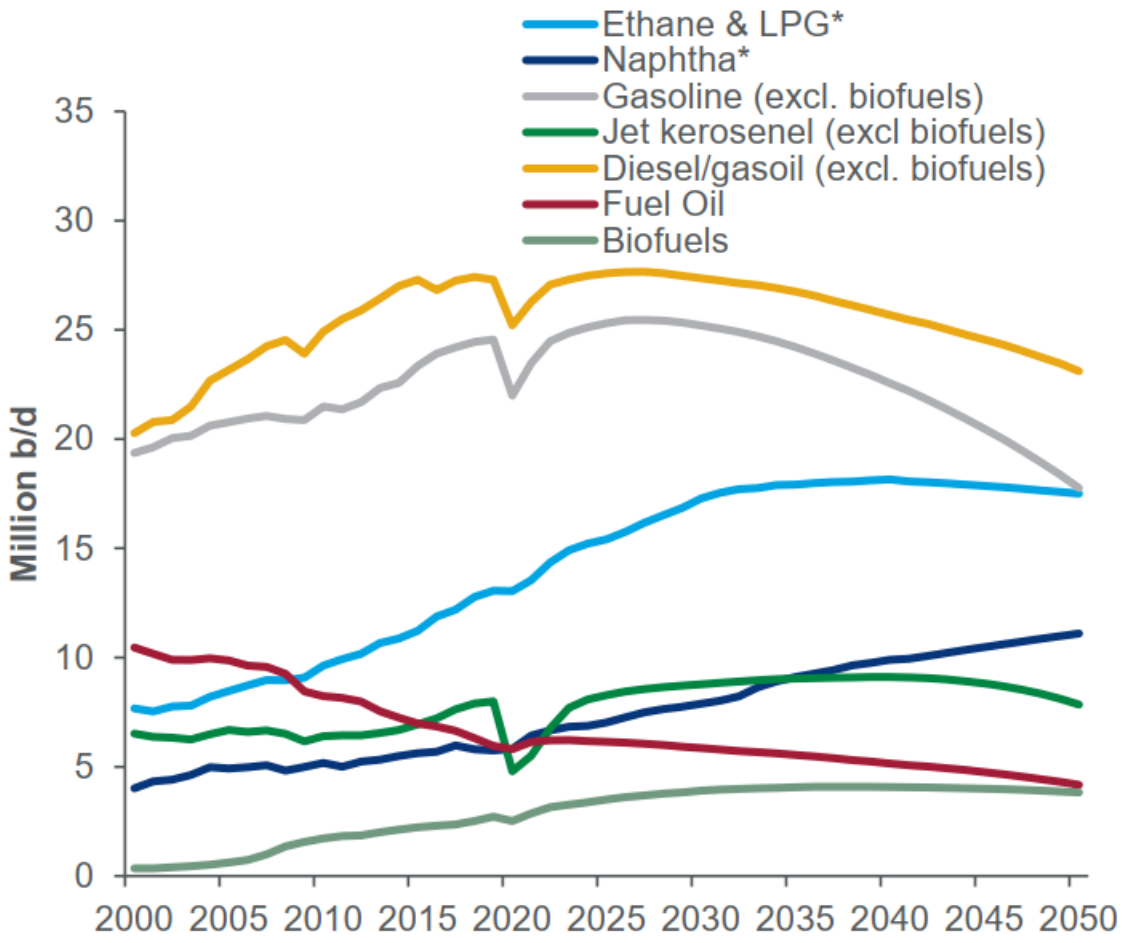
Global Crude Oil and Condensate Outlook Balance in 2040



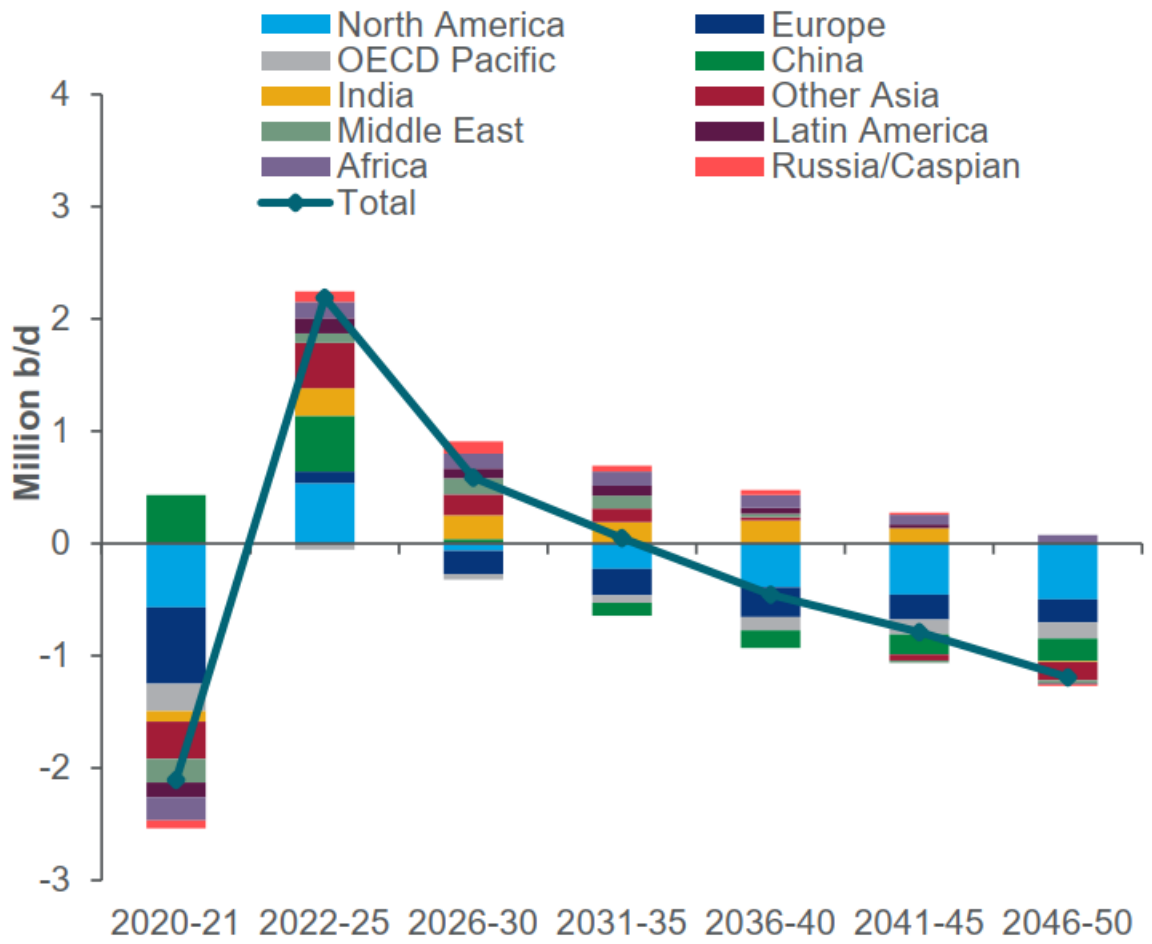
IHS Markit

Demand Peak By Product And Region

Global products demand



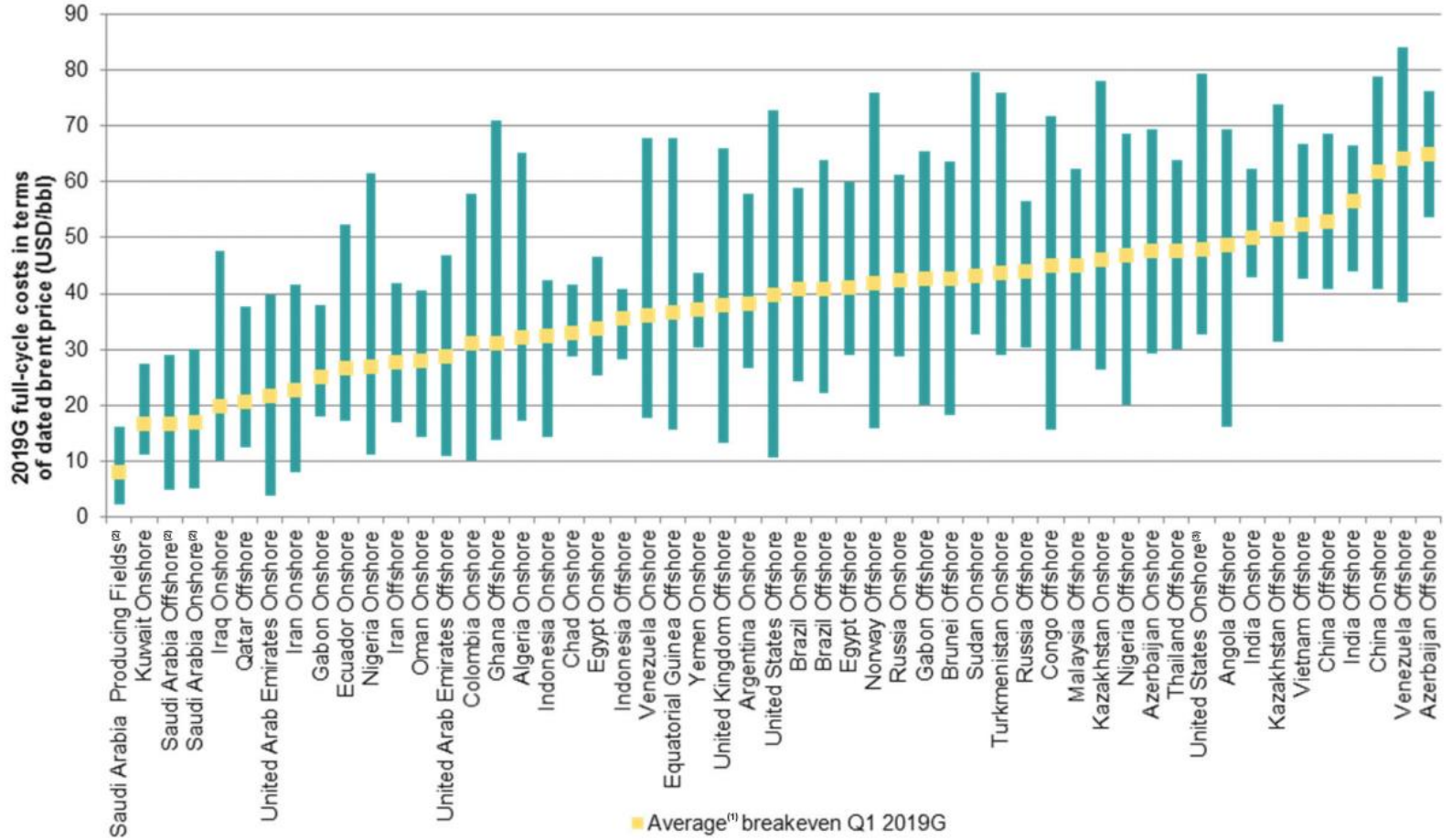
Average YoY change in total liquids demand by region



Wood Mackenzie Macro Oils long-term 2021 outlook to 2050 November 2021

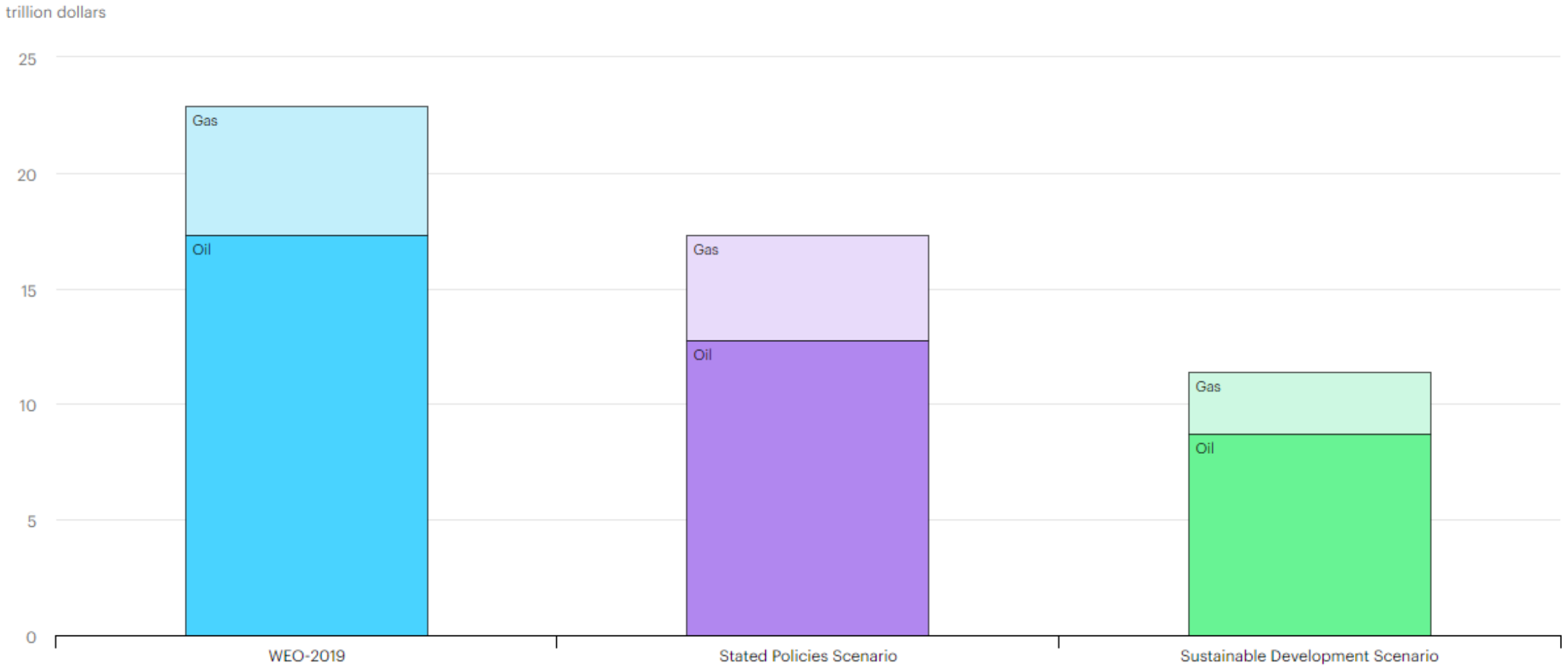
Breakeven Cost for New Oil Projects

Exhibit 6: Post-tax breakeven costs for new oil projects at a 10% rate of return by country through 2030G



Saudi Aramco prospectus

Estimated Present Value of Future Oil and Natural Gas Production to 2040



IEA World Energy Outlook 2020

Unburnable Carbon

مجله ی 181 - آن که گفت آری، آن که گفت نه اخبار بین الملل (اقتصاد)

تاریخ انتشار: هنبه ۲۹ خرداد ۱۳۹۵

مرگ مدل قدیمی کسب و کار شرکتهای بینالمللی نفتی

پایان غول‌ها

آینده شرکت‌های نفتی بزرگ بین‌المللی(IOCها)، شامل بی‌پی، شورون، اگزون موبیل، شل و توتال، در هاله‌ای از تردید قرار دارد. مدل کسب و کار که طی قرن بیستم موجب بقای آنها شد، اکنون دیگر برای دستیابی به اهداف مناسب به نظر نمی‌رسد. در نتیجه این شرکت‌ها با دو انتخاب مواجه هستند: مدیریت نزولی آرام از طریق کوچک‌سازی؛ یا ریسک سقوطی سریع با تلاش برای تداوم استفاده از مدل قبلی. اغلب تحلیلگران در زمینه مشکلات IOCها، بر سقوط اخیر قیمت نفت و تعهدهای رو به فزونی در سطح جهان برای مقابله با تغییرات اقلیمی متمرکز شده‌اند. این در حالی است که طالع آنها پیش از این دو مورد تاریک به نظر می‌رسید. آخرین تکرار مدل کسب و کار IOCها طی دهه ۱۹۹۰ ظهور کرد و بر سه ستون استوار بود: افزایش ارزش دارایی سهامداران، حداکثرسازی ذخایر قابل ثبت و حداقل کردن هزینه.

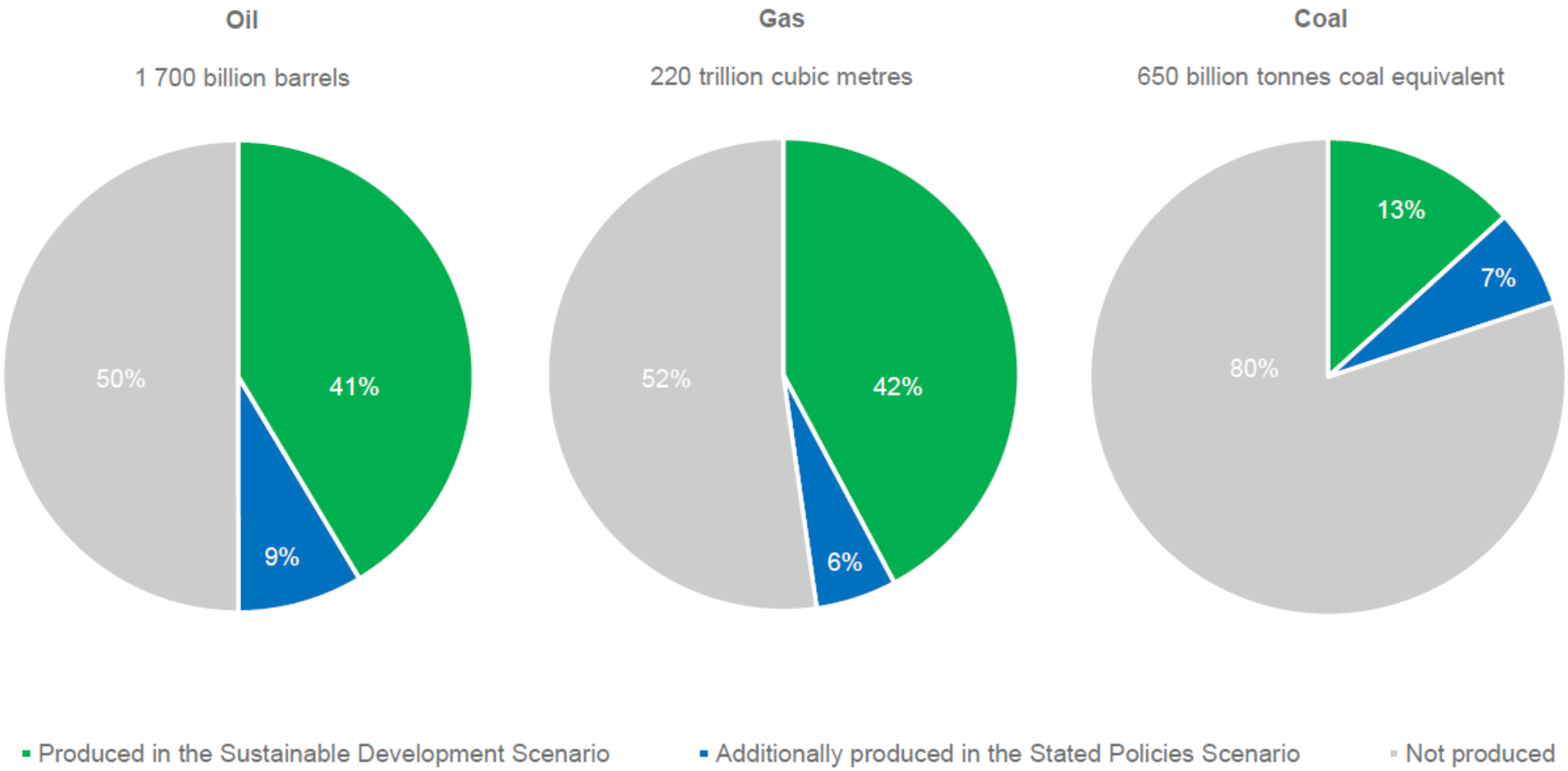
پل استیونس پژوهشگر چتم هاوس /ترجمه: رامین فروزنده

آینده شرکت‌های نفتی بزرگ بین‌المللی (IOCها)، شامل بی‌پی، شورون، اگزون موبیل، شل و توتال، در هاله‌ای از تردید قرار دارد. مدل کسب و کار که طی قرن بیستم موجب بقای آنها شد، اکنون دیگر برای دستیابی به اهداف مناسب به نظر نمی‌رسد. در نتیجه این شرکت‌ها با دو انتخاب مواجه هستند: مدیریت نزولی آرام از طریق کوچک‌سازی؛ یا ریسک سقوطی سریع با تلاش برای تداوم استفاده از مدل قبلی.

اغلب تحلیلگران در زمینه مشکلات IOCها، بر سقوط اخیر قیمت نفت و تعهدهای رو به فزونی در سطح جهان برای مقابله با تغییرات اقلیمی متمرکز شده‌اند. این در حالی است که طالع آنها پیش از این دو مورد تاریک به نظر می‌رسید. آخرین تکرار مدل کسب و کار IOCها طی دهه 1990 ظهور کرد و بر سه ستون استوار بود: افزایش ارزش دارایی سهامداران، حداکثرسازی ذخایر قابل ثبت و حداقل کردن هزینه. با تغییر شرایط عملیاتی، این مدل با چالش‌های جدی روبه‌رو شد. شرکت‌های یادشده طی 25 سال پایانی قرن گذشته توانستند نجات یابند، اما نشانه‌هایی وجود دارد مبنی بر اینکه ضعف مدل کسب و کار آنها در حال نمایان شدن است.

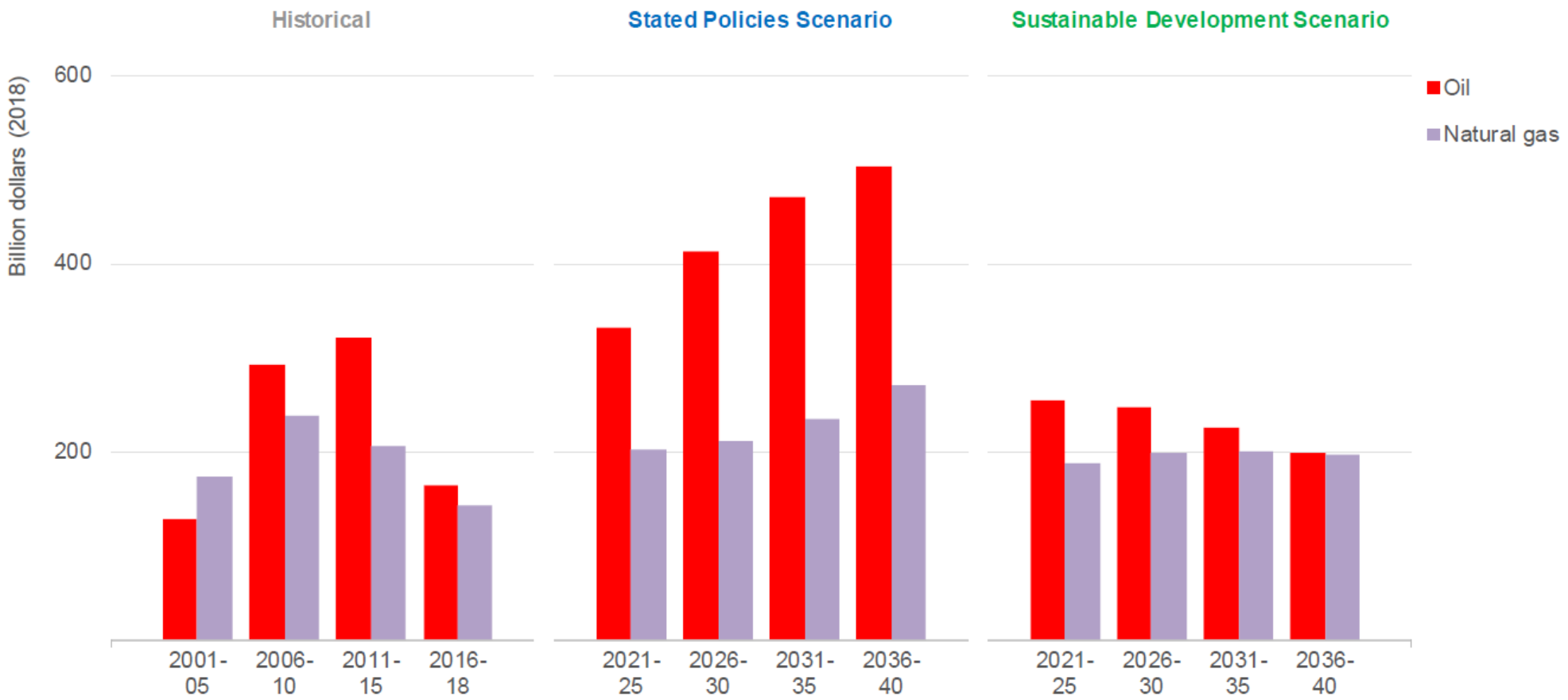
Tejarat-e Farda

Stranded Assets



IEA The Oil and Gas Industry in Energy Transitions 2020

Average Annual Net Income for Private Companies



Notes: Net income is revenue minus finding and development costs, operating costs, and government taxes. Estimates are for all private oil and gas companies (Majors and Independents), and are derived from country-level data using a field-by-field database that classifies asset ownership by type of company along with assumptions about the ownership of future discoveries. Assumes no changes in fiscal terms.

IEA The Oil and Gas Industry in Energy Transitions 2020

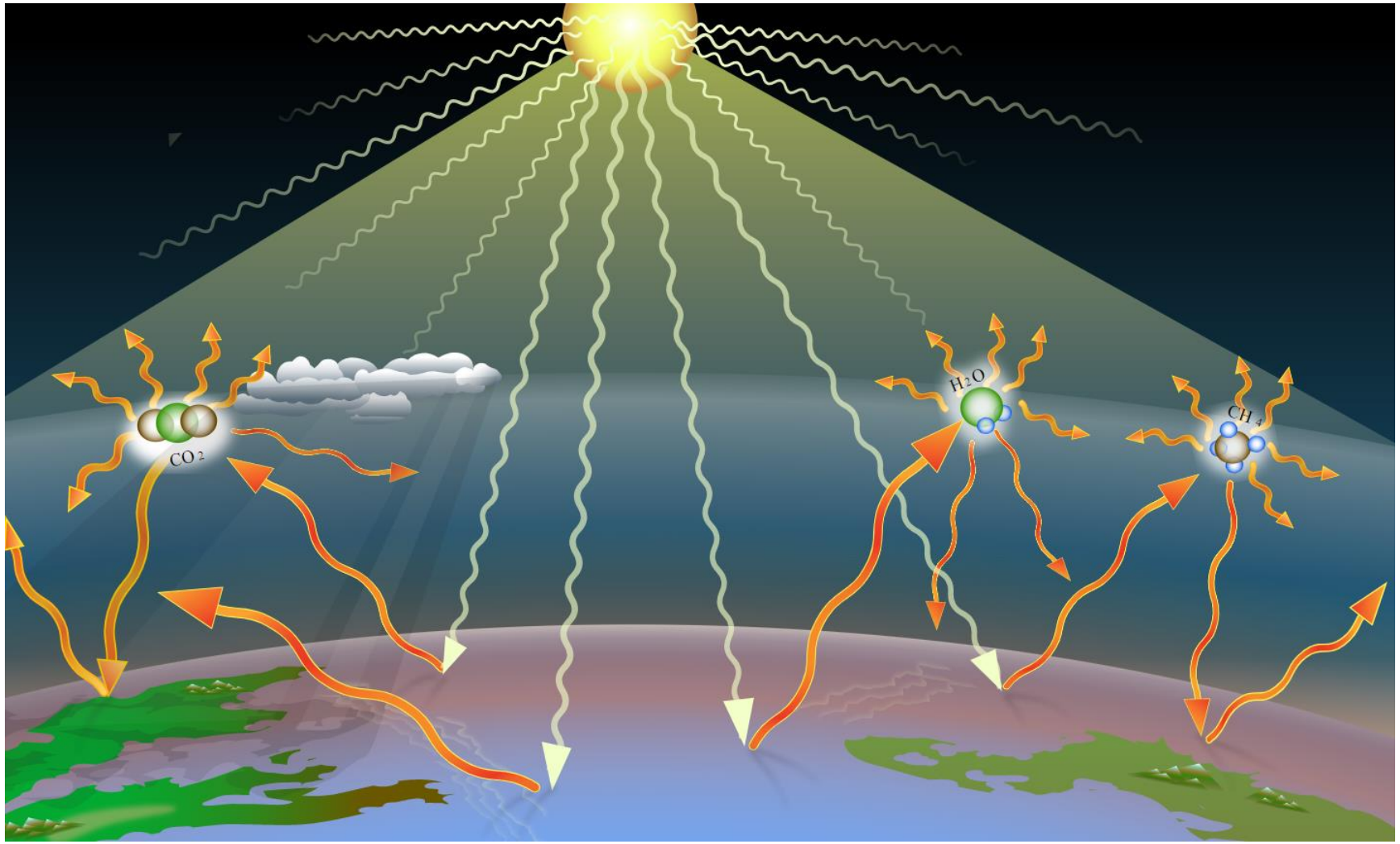
New Versus Old Peak Oil

Old	New
Supply	Demand
Resource Scarcity	Resource Abundance
Asset Over-exploitation	Stranded Assets

Climate Change

To introduce climate change fundamentals

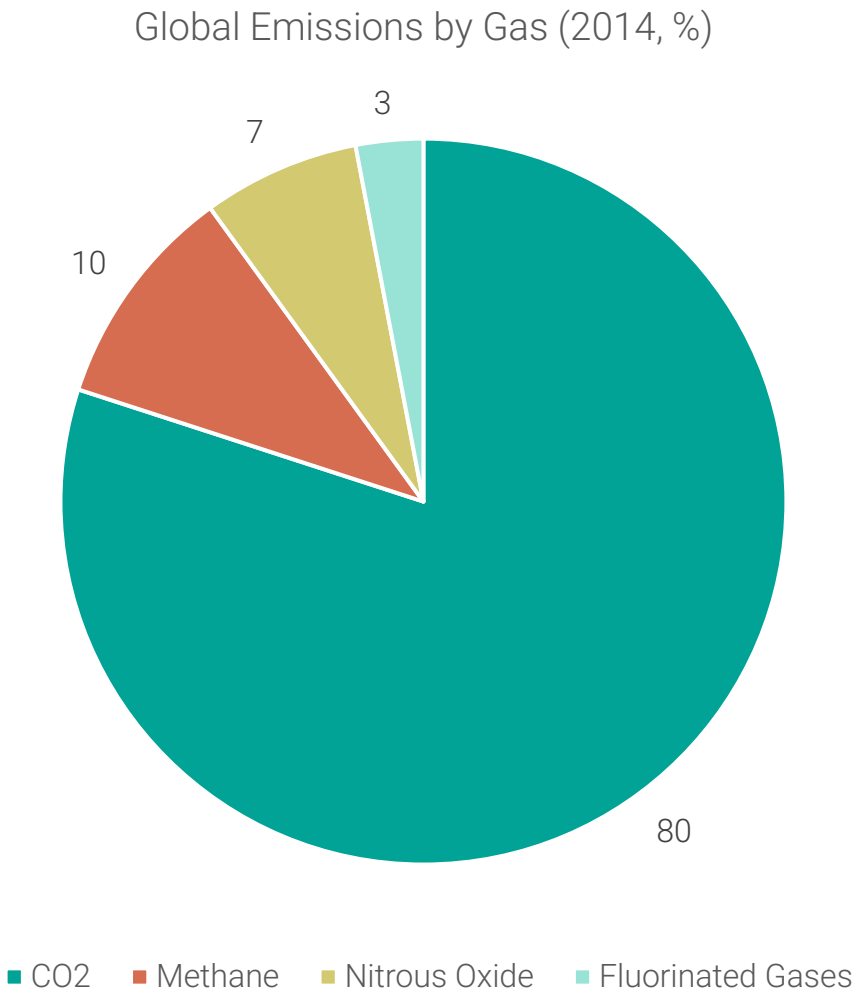
Greenhouse effect



Wikipedia on Greenhouse gas

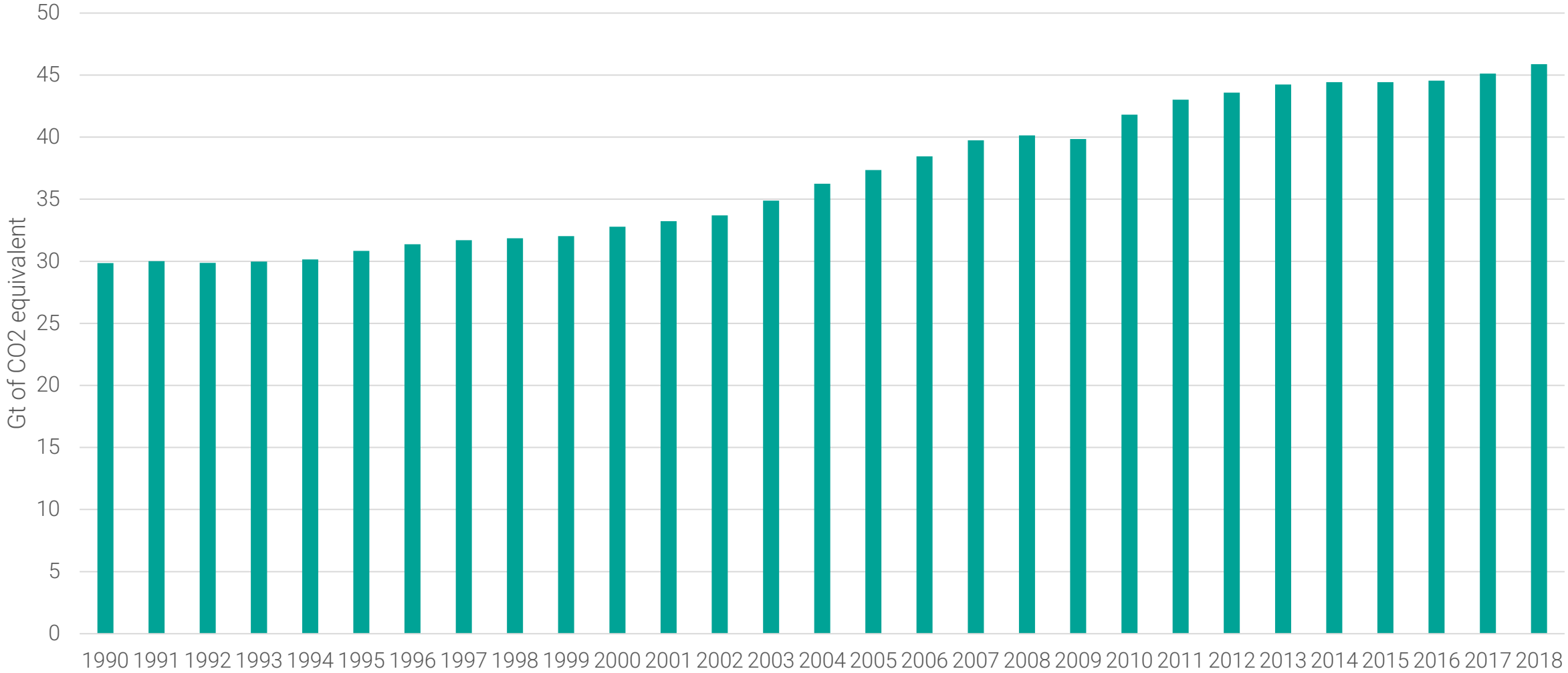
GHG

- Carbon Dioxide (CO2)
- Methane
- Nitrous Oxide
- Fluorinated Gases (F-gases)
- Water Vapor!

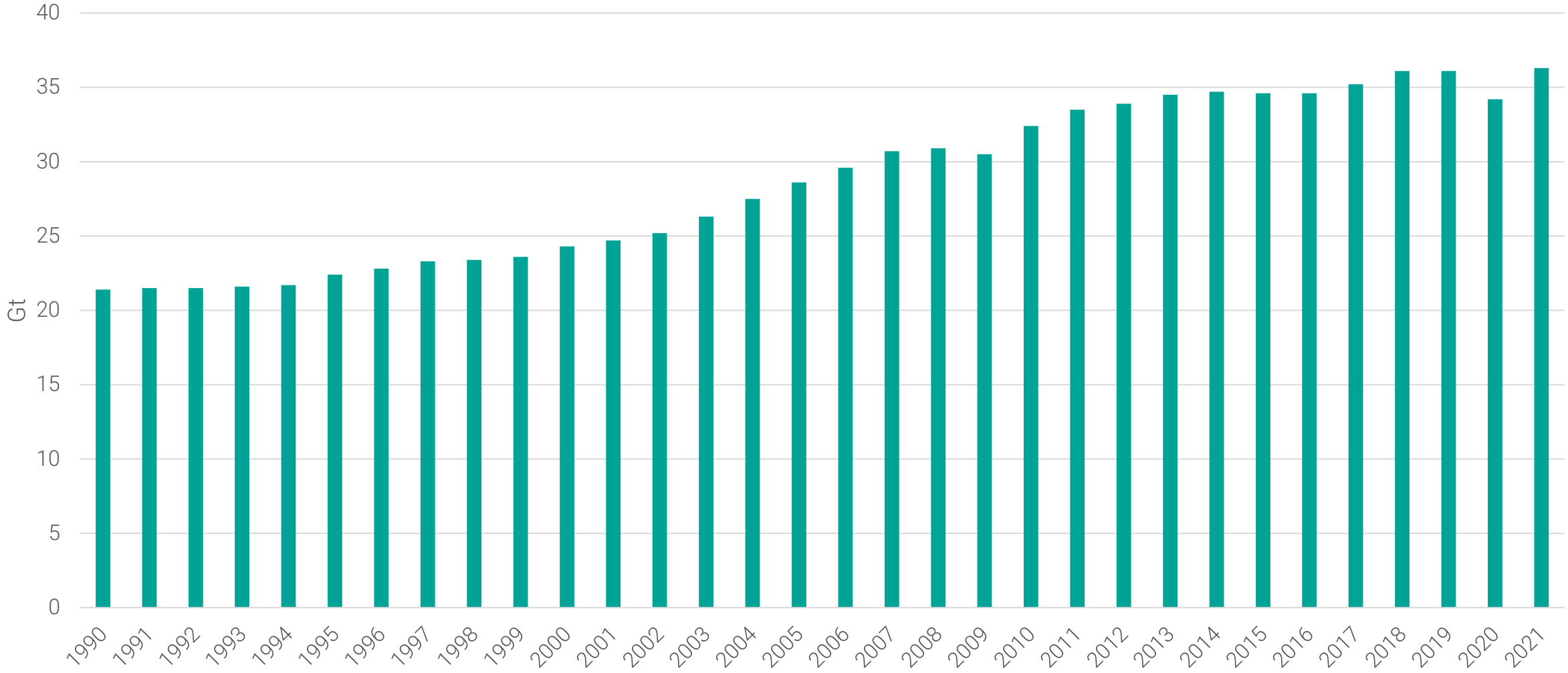


www.epa.gov

Global Greenhouse Gas Emissions

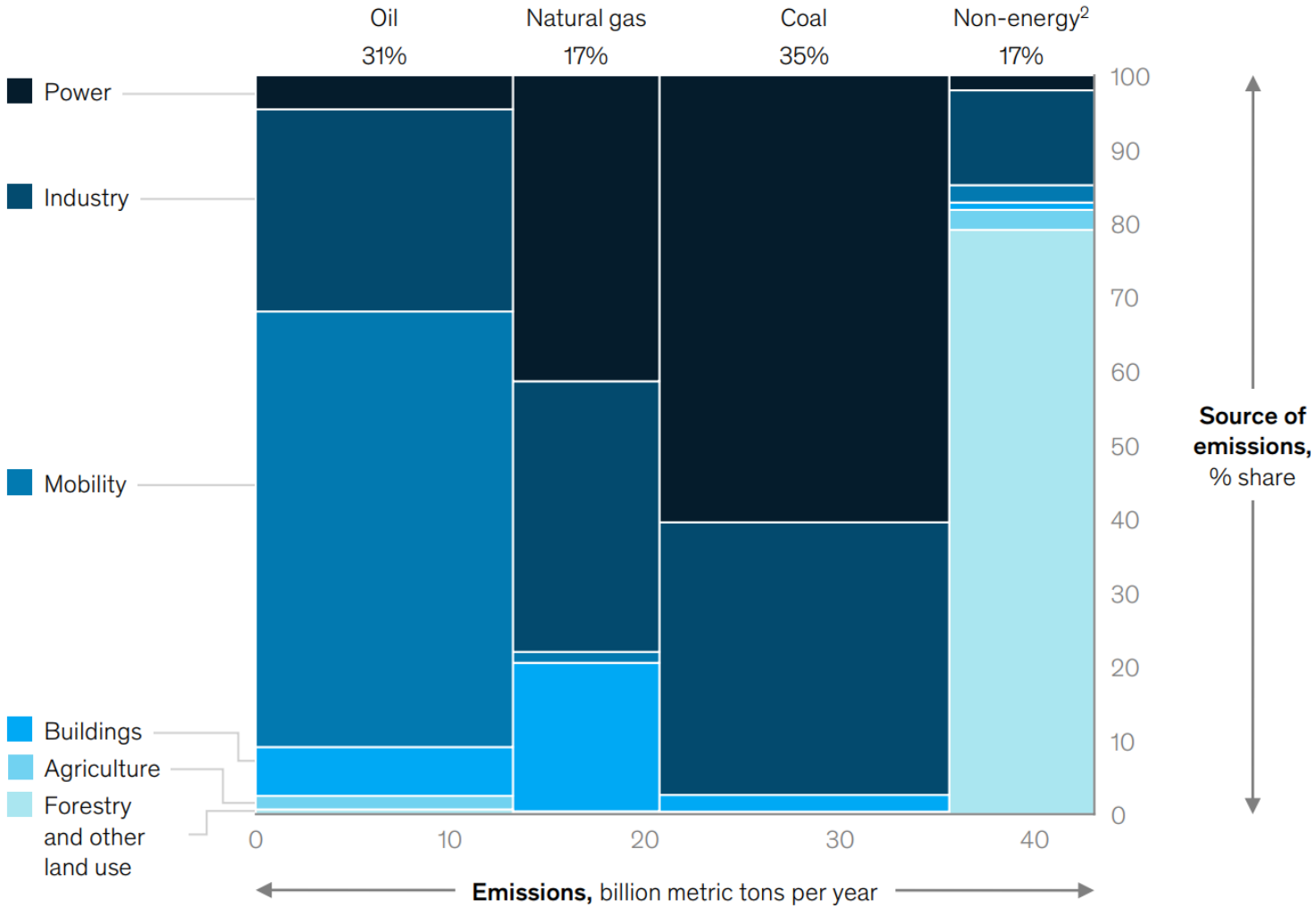


CO2 Emissions from Energy Combustion and Industrial Processes, 1900-2021



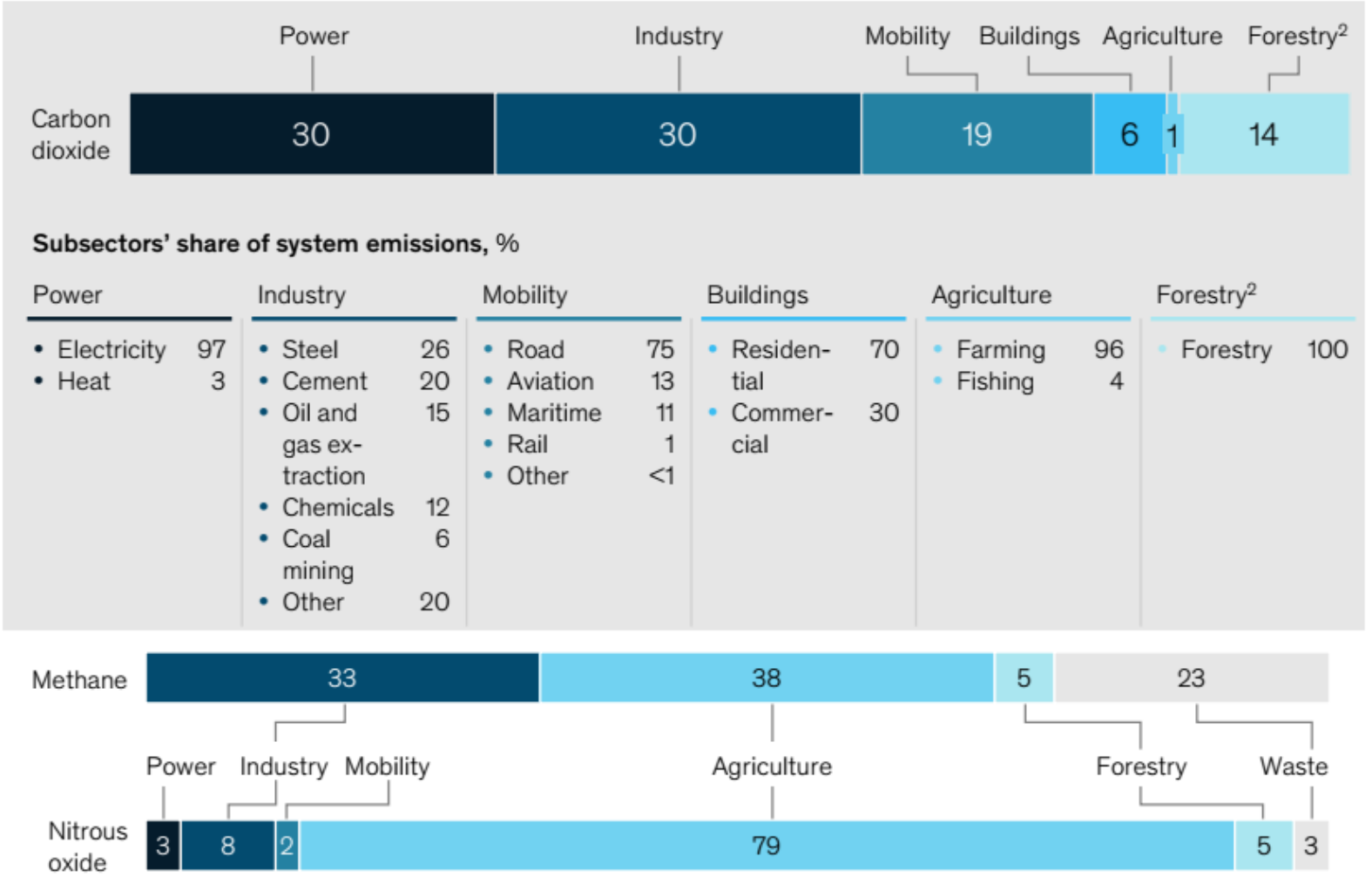
IEA Global Energy Review: CO2 Emissions in 2021

CO_2 Emissions Per Fuel And Energy And Land-use System, 2019, Share



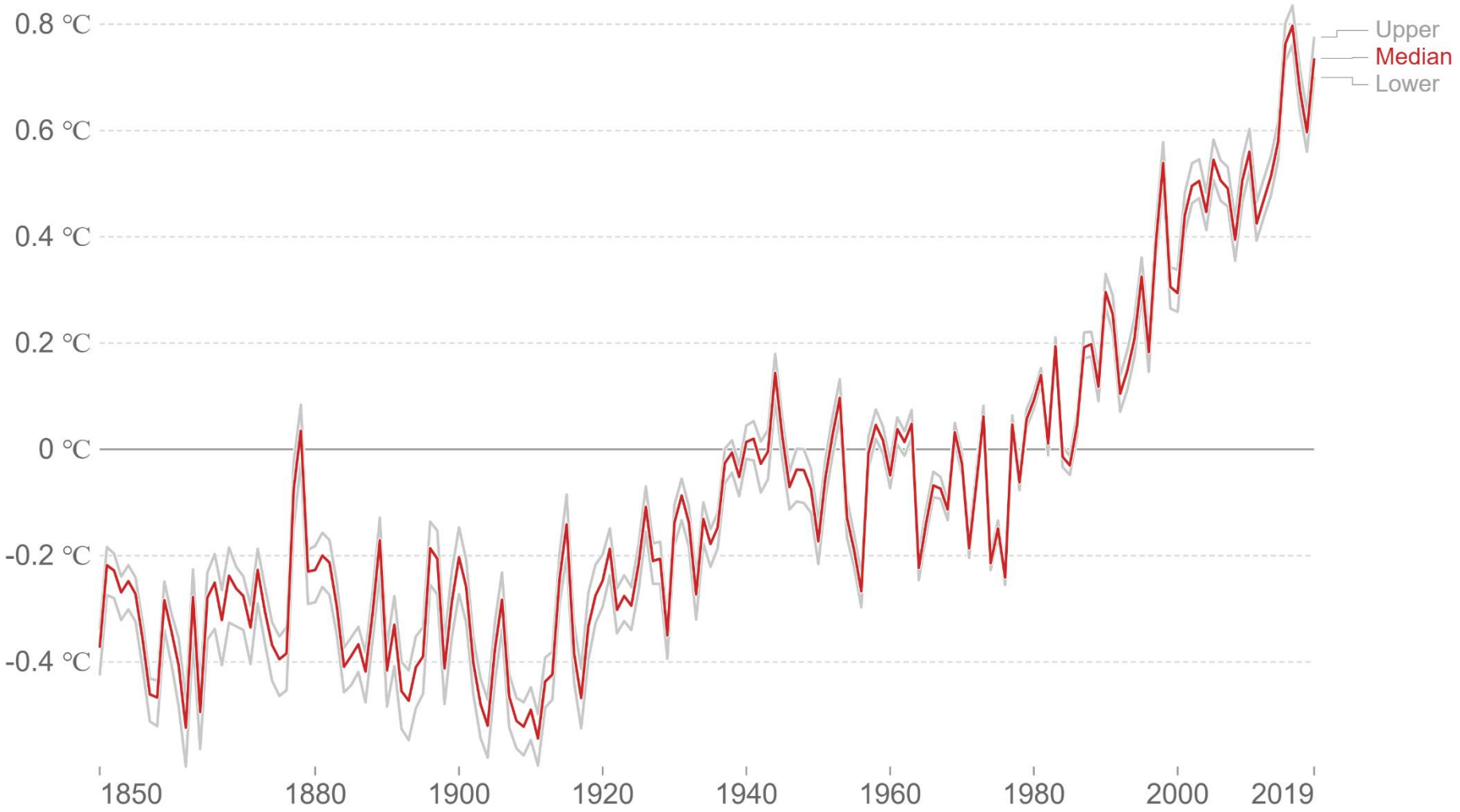
McKinsey The net-zero transition: What it would cost, what it could bring 2022

Share of Emissions per Energy and Land-use System (2019, %)



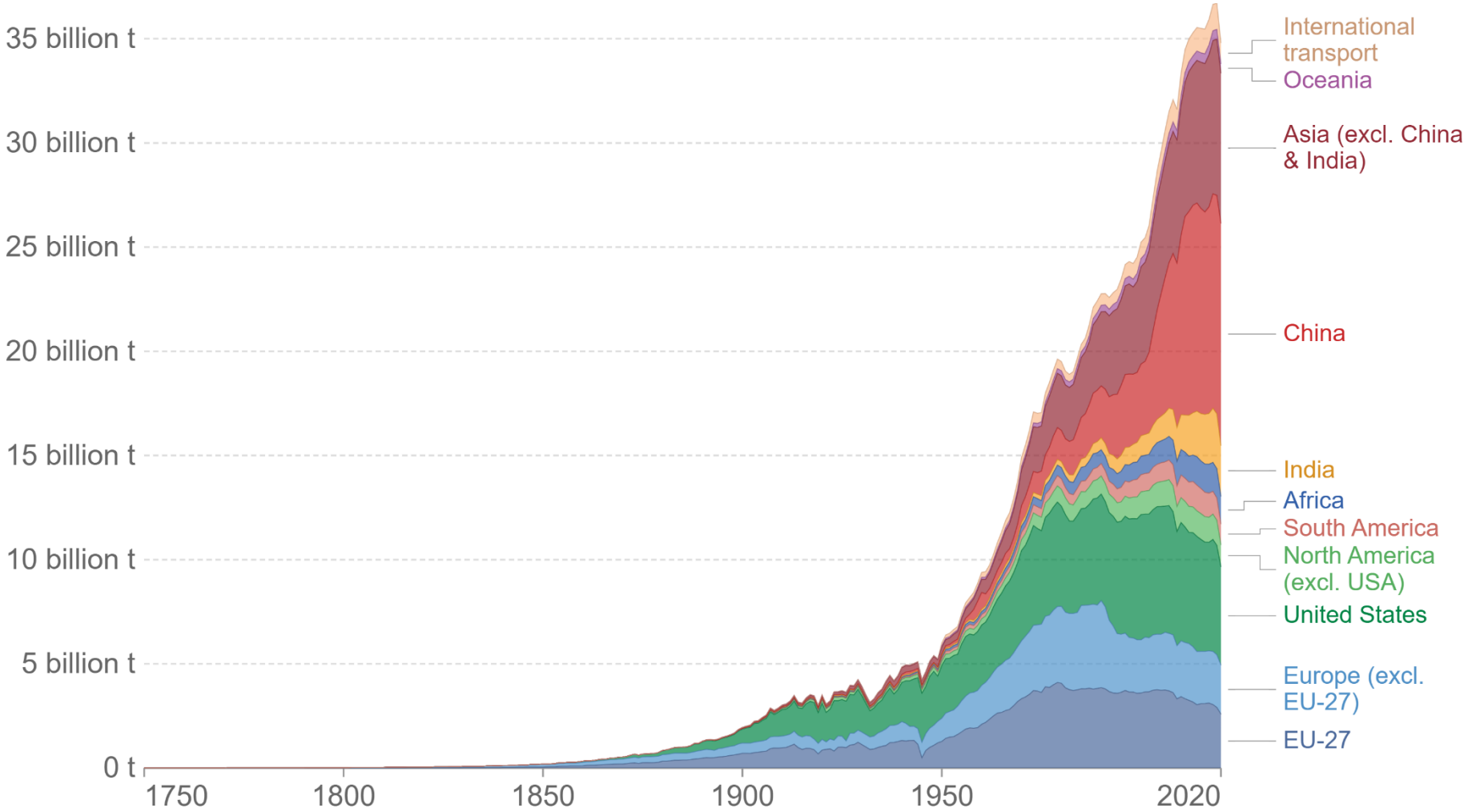
McKinsey The net-zero transition: What it would cost, what it could bring 2022

Average Temperature Anomaly (Global)



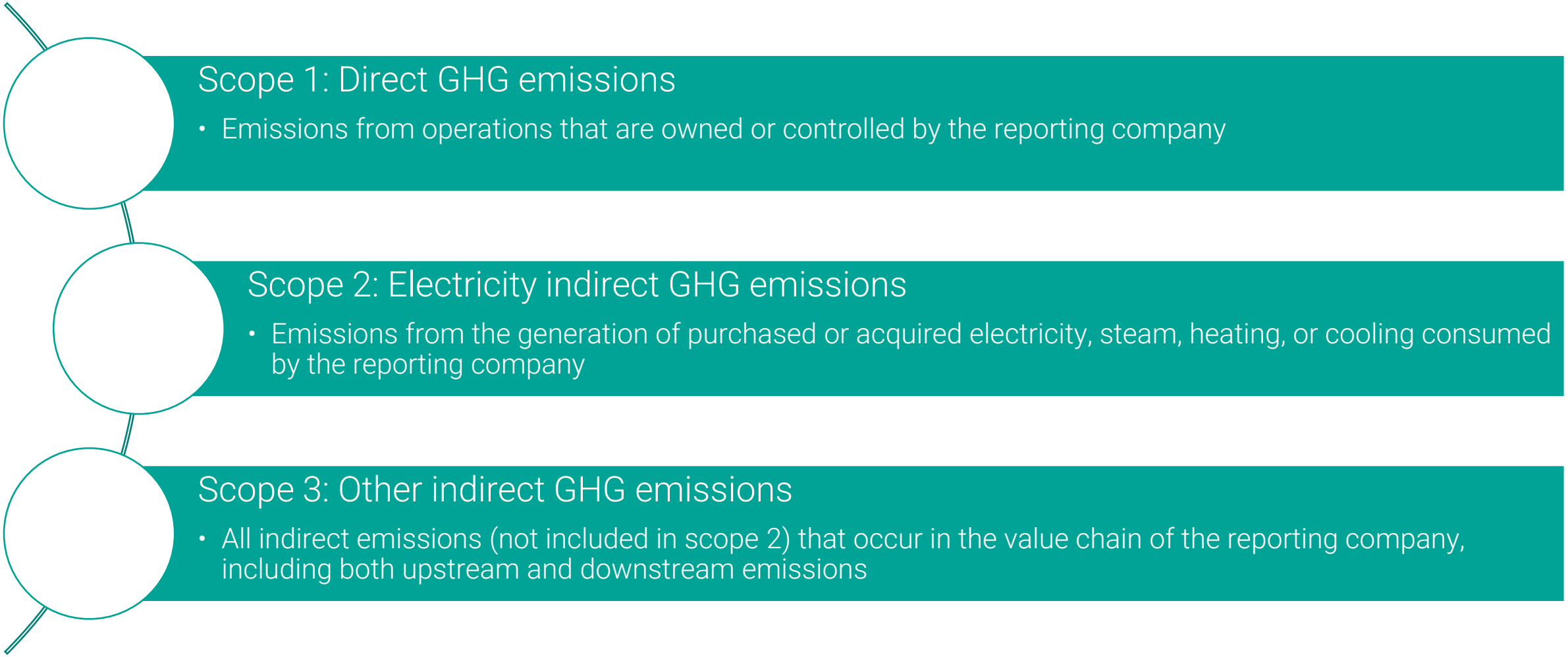
www.ourworldindata.org

Annual CO_2 Emissions from Fossil Fuels by World Region



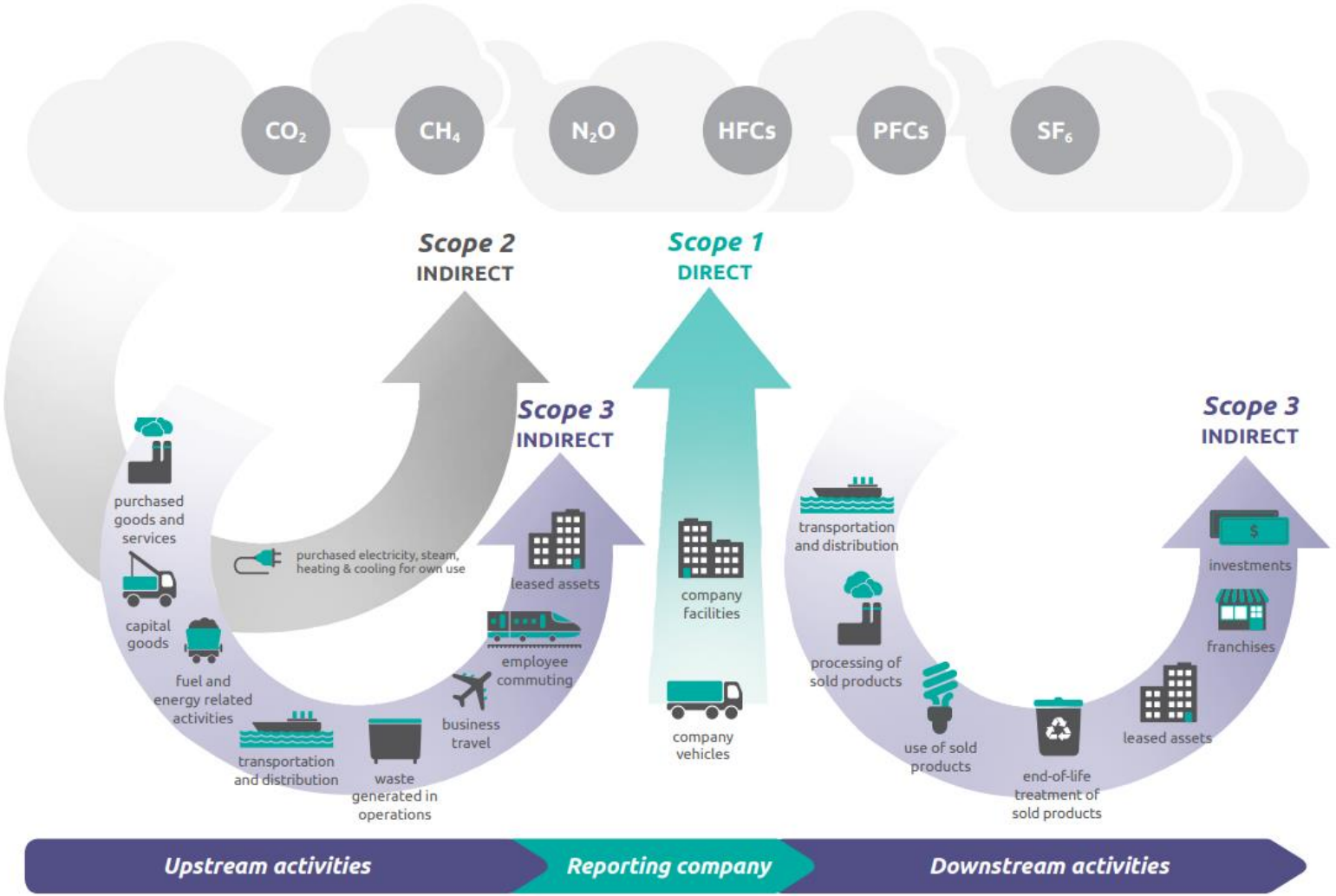
www.ourworldindata.org

Emissions' Scopes



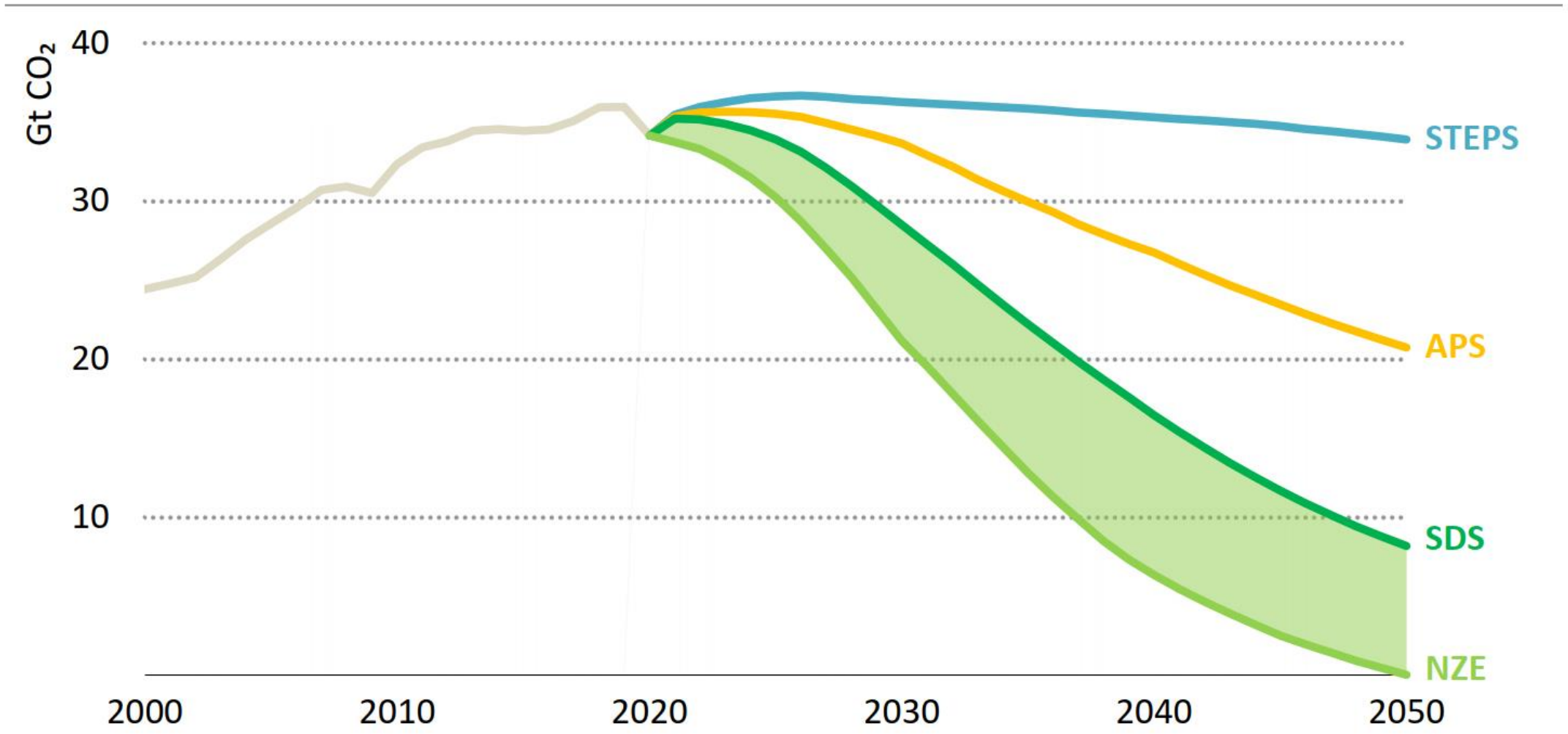
Greenhouse Gas Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard 2011

Overview of GHG Protocol Scopes and Emissions Across the Value Chain



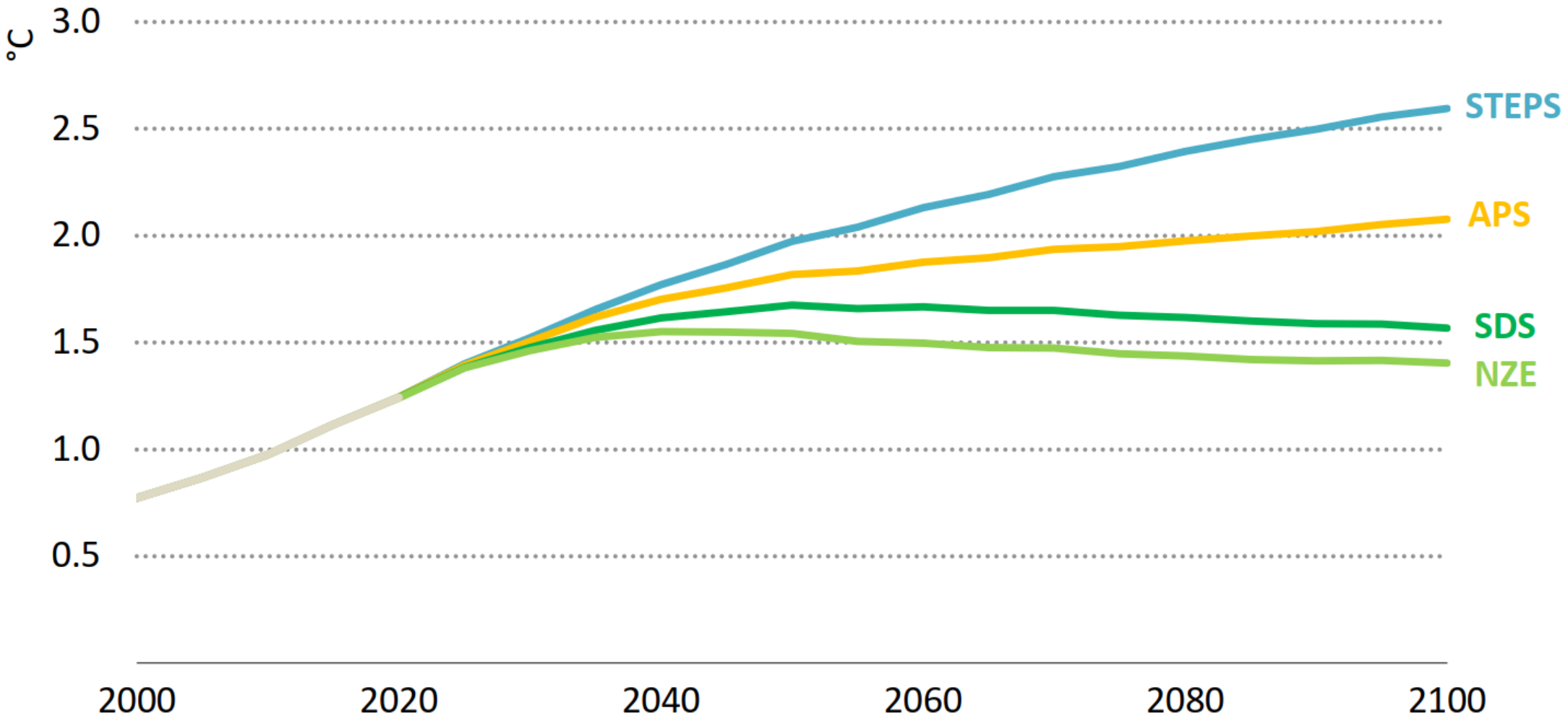
Greenhouse Gas Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard 2011

CO2 Emissions In The WEO-2021 Scenarios Over Time



IEA World Energy Outlook 2021

Global Median Surface Temperature Rise Over Time

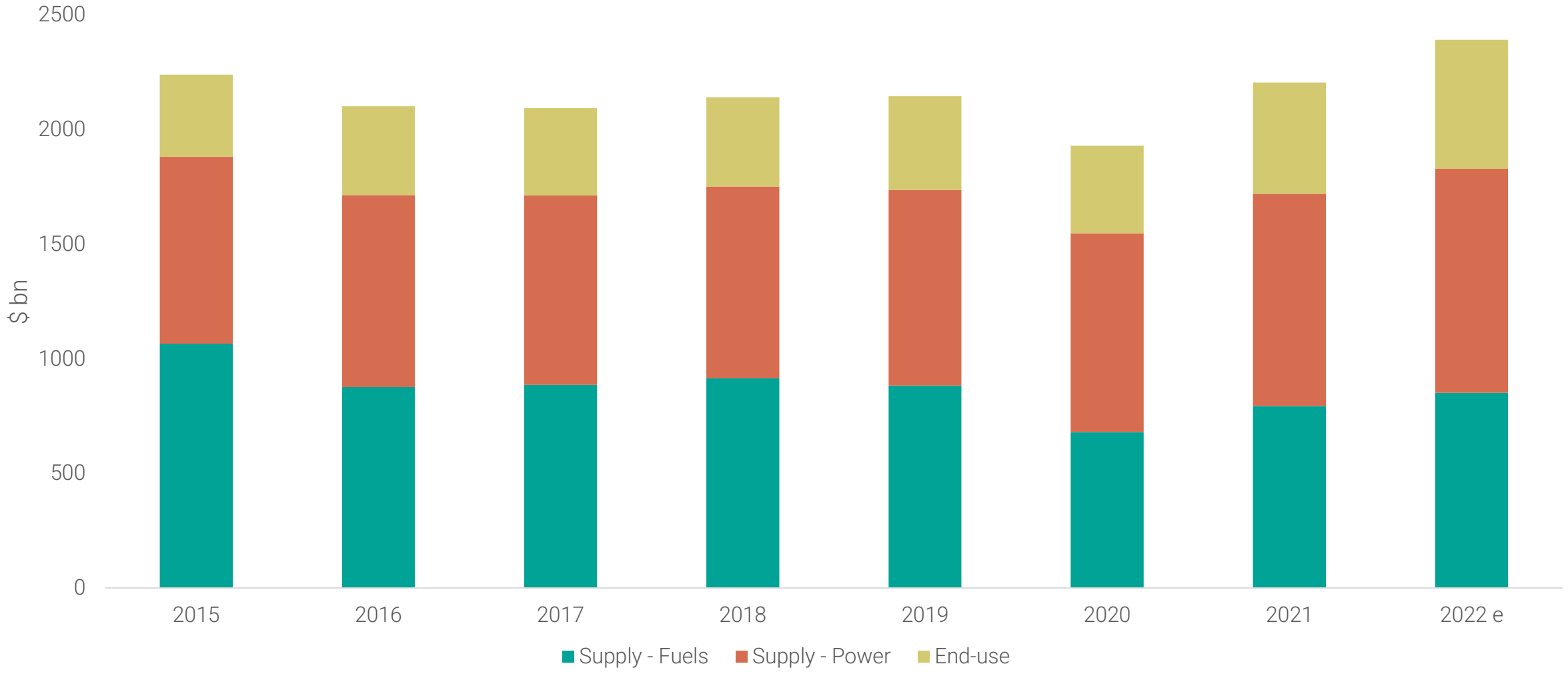


IEA World Energy Outlook 2021

Investment

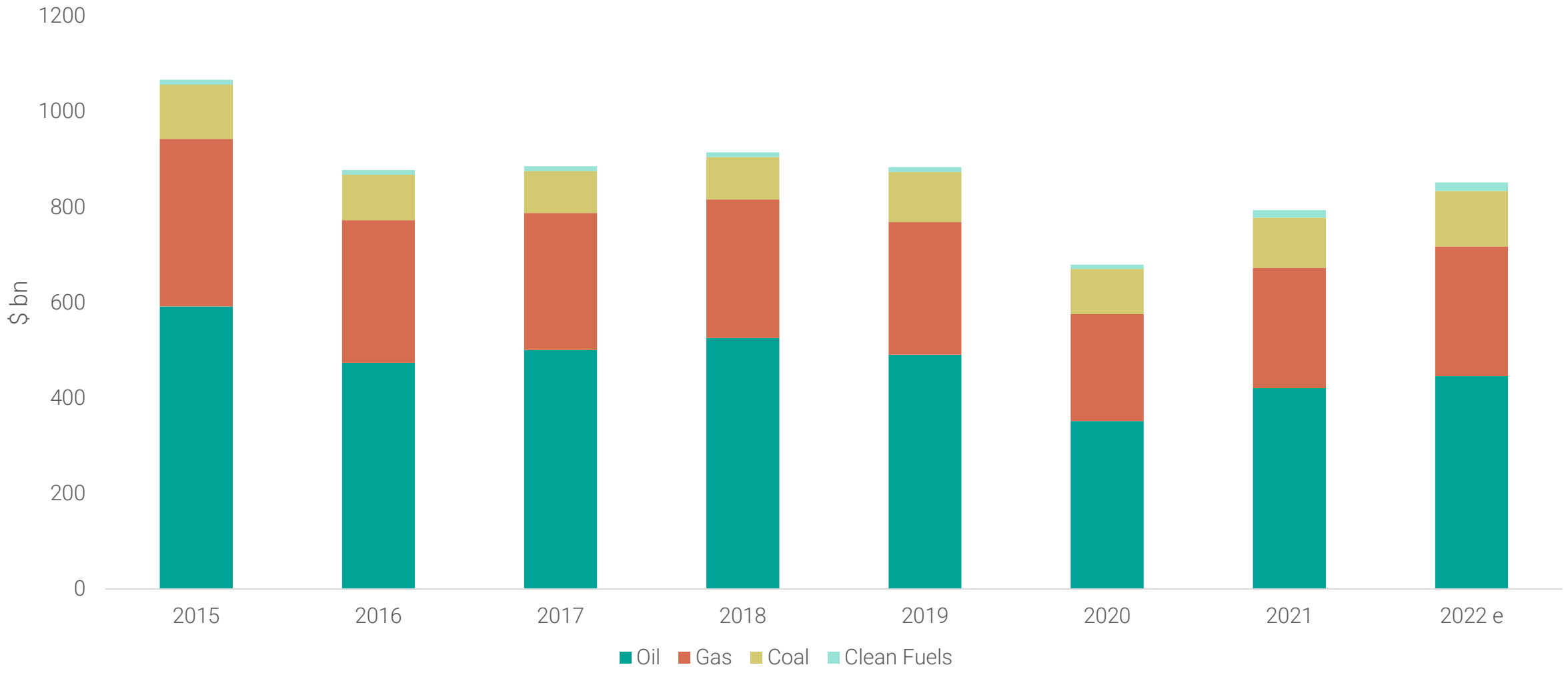
To understand key trends in global energy investment, with specific focus on upstream oil and gas industry

World Energy Investment Trend



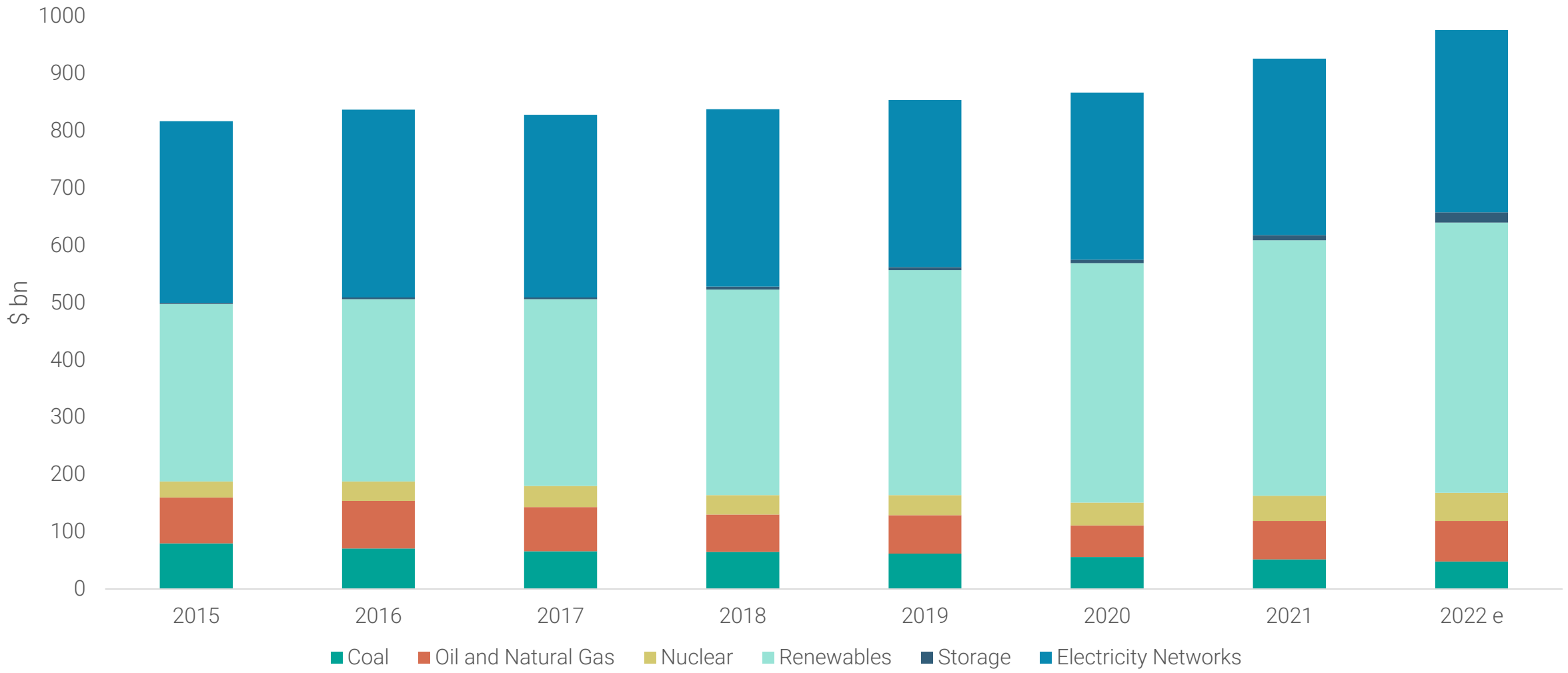
IEA World Energy Investment 2022

Investment in Fuels Supply



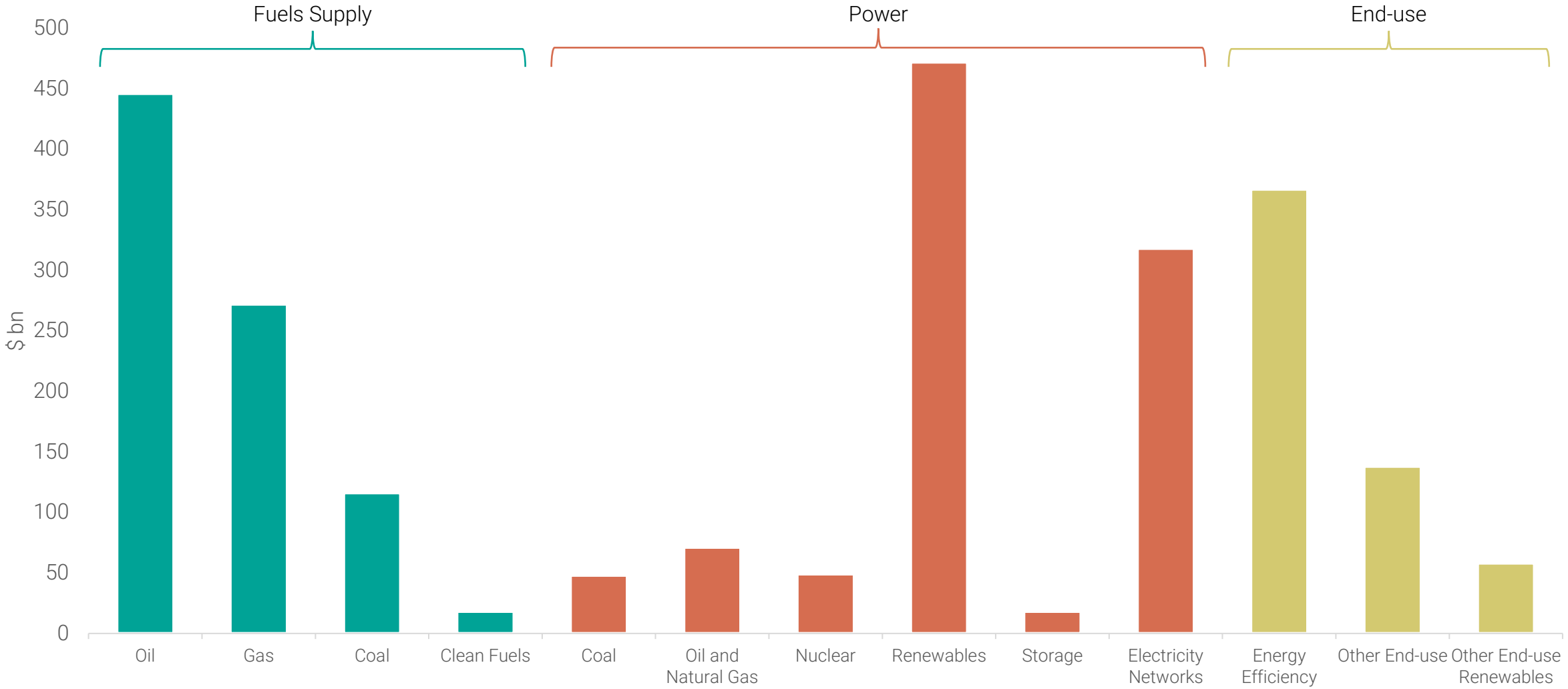
IEA World Energy Investment 2022

Investment in Power Supply



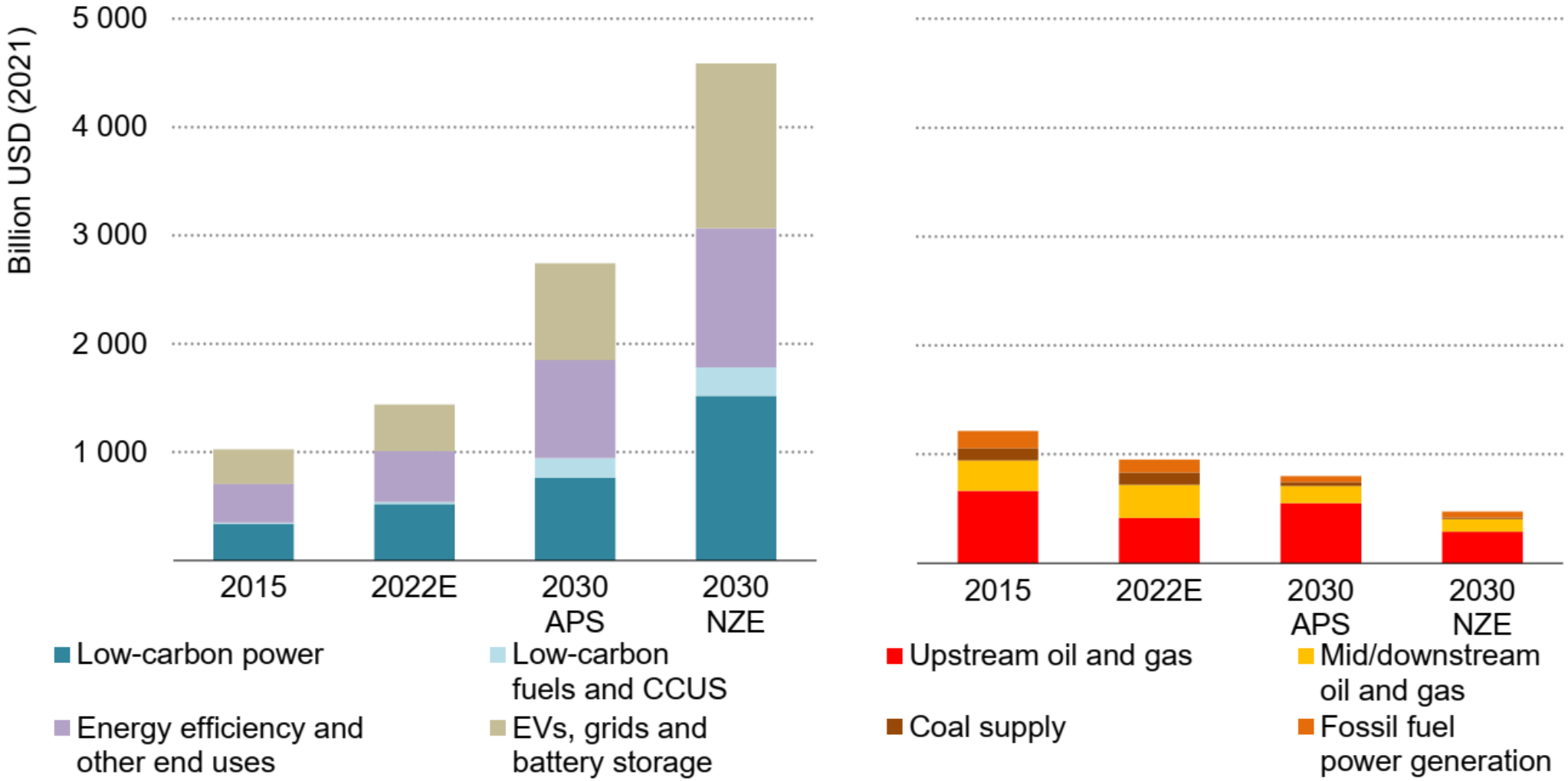
IEA World Energy Investment 2022

Overview of Energy Investment



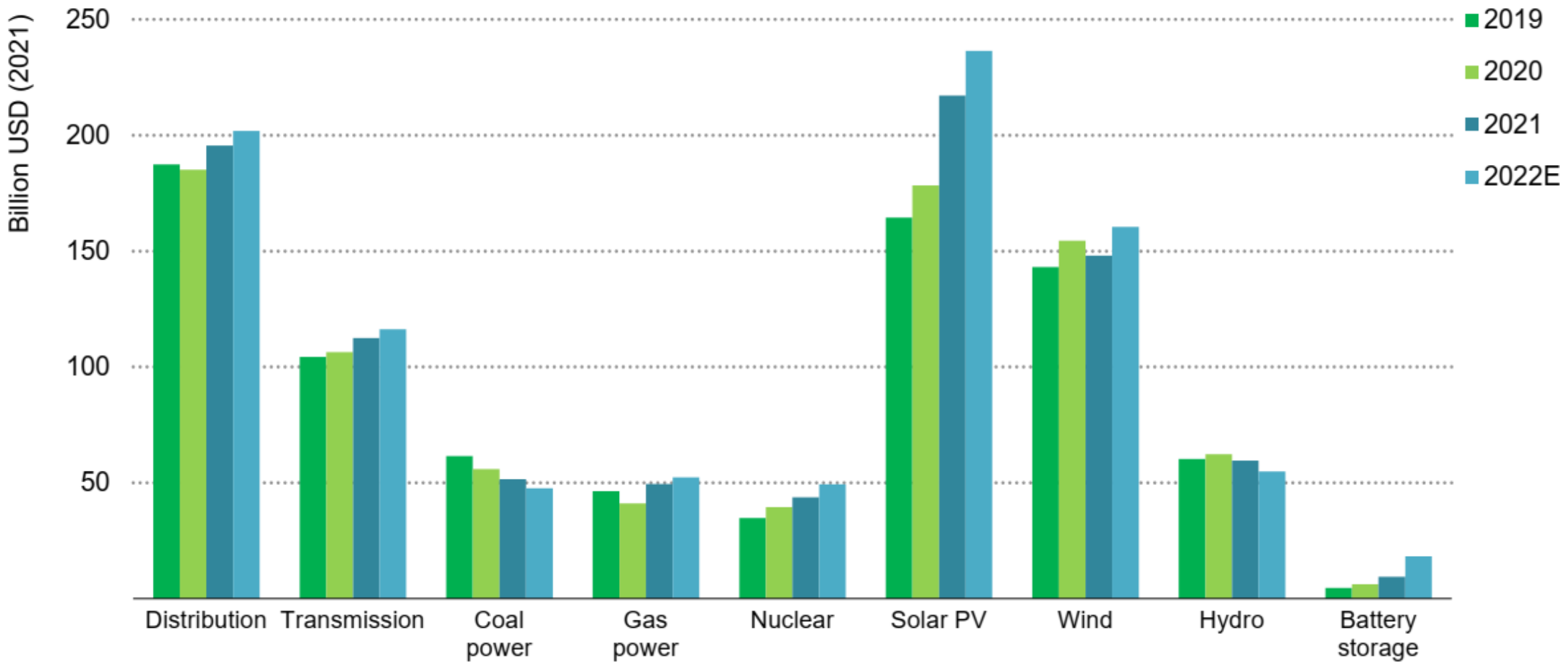
IEA World Energy Investment 2022

Annual Global Energy Investment Benchmarked Against The Needs



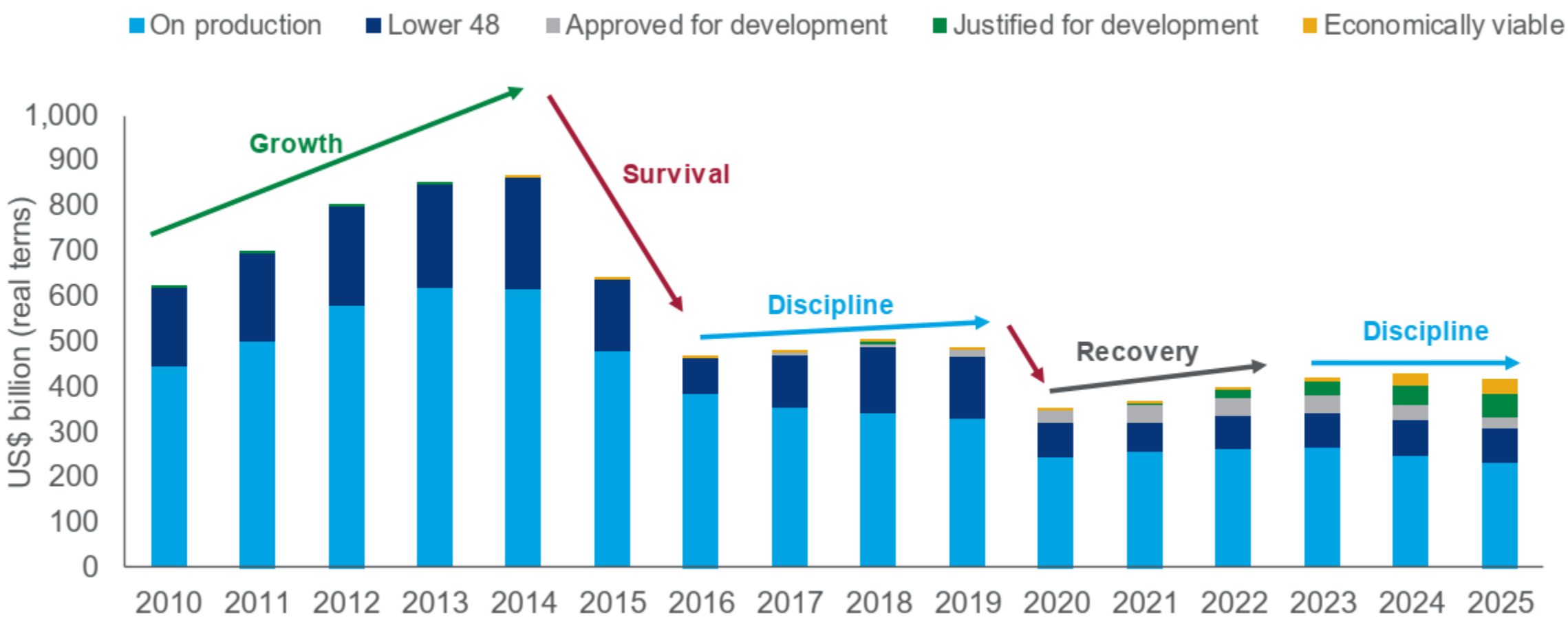
IEA World Energy Investment 2022

Global Annual Investment in the Power Sector By Technology



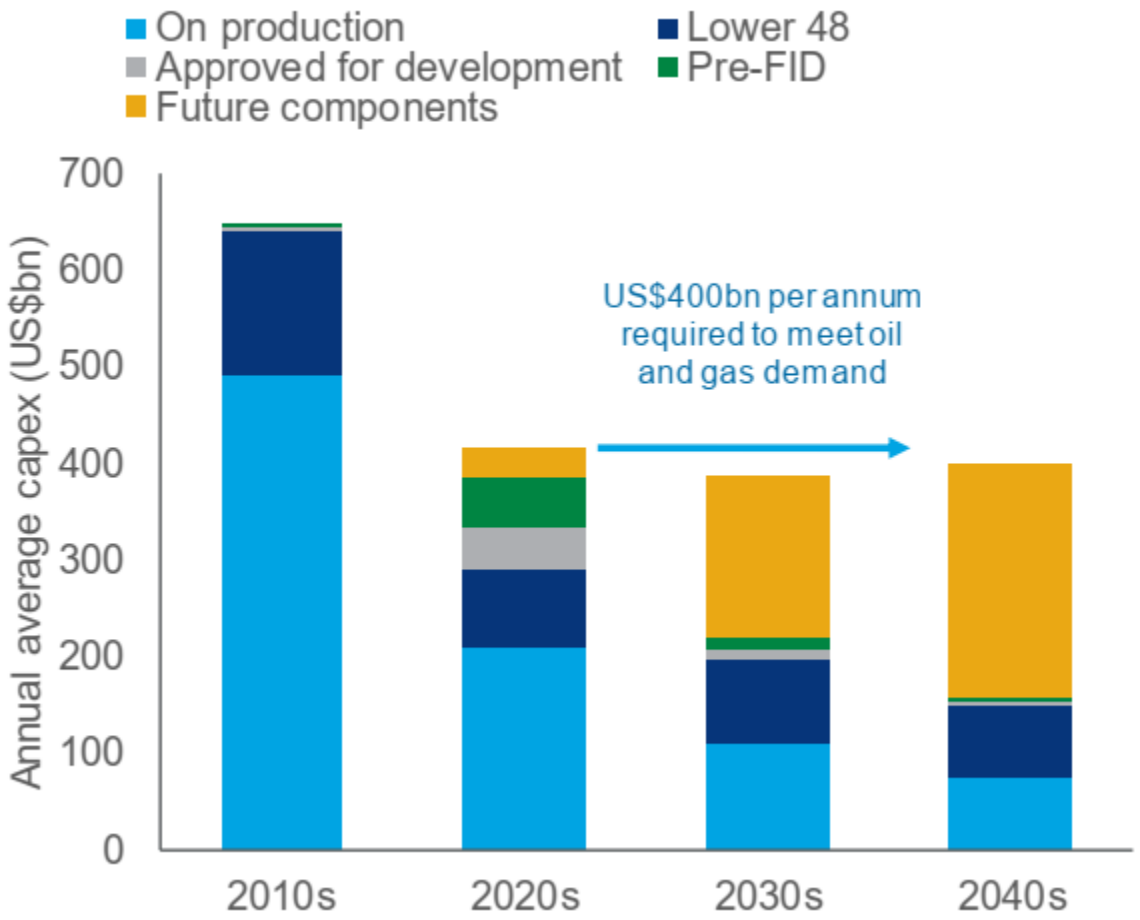
IEA World Energy Investment 2022

Upstream Development Capex



Wood Mackenzie How much does the oil and gas industry need to spend?

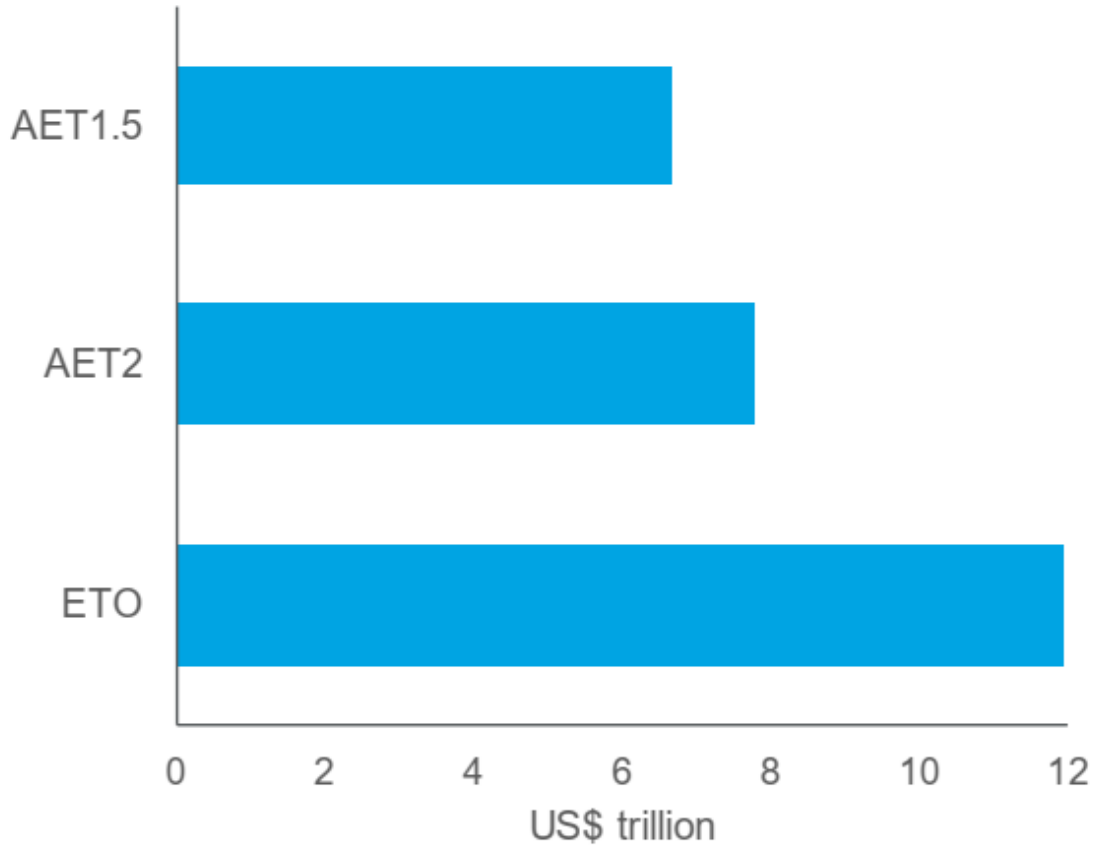
Upstream Capex by Development Status



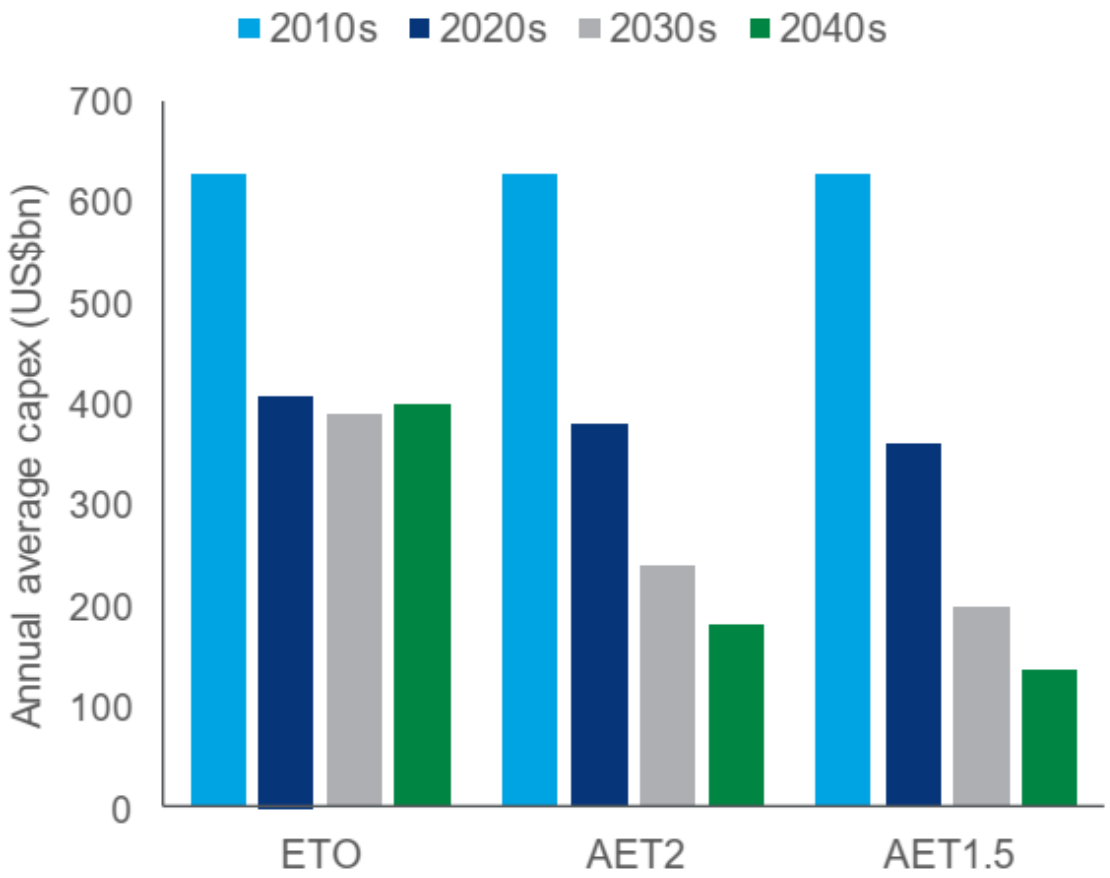
Wood Mackenzie How much does the oil and gas industry need to spend?

Upstream CAPEX by Scenario

Cumulative capex by scenario (2021 to 2050)

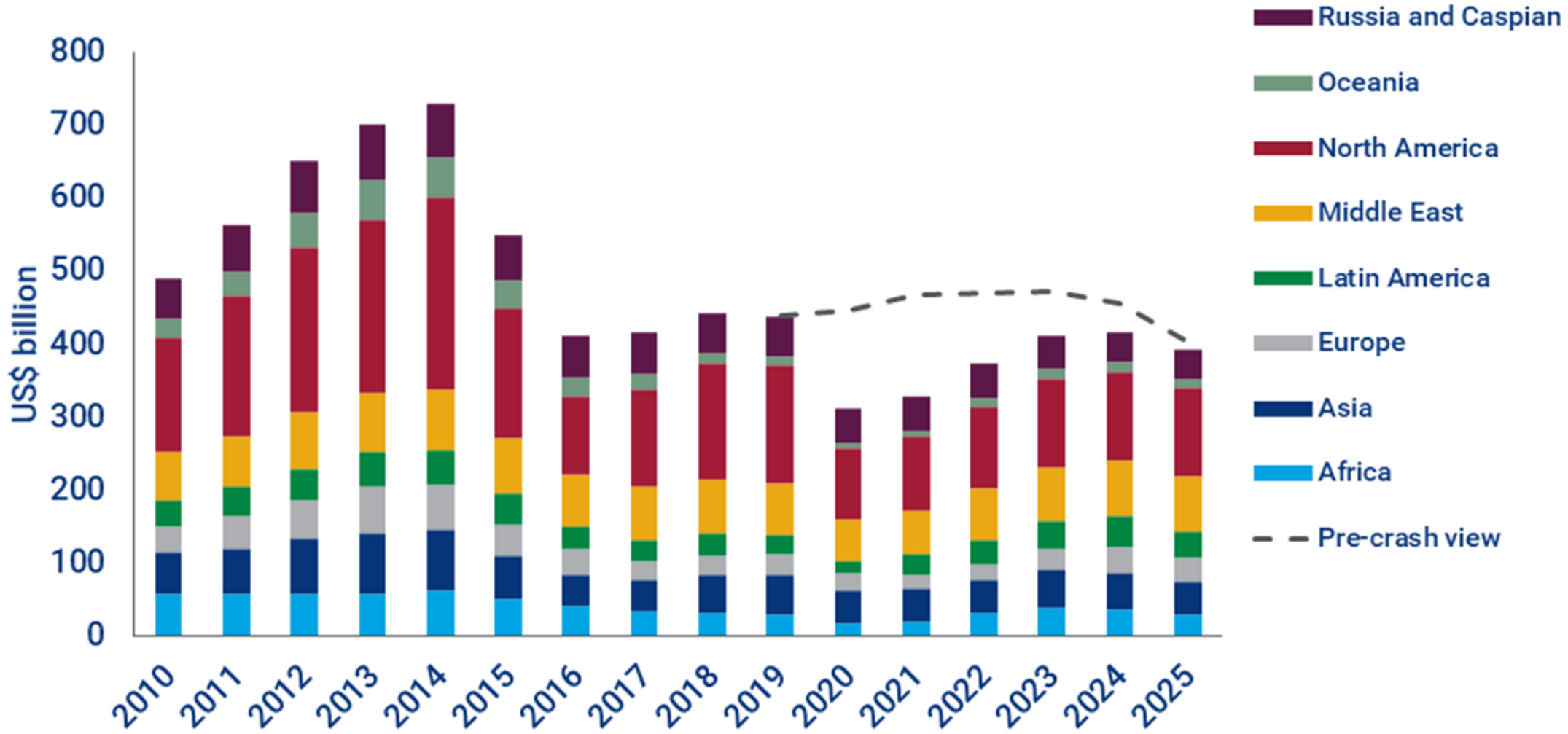


Upstream development capex (in real terms)



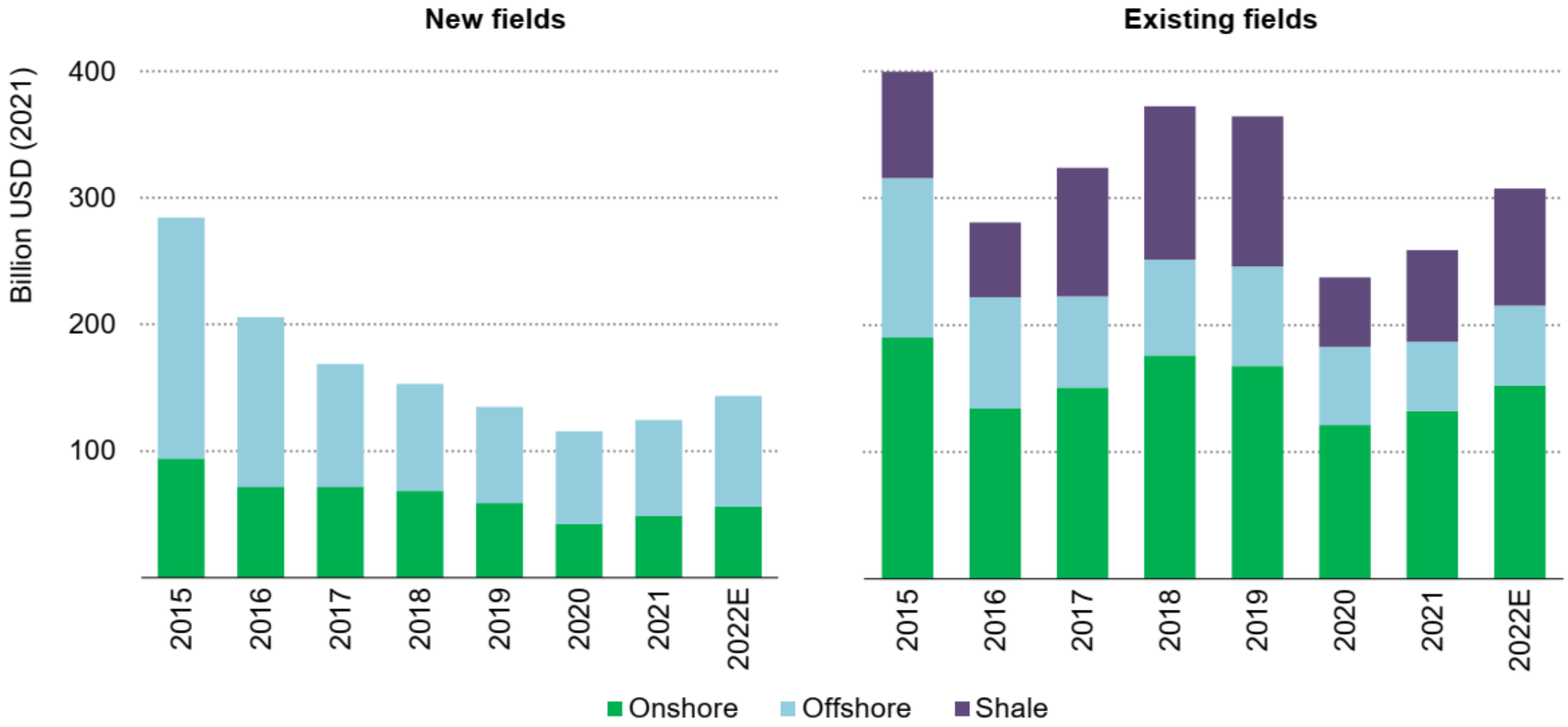
Wood Mackenzie How much does the oil and gas industry need to spend?

World Upstream Investment by Region



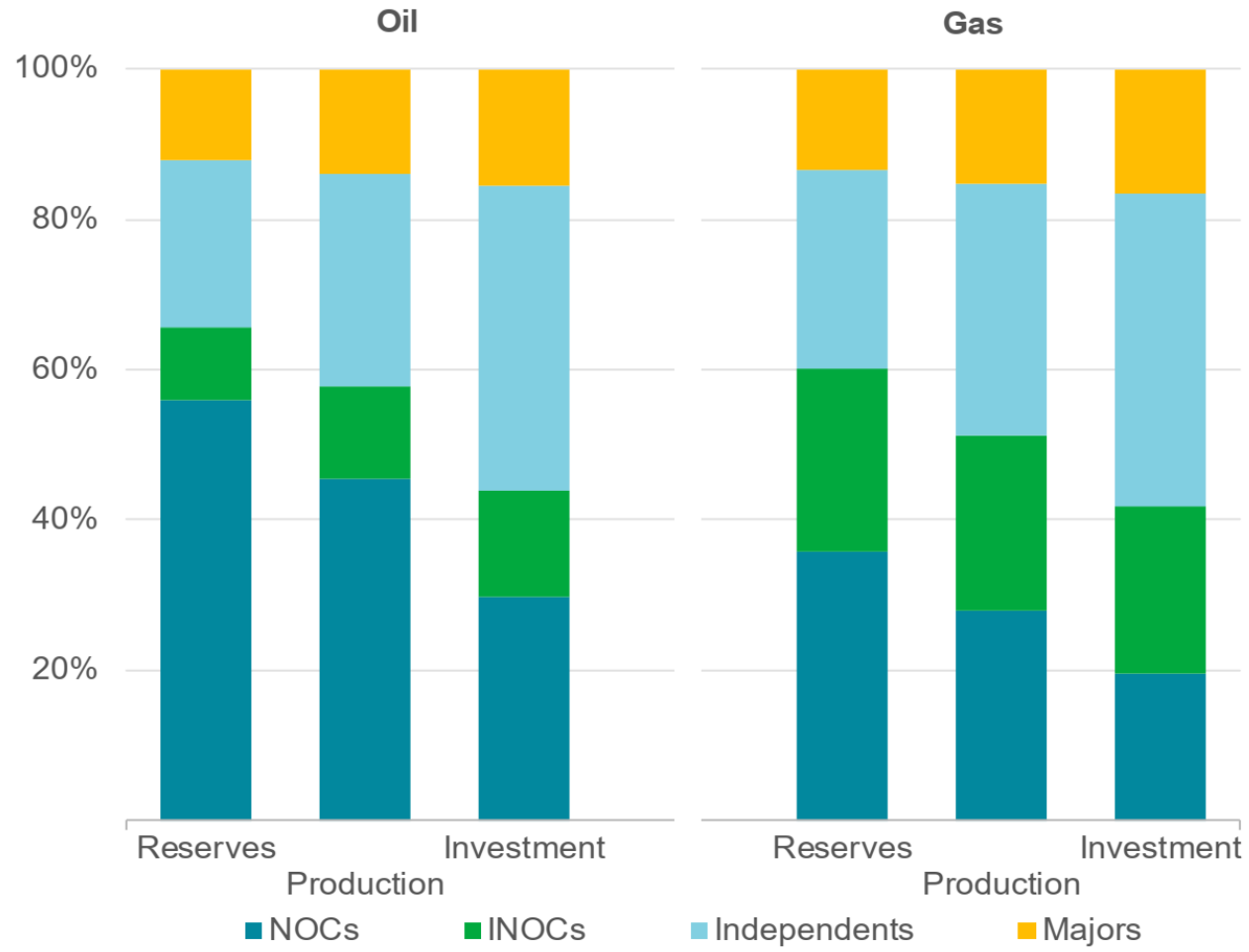
Wood Mackenzie Competing for capital in a downcycle

Upstream Investment in New and Existing Oil and Natural Gas Fields



IEA World Energy Investment 2022

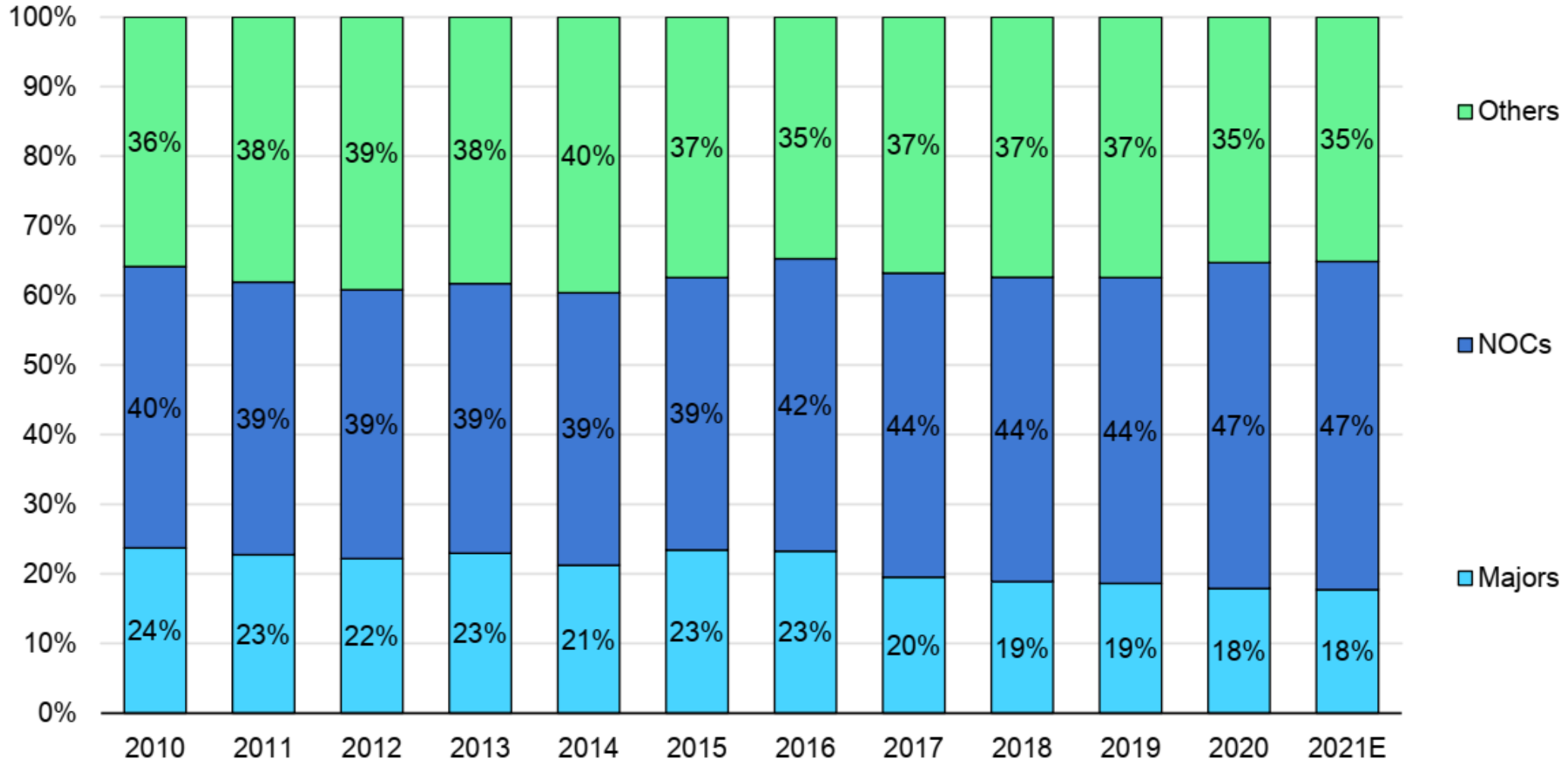
Ownership Of Oil And Gas Reserves, Production and Upstream Investment



Note: NOCs = national oil companies; INOCs = international national oil companies.

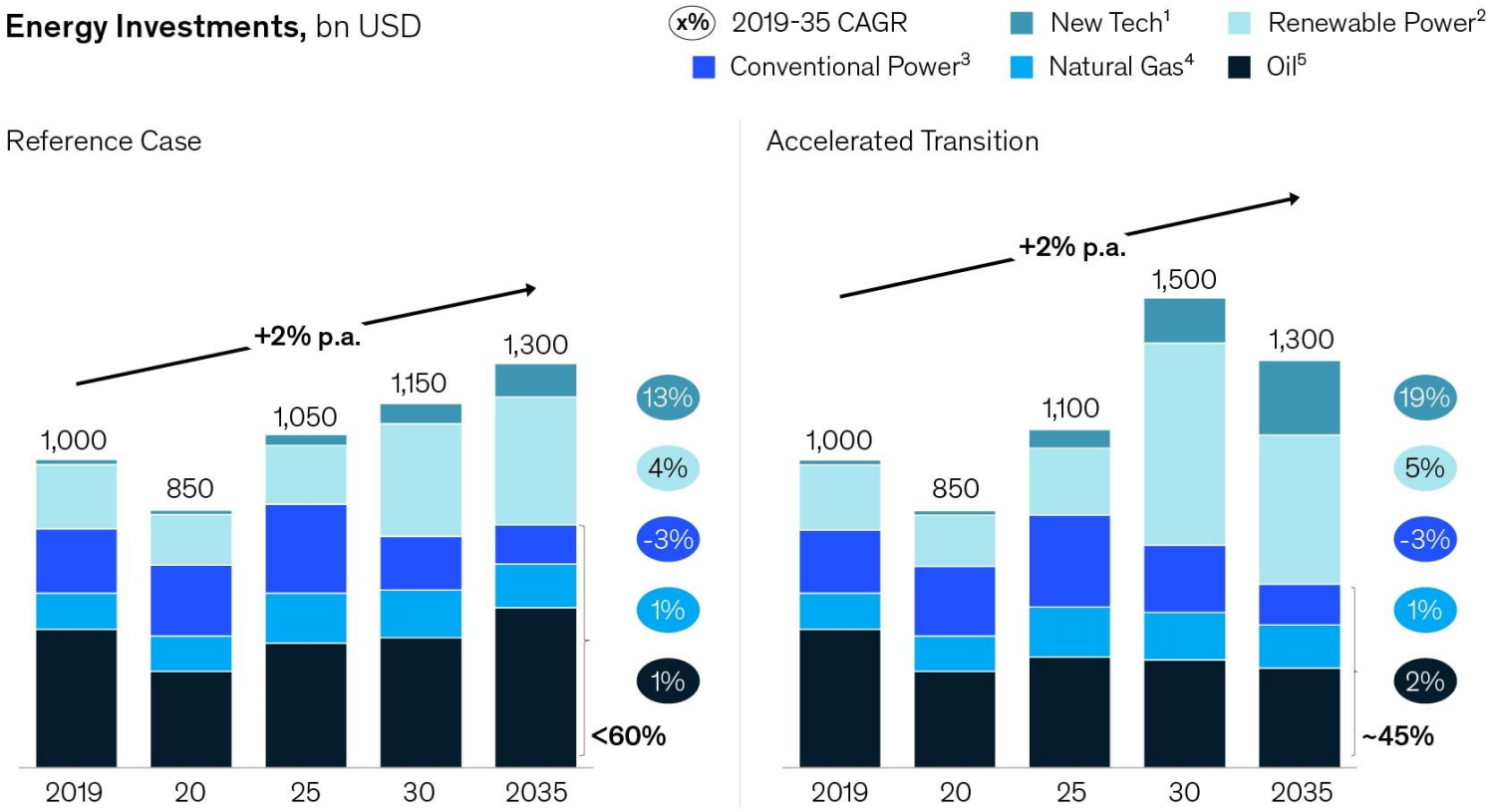
IEA The Oil and Gas Industry in Energy Transitions

Share of Upstream Investment by Company Type



IEA Oil 2021

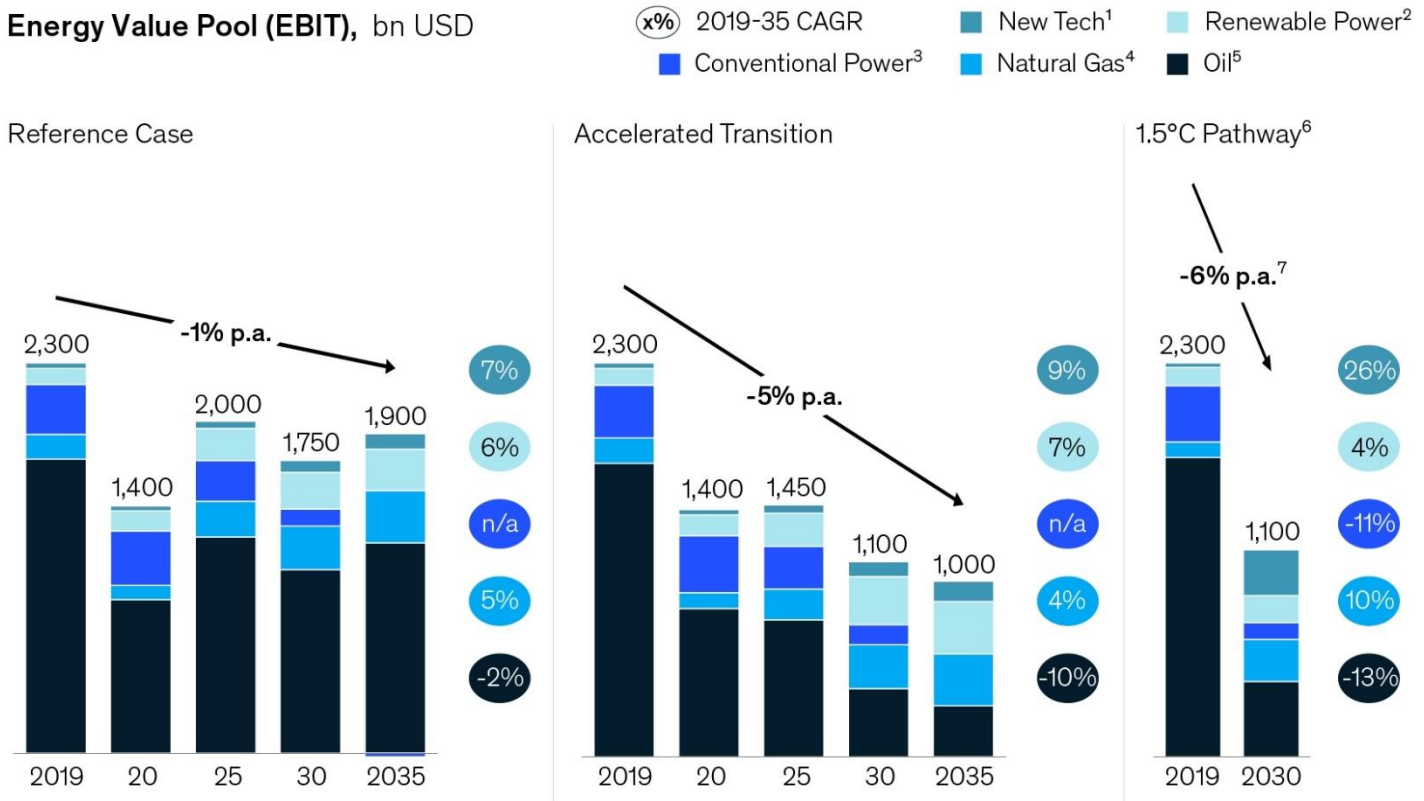
Energy Investments by Technology in Two Scenarios



[1]Includes Biofuels, Hydrogen production, EV Charging, and NBS
[2]Includes Solar, Onshore Wind, and Offshore Wind
[3]Includes Coal, Gas, Nuclear, Hydro, Other
[4]Includes Upstream gas, and LNG
[5]Includes Upstream Oil, Oil Refining, Specialty Chemicals, PetChem (only for Reference Case), Lubricants (only for Reference Case), and Retail.
Source: McKinsey Energy Insights Energy Value Pools Model

McKinsey The global energy landscape is going through major shifts: What does this mean for value pools in energy?

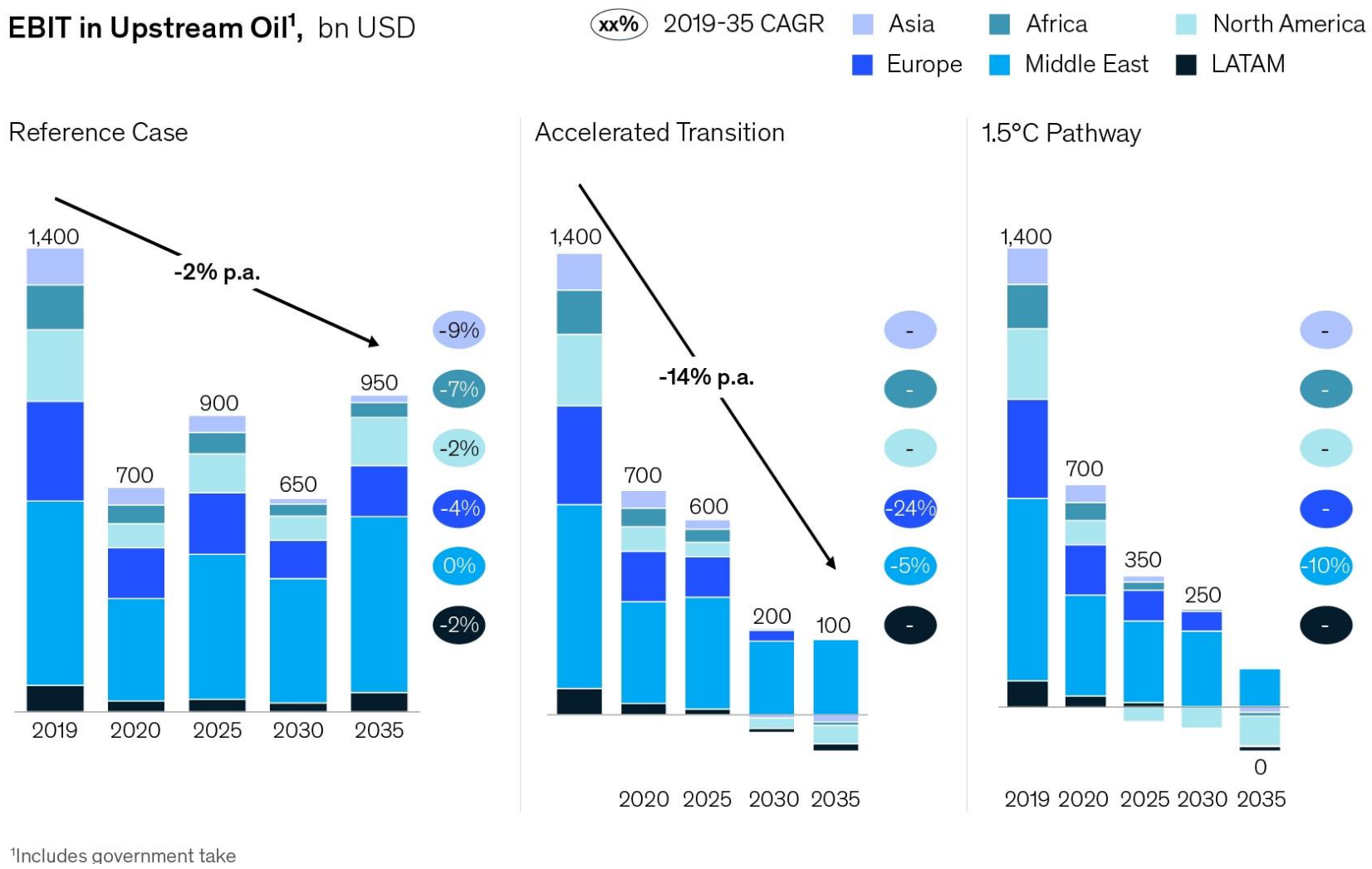
Energy Value Pool by Technology in Three Scenarios



[1]Includes Biofuels, Hydrogen production, CCUS, EV Charging, and NBS
[2]Includes Solar, Onshore Wind, and Offshore Wind
[3]Includes Coal, Gas, Nuclear, Hydro, Other
[4]Includes Upstream gas, and LNG
[5]Includes Upstream Oil, Oil Refining, Specialty Chemicals, PetChem (only for Reference Case), Lubricants (only for Reference Case), and Retail
[6]EV Charging, NBS, and Specialty Chemicals components based on Accelerated Scenario values
[7]CAGR values in 1.5C pathway are 2019-2030.
Source: McKinsey Energy Insights Energy Value Pools Model

McKinsey The global energy landscape is going through major shifts: What does this mean for value pools in energy?

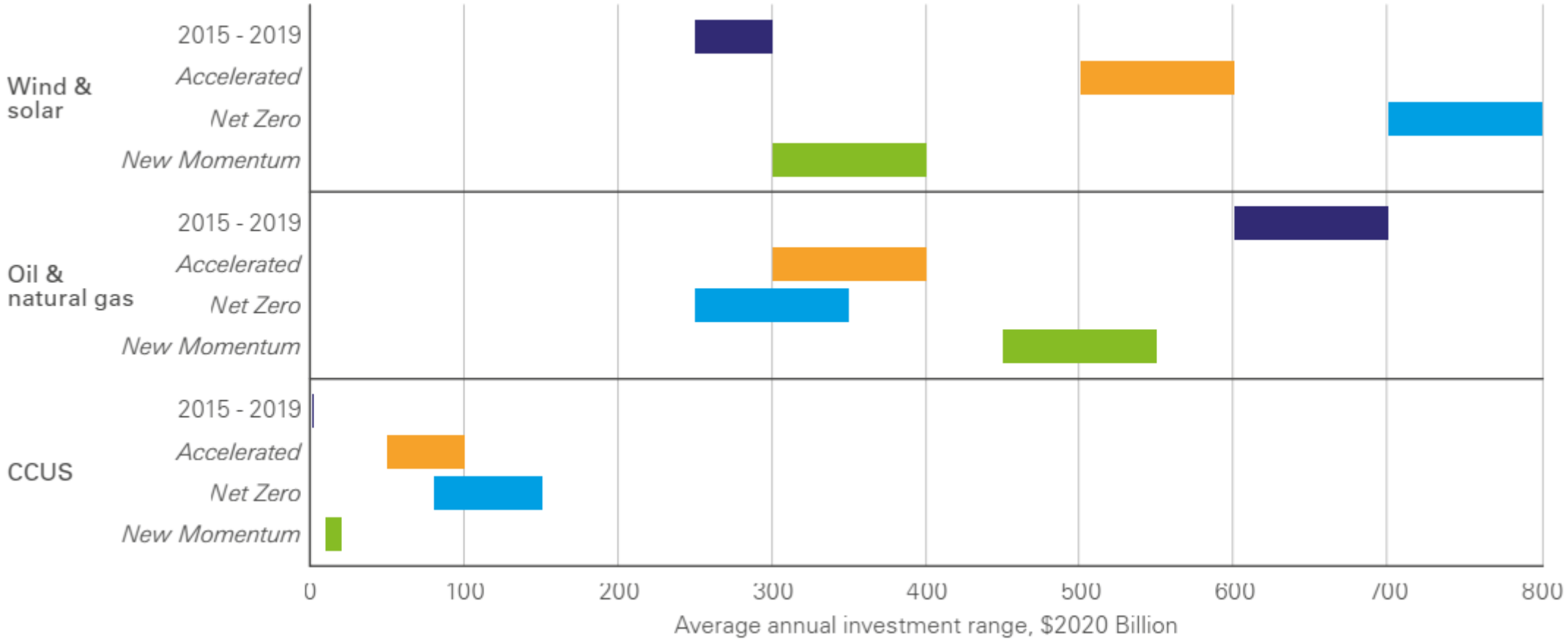
EBIT in Upstream Oil in Three Scenarios



[1]Includes government take

McKinsey The global energy landscape is going through major shifts: What does this mean for value pools in energy?

Average Annual Investment, History and 2020-2050

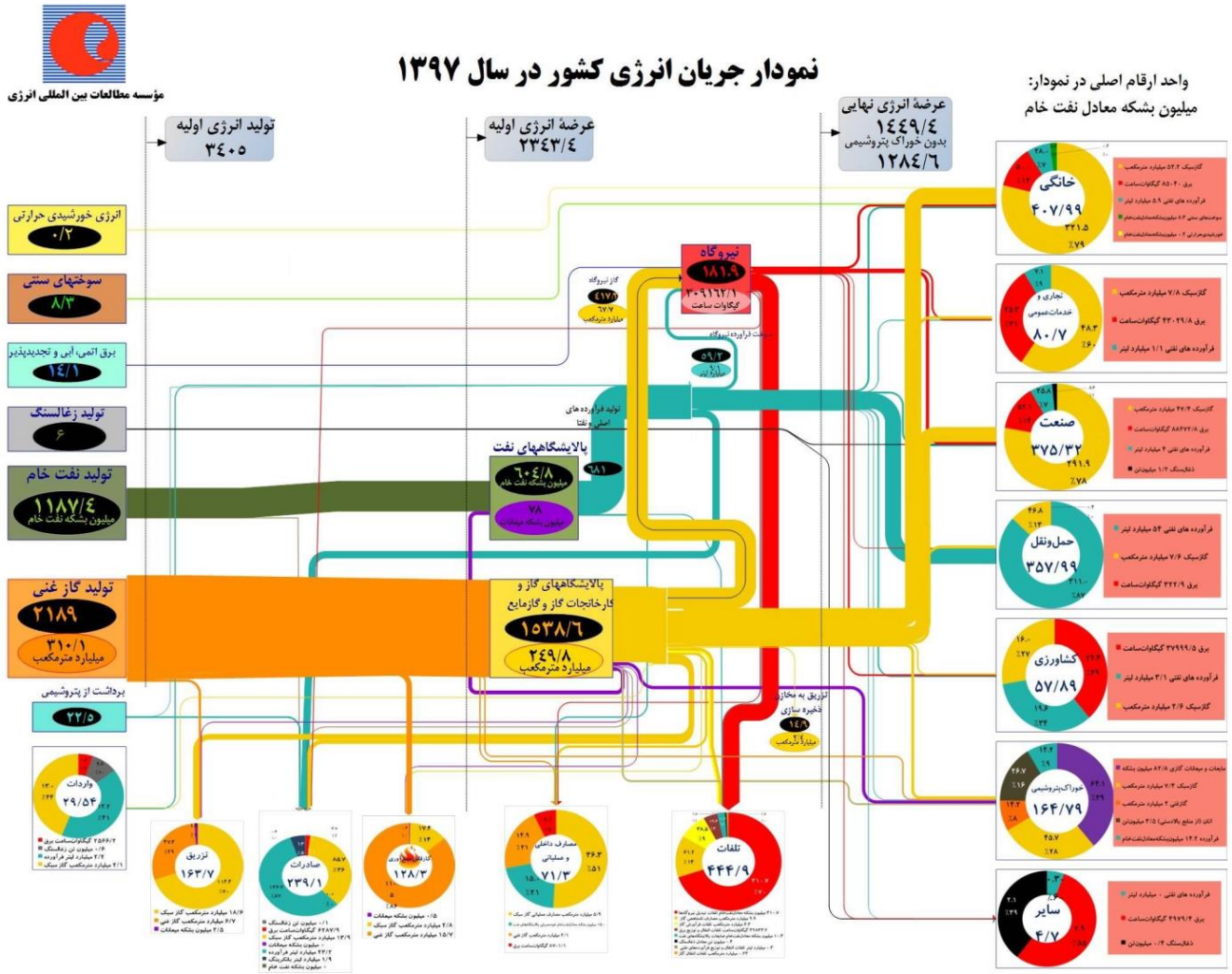


BP World Energy Outlook 2022

Iran Energy Profile

To provide an overview of Iran’s energy basket, based on Iran’s Hydrocarbon Balance 1397

Energy Flow in 1397

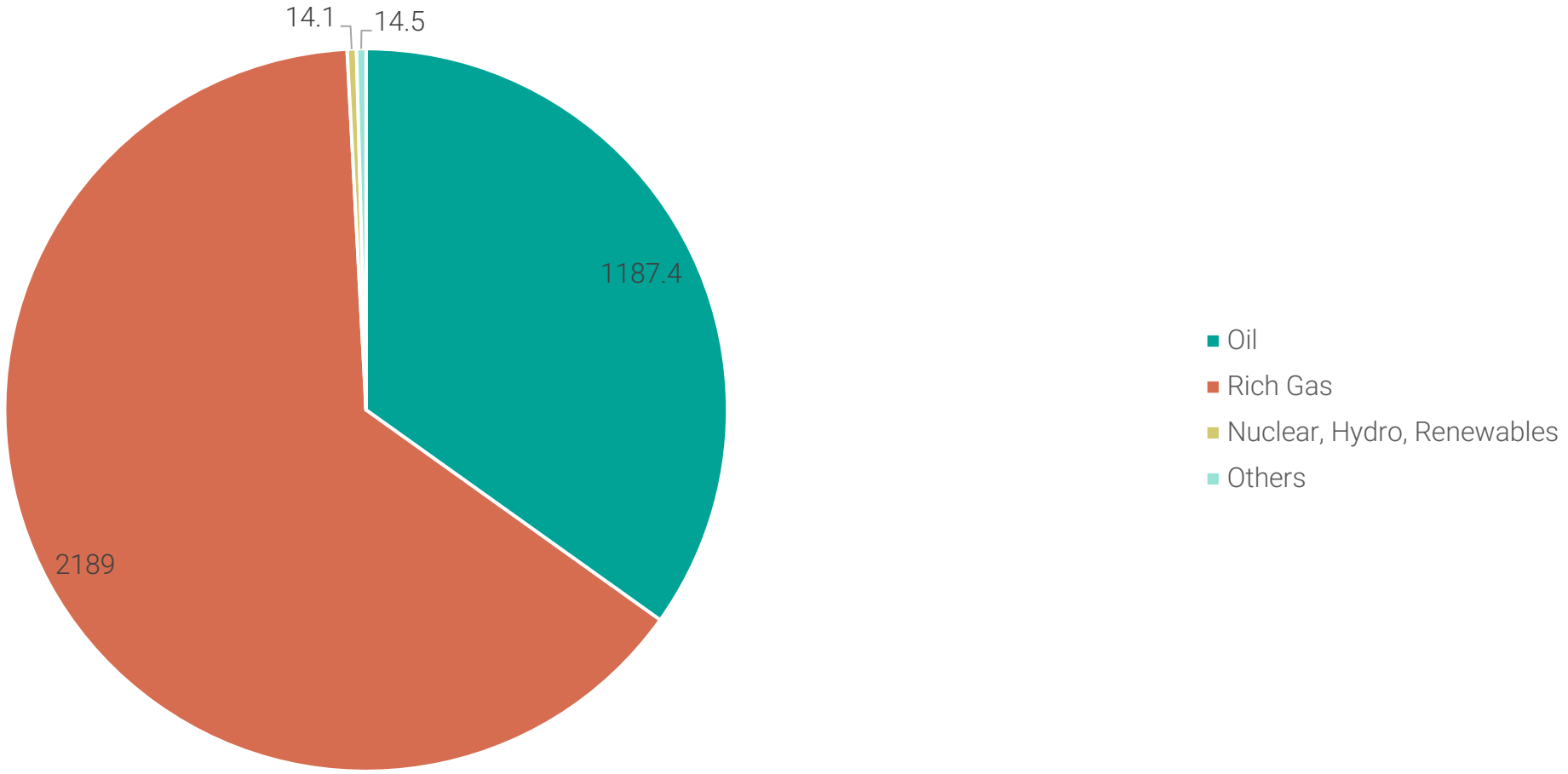


IIES Iran's hydrocarbon balance 1397

Energy Flow Summary

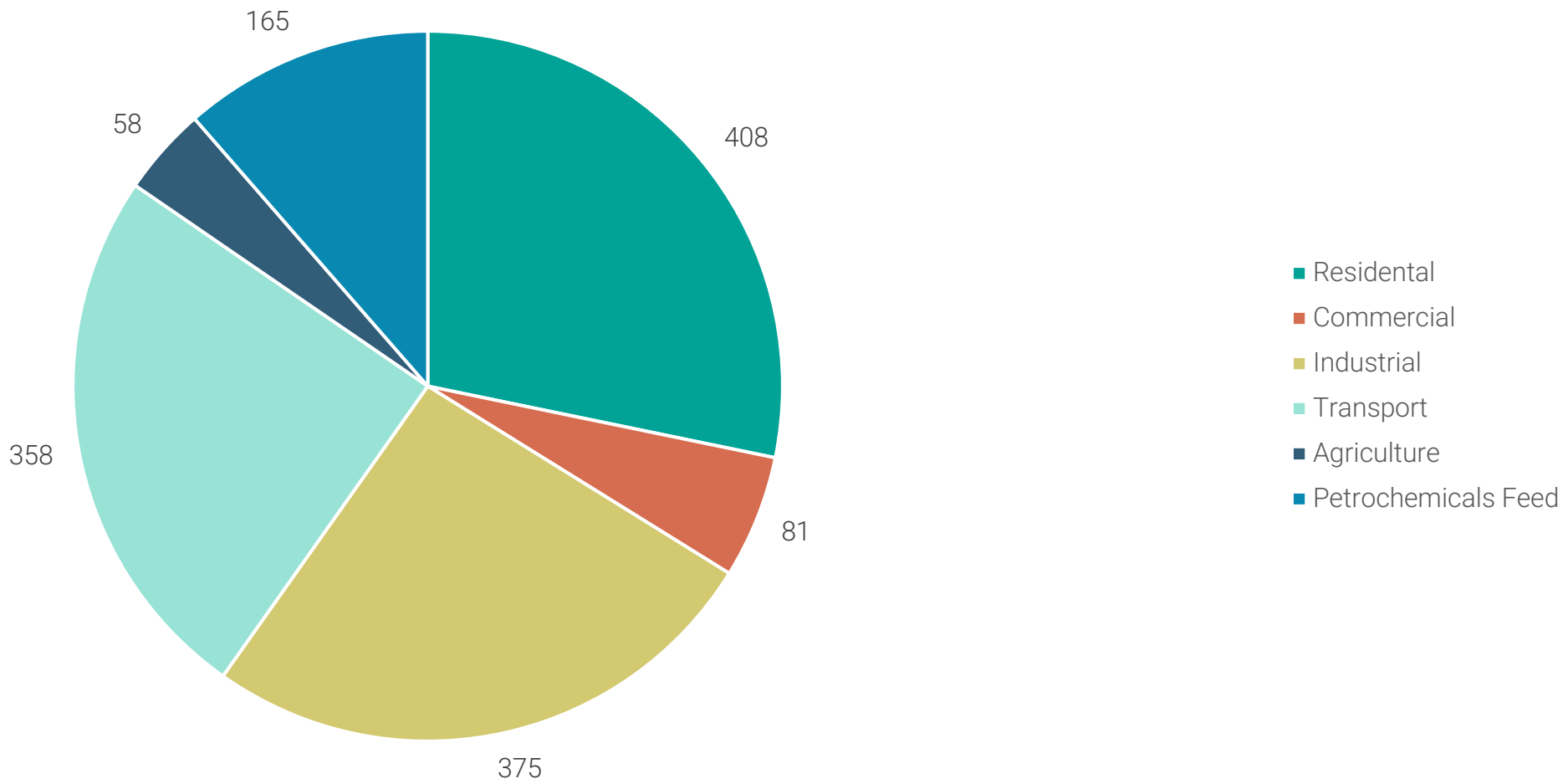
IIES Iran's hydrocarbon balance 1397

Primary Energy Production (MBOE)



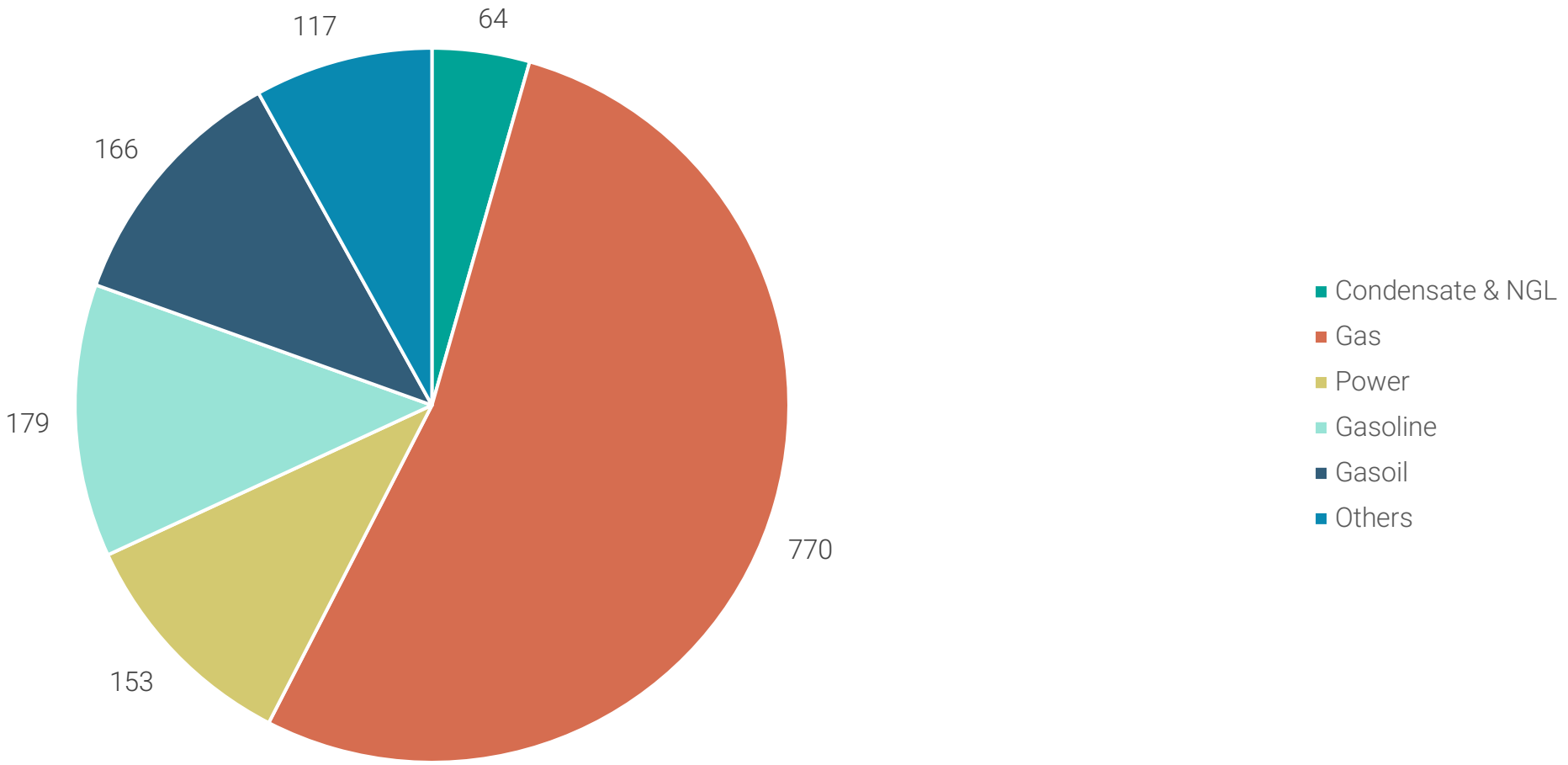
IIES Iran's hydrocarbon balance 1397

Final Energy Consumption by Sector (MBOE)



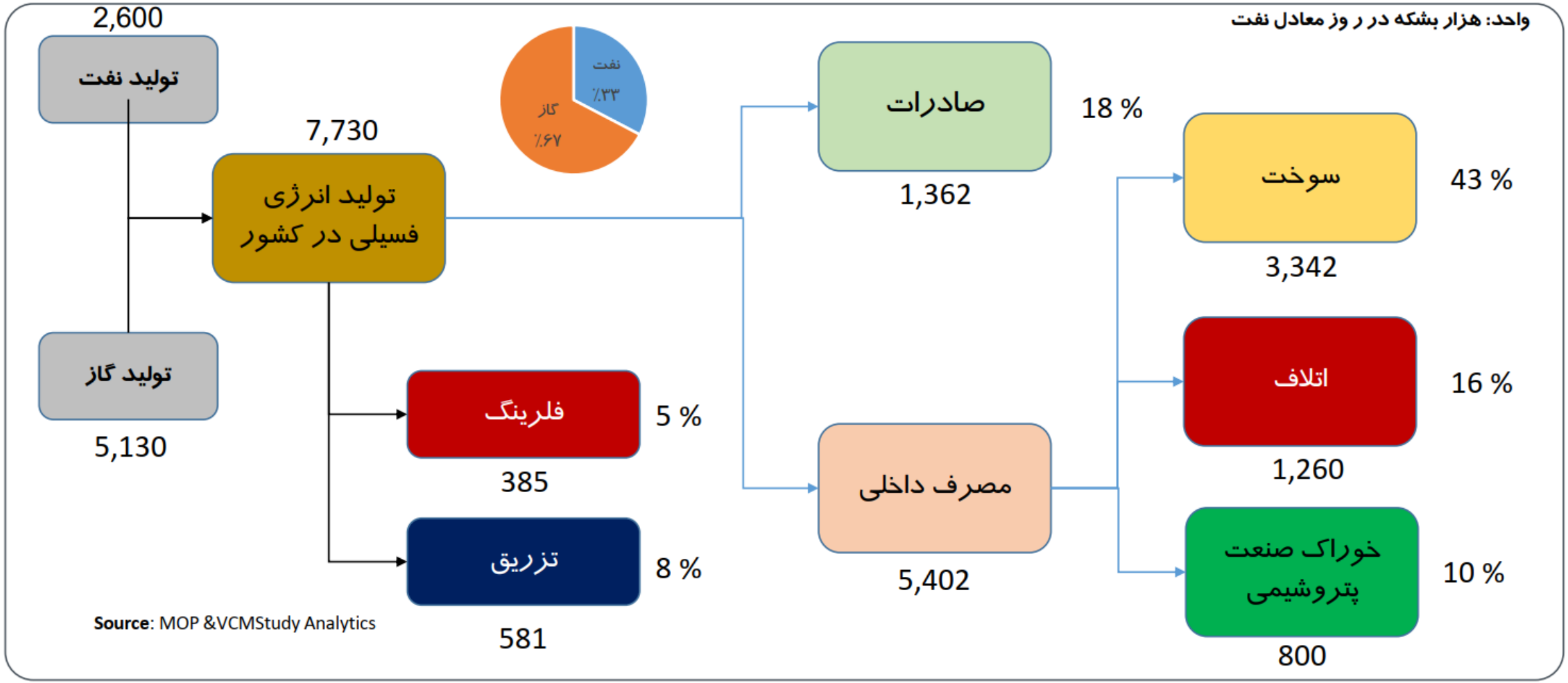
IIES Iran's hydrocarbon balance 1397

Final Energy Consumption by Fuel (MBOE)



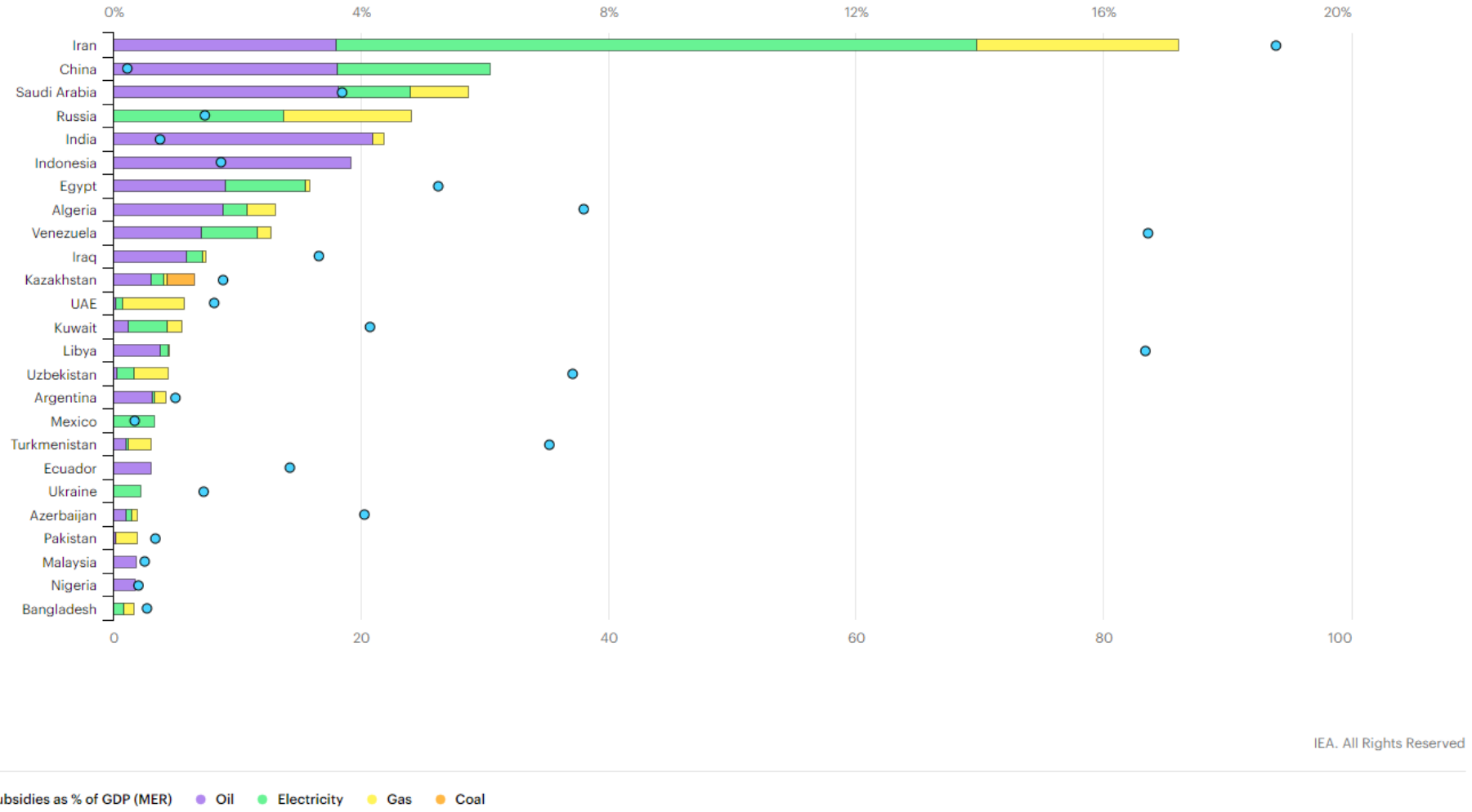
IIES Iran's hydrocarbon balance 1397

Iran Energy Flow (1399)



VCM Study

Value of Fossil-fuel Subsidies by Fuel in the Top 25 Countries (2019)



IEA

Key Issues

Energy

- Efficiency
- Subsidies
- Sustainability
- Emission

Oil & Gas

- Investment
- Fiscal Regime
- Governance
- Technology

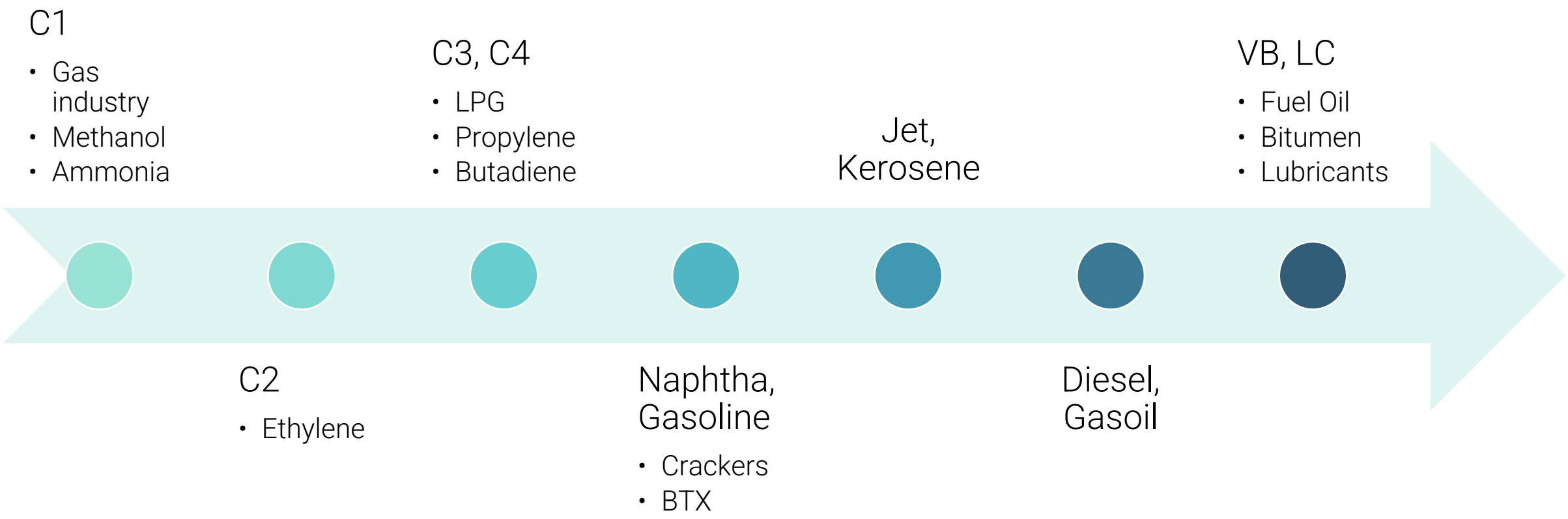
Power

- Efficiency
- Emission
- Pricing
- Investment

Carbon

To provide a high-level introduction of key elements within hydrocarbon value chain

A Simplified Overview



Gas-related Abbreviations

CNG

- Compressed Natural Gas (Cars in Iran)

LNG

- Liquified Natural Gas (Power Sector)

NGL

- Natural Gas Liquid (C2+ for Olefin, …)

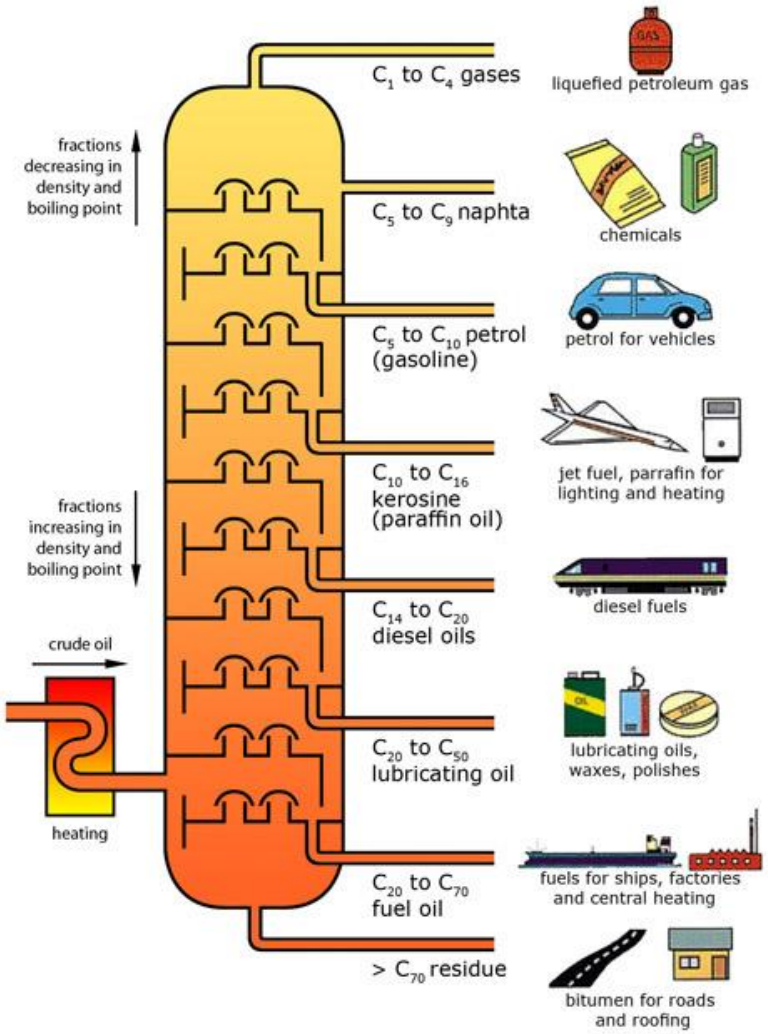
LPG

- Liquid Petroleum Gas (C3 & C4 for fuel, …)

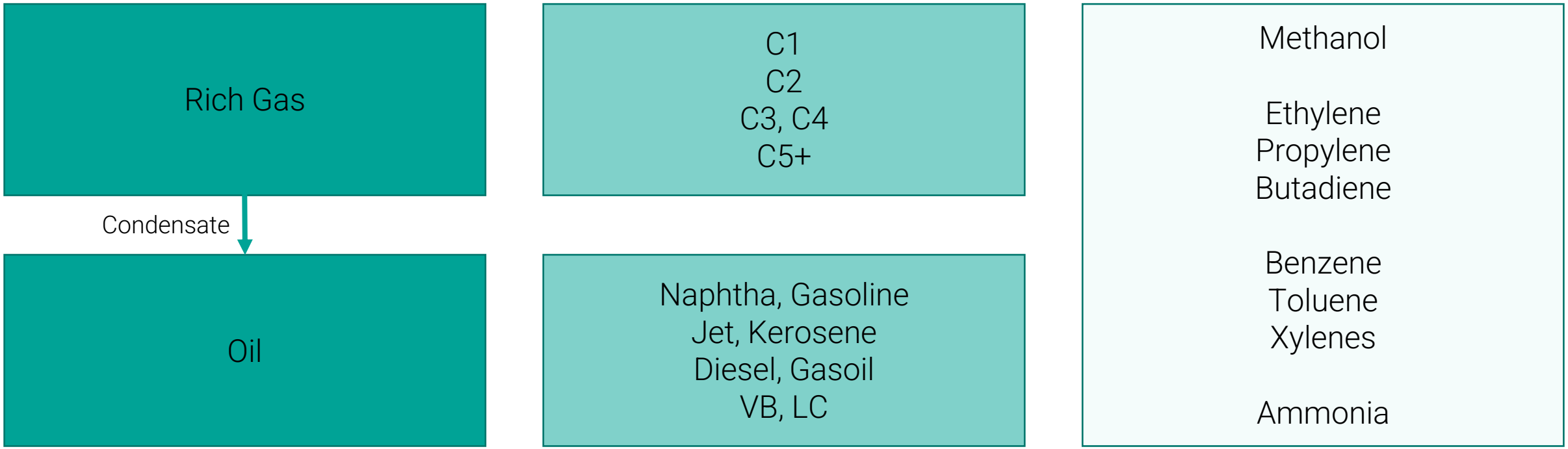
GTL

- Gas to Liquid (Convert C1 to Products)

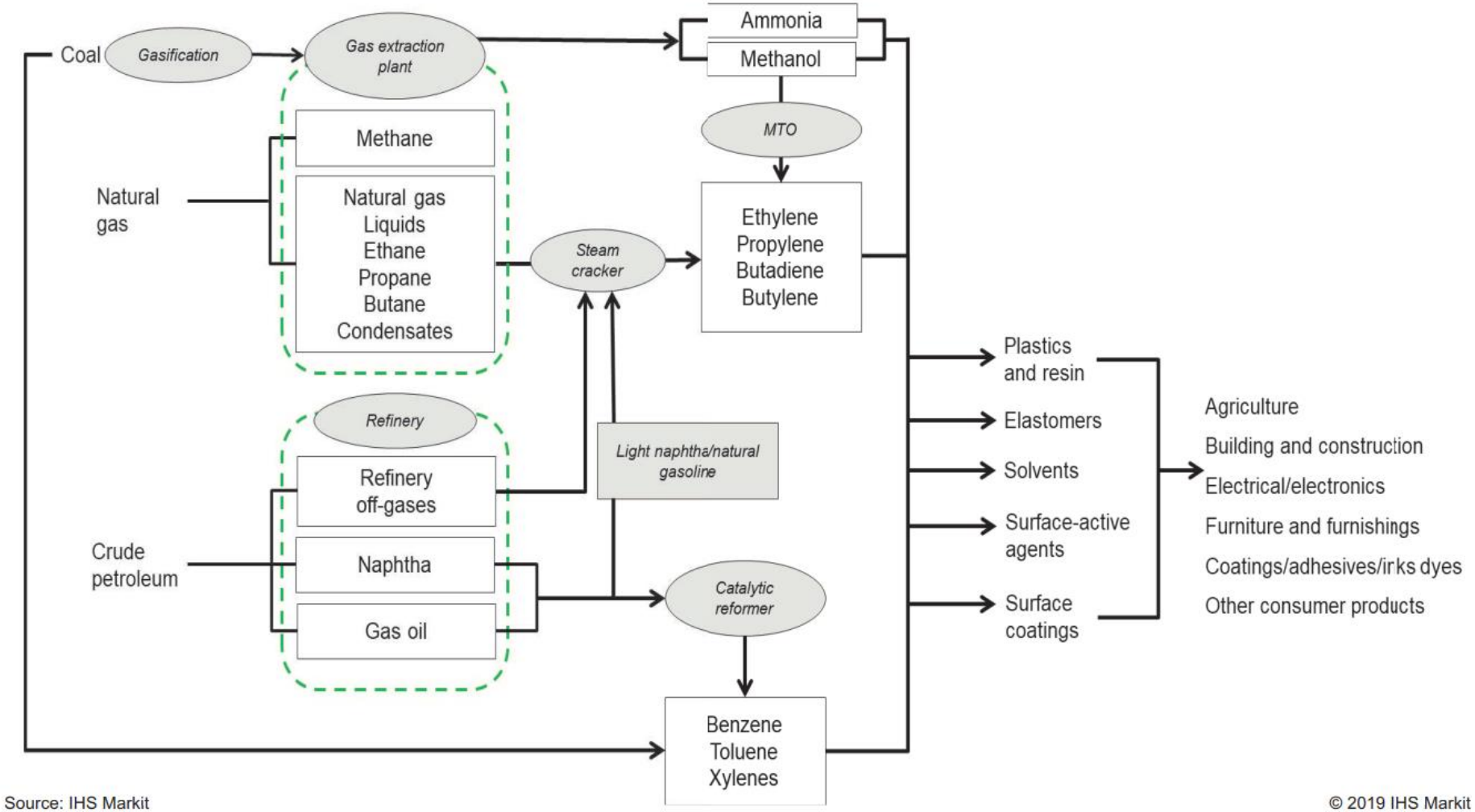
Distillation Tower



Industry Flow

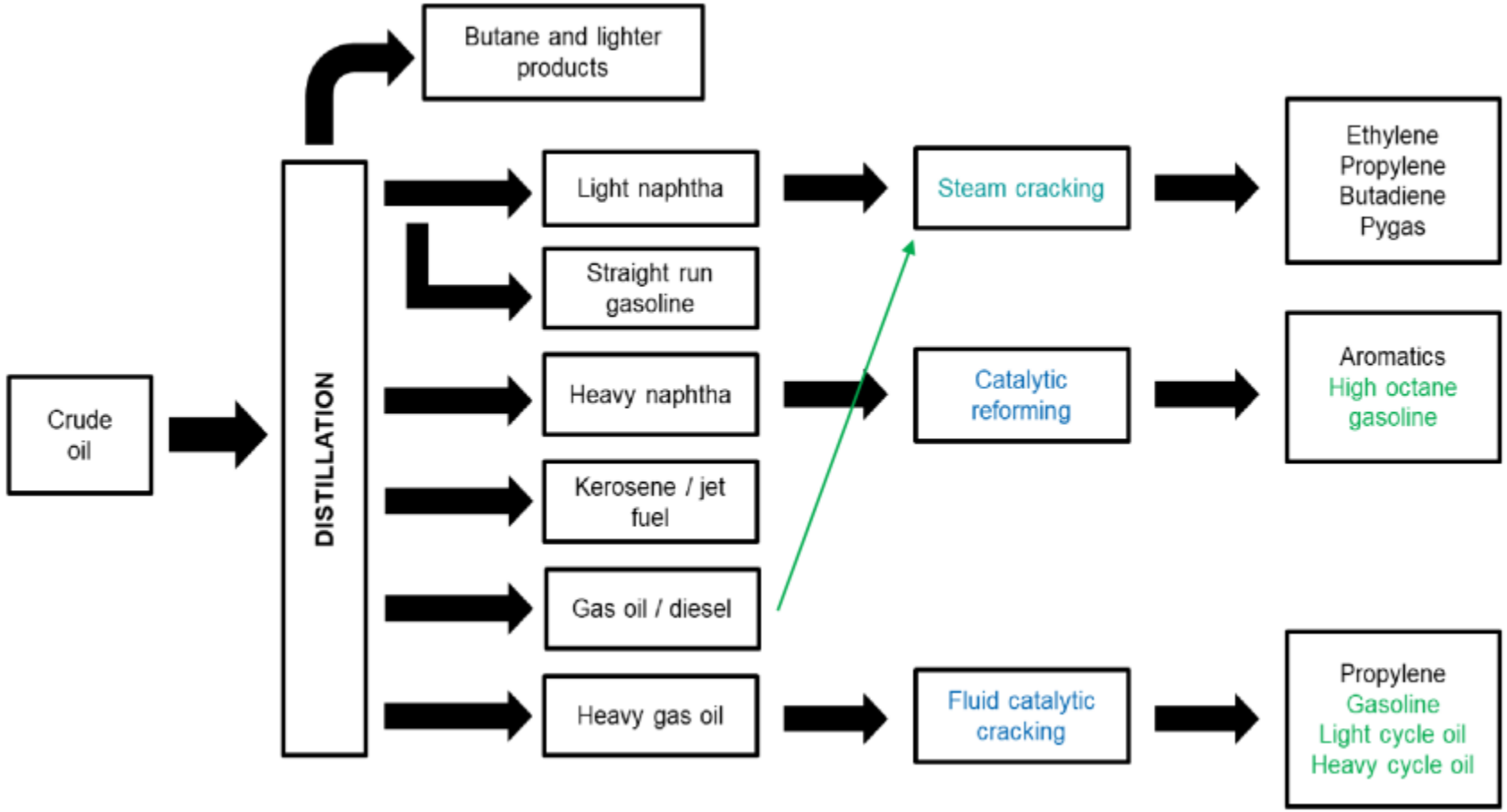


Petrochemical Feedstock and Derivatives



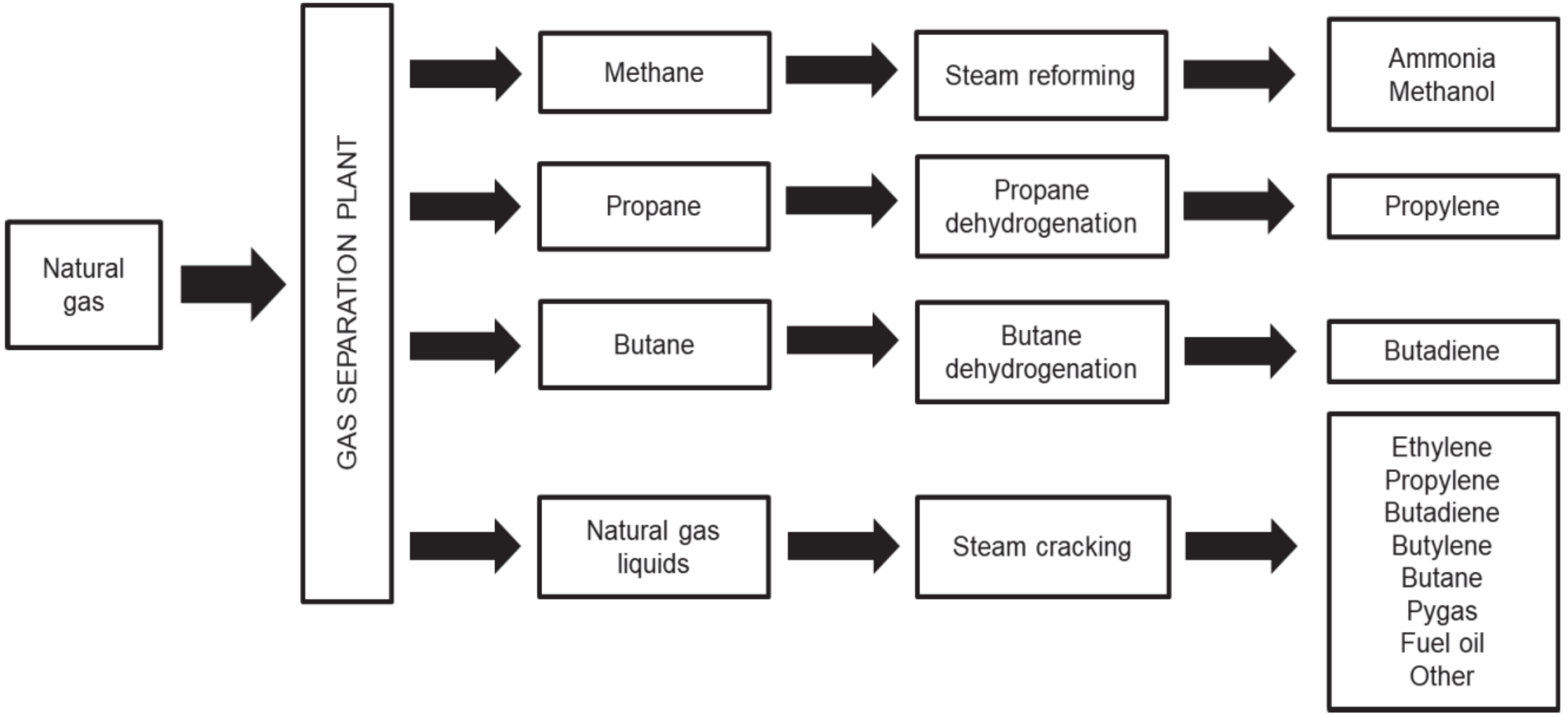
IHS Markit Petrochemical Industry Overview

From Crude Oil to Basic Petrochemicals



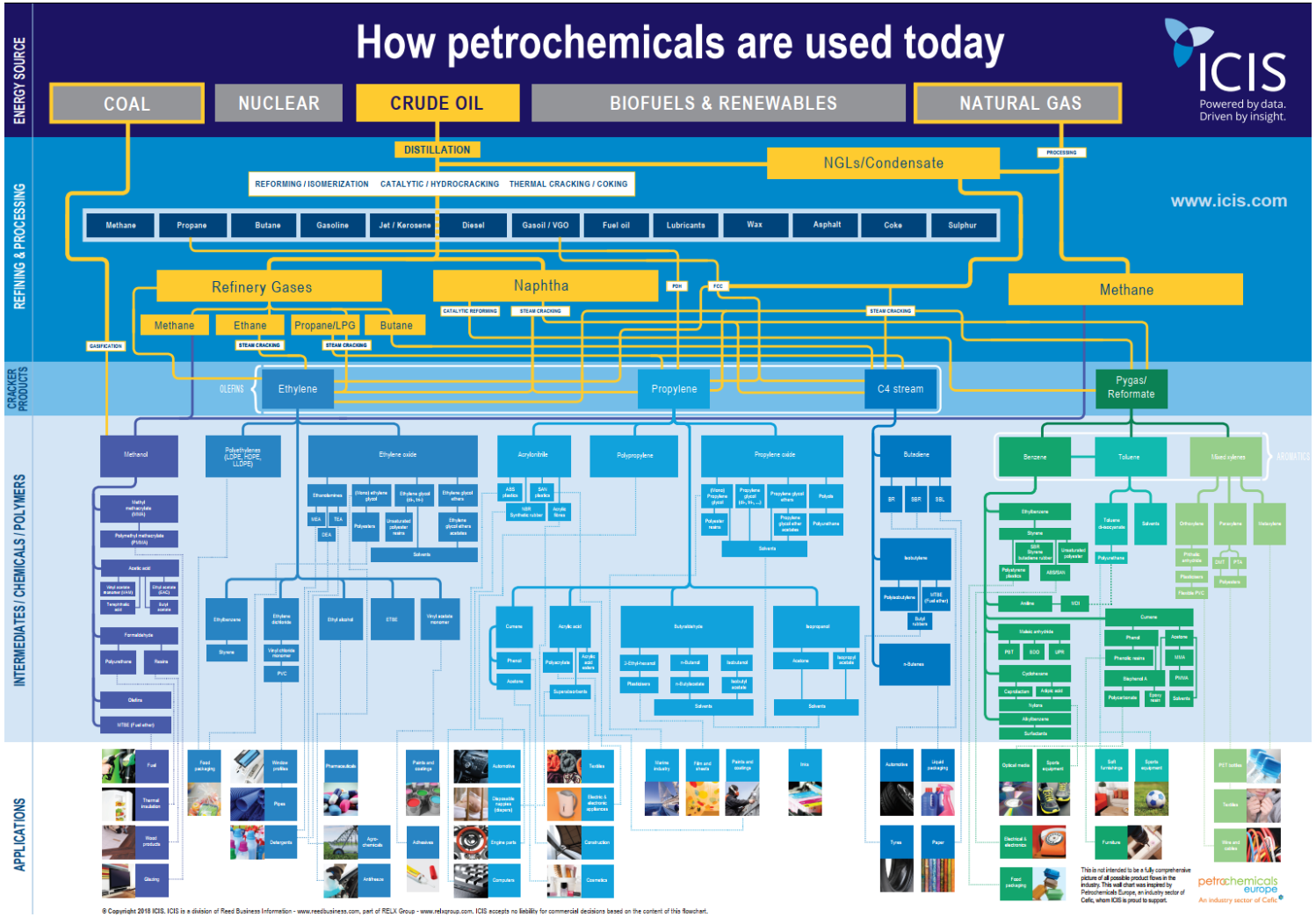
IHS Markit Petrochemical Industry Overview

From Natural Gas to Basic Petrochemicals



IHS Markit Petrochemical Industry Overview

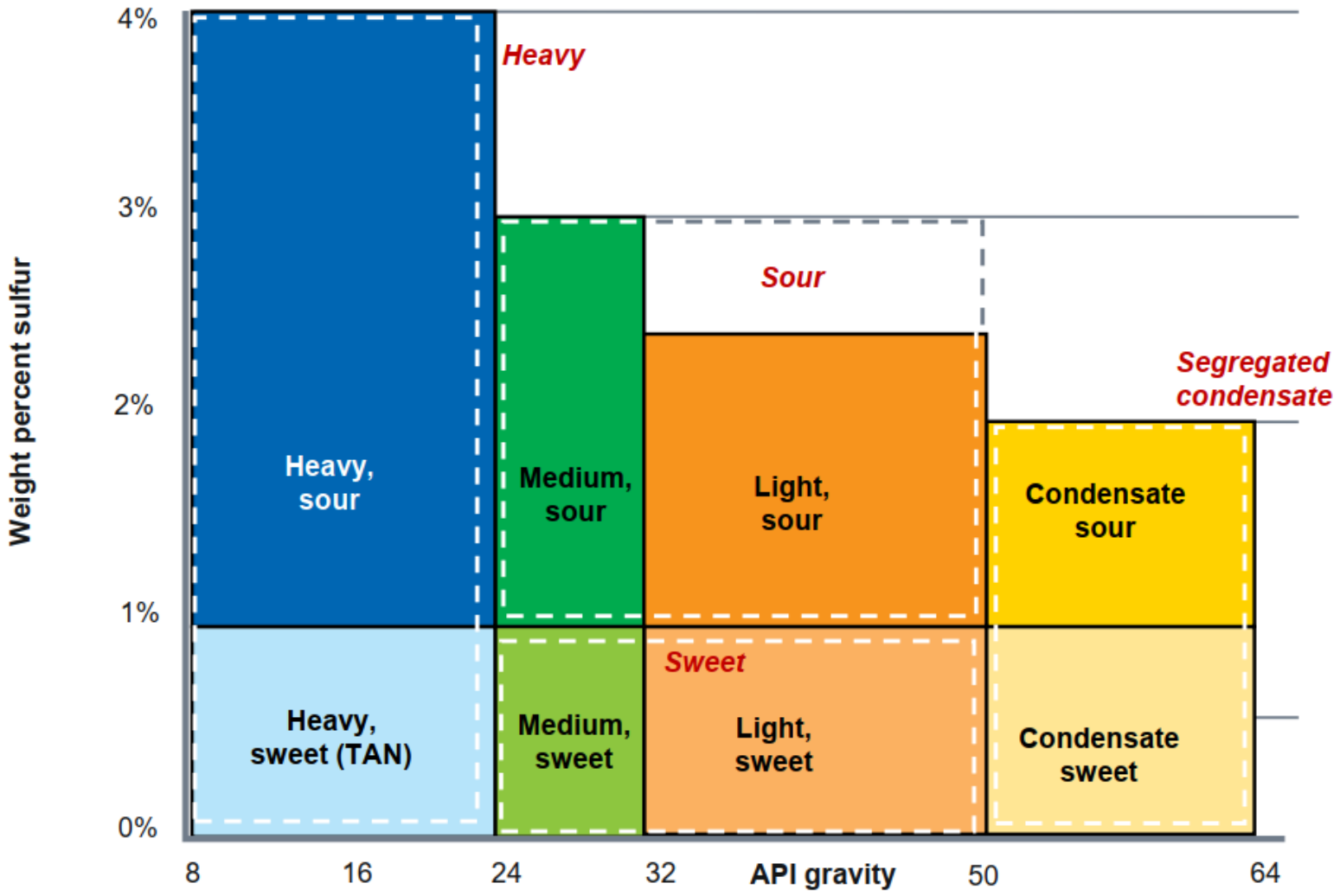
How petrochemicals are used



The Oil Market

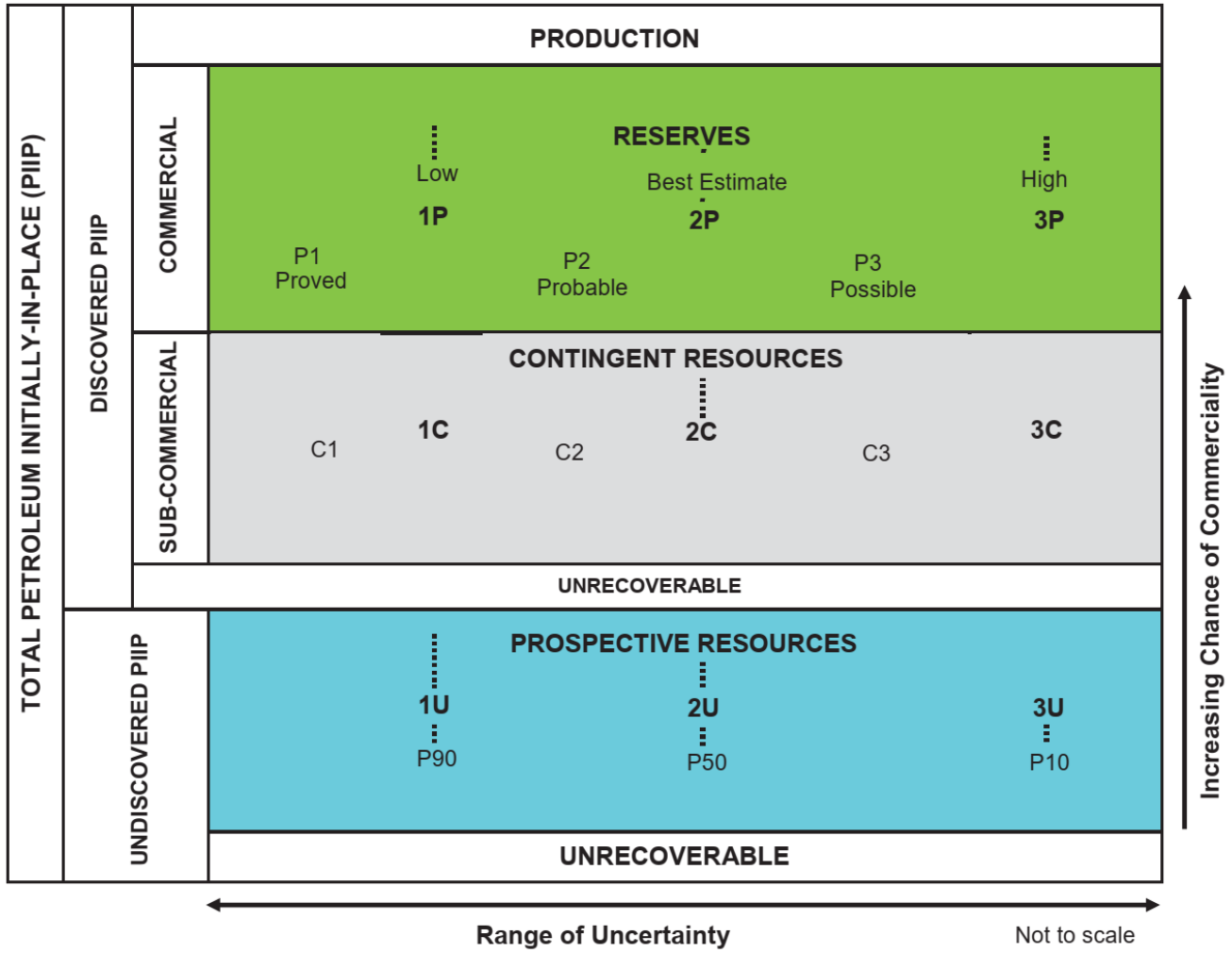
To define a supply and demand framework for short-term and long-term analysis of oil market

Oil Markets And Downstream Crude Oil Grade Map (General)



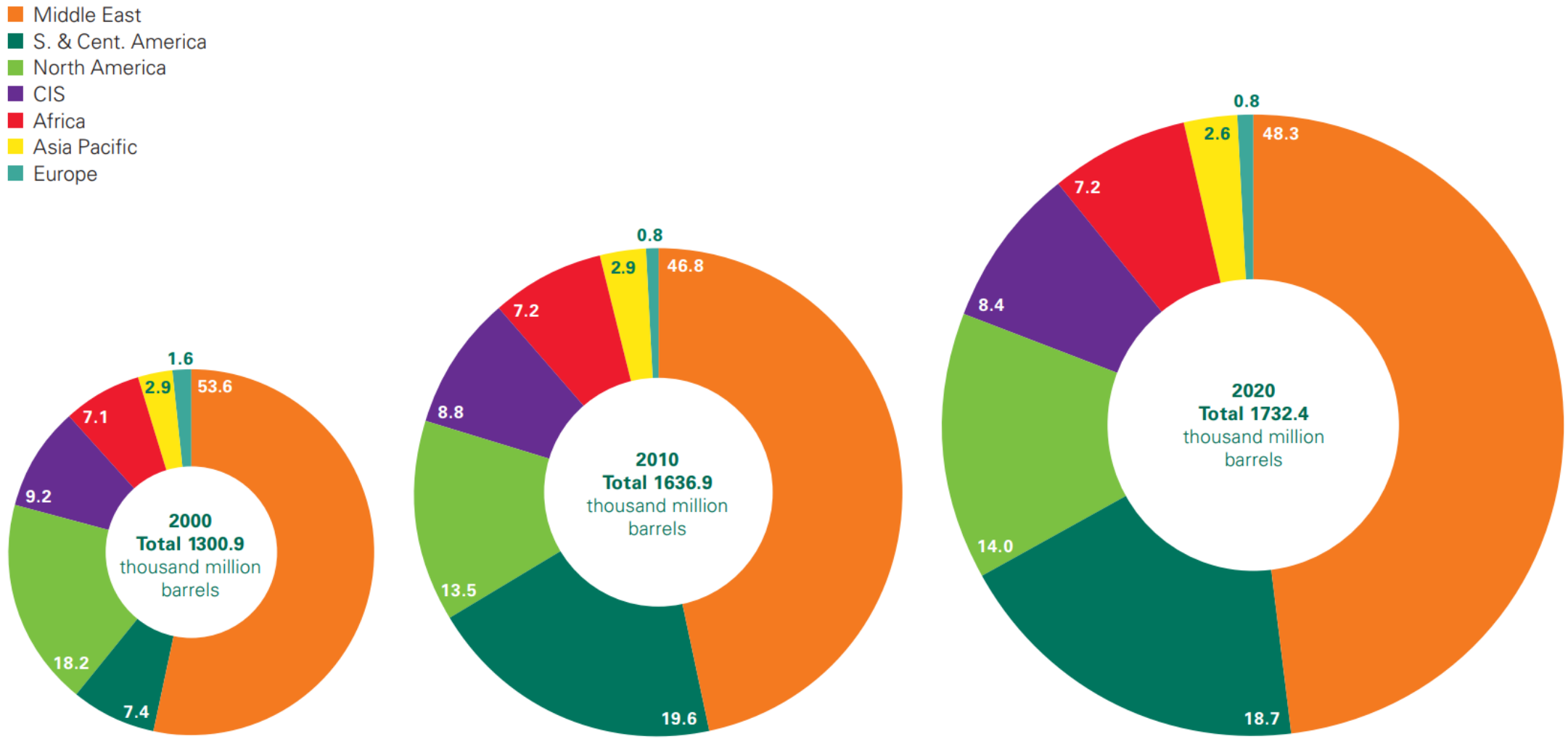
IHS Markit

Resources Classification Framework



SPE Petroleum Resources Management System

Distribution of Proved Reserves



BP Statistical Review of World Energy 2021

Top Oil Producers, Net Exporters and Net Importers

Producers	Mt	% of world total
United States	706	17.0
Russian Federation	512	12.4
Saudi Arabia	511	12.3
Canada	255	6.2
Iraq	201	4.9
People's Rep. of China	195	4.7
United Arab Emirates	174	4.2
Brazil	153	3.7
Kuwait	131	3.2
Islamic Rep. of Iran	130	3.1
Rest of the world	1 173	28.3
World	**4 141**	**100.0**

2020 provisional data

Net exporters	Mt
Saudi Arabia	352
Russian Federation	269
Iraq	195
Canada	154
United Arab Emirates	148
Kuwait	102
Nigeria	99
Kazakhstan	70
Angola	63
Mexico	59
Others	531
Total	**2 042**

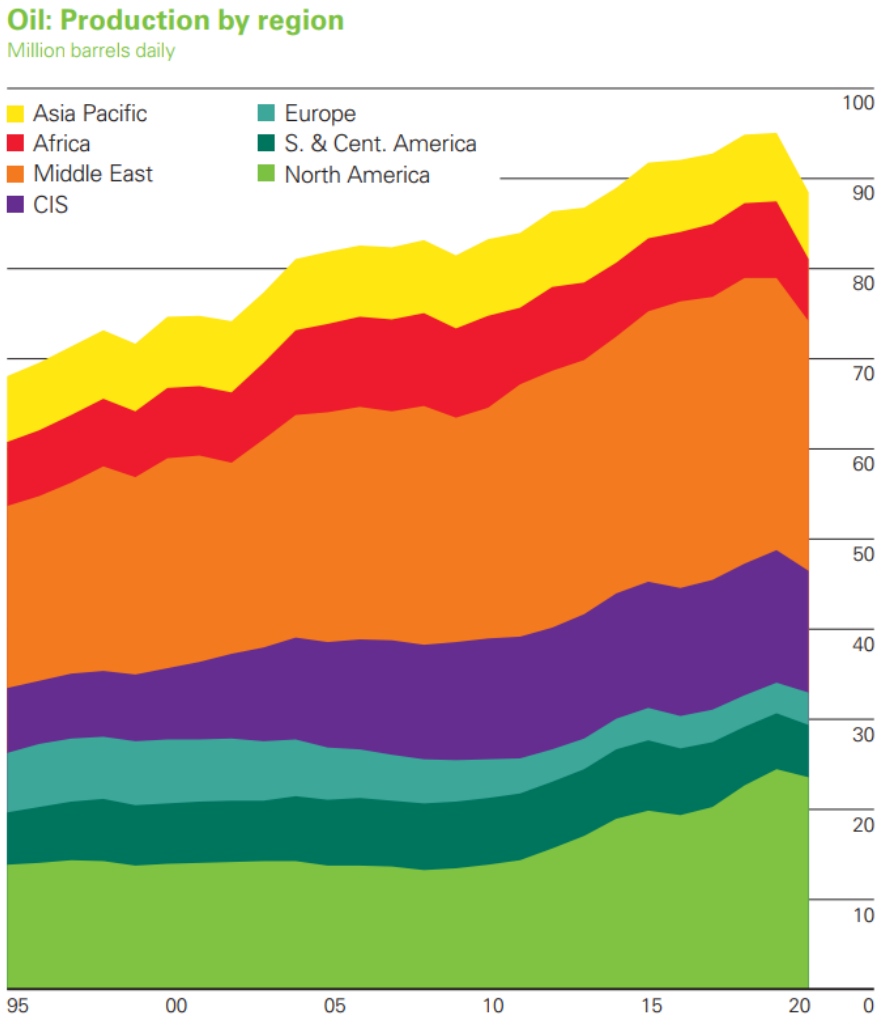
2019 data

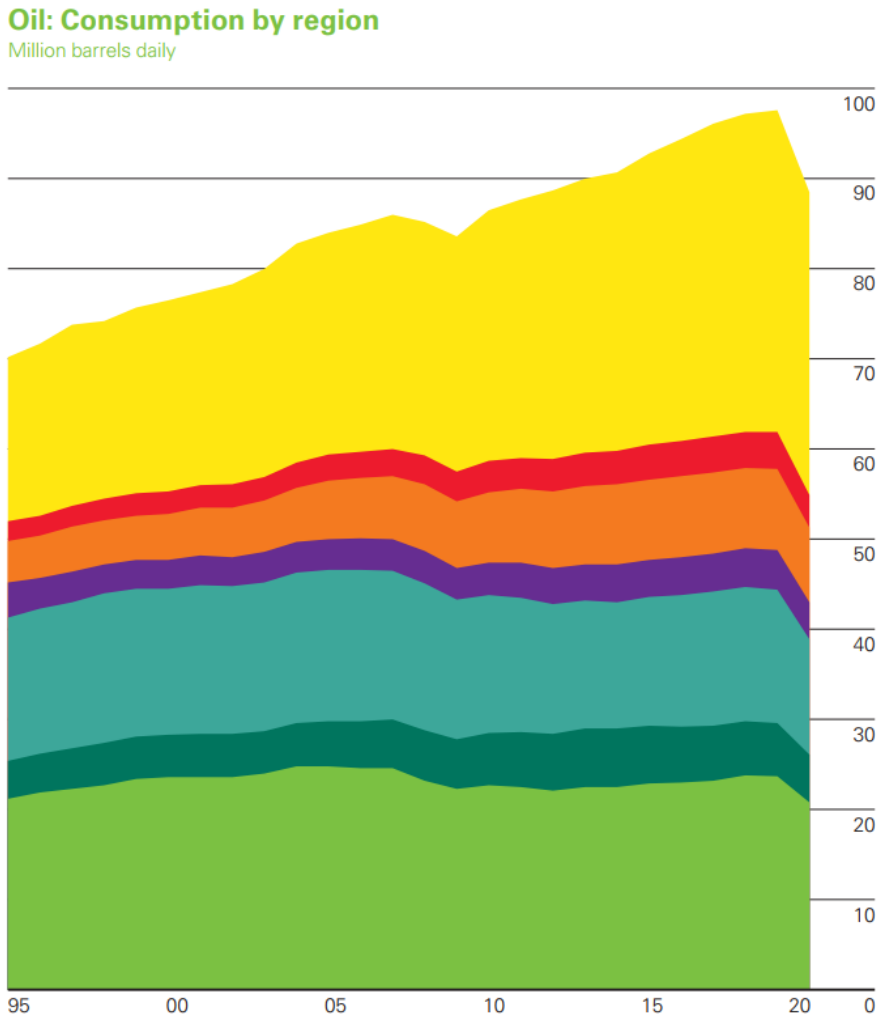
Net importers	Mt
People's Rep. of China	505
India	227
United States	202
Japan	149
Korea	145
Germany	86
Spain	66
Italy	65
Netherlands	62
Singapore	53
Others	509
Total	**2 069**

2019 data

IEA Key World Energy Statistics 2021

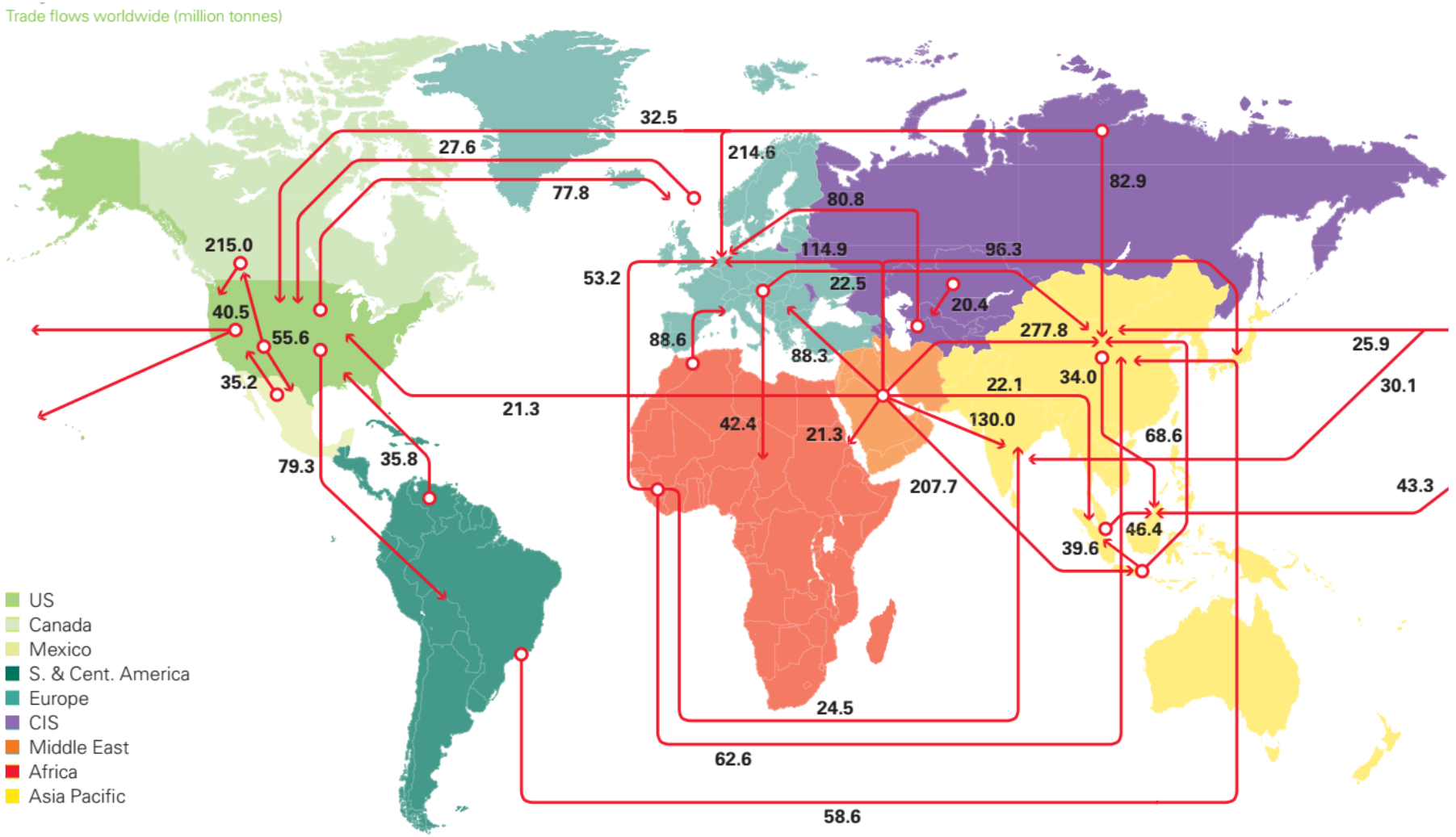
Oil Production and Consumption by Region





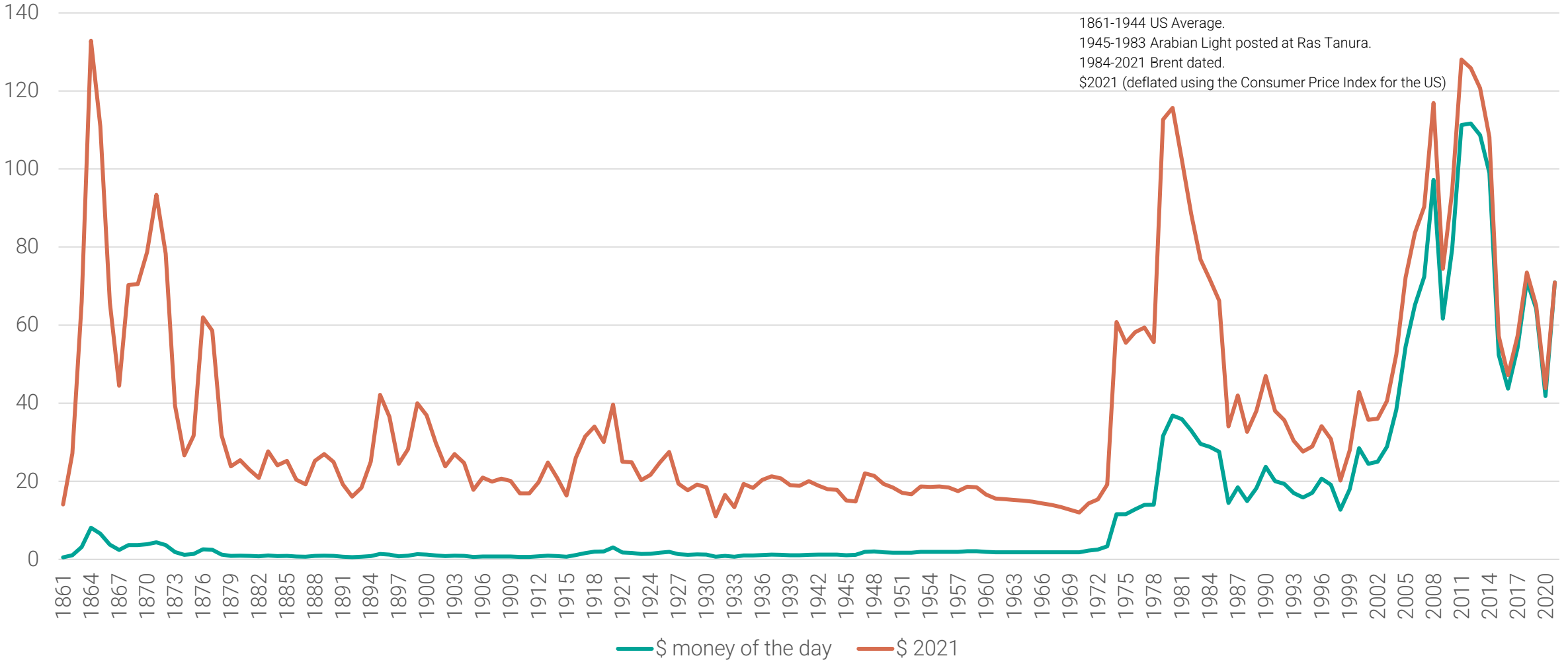
BP Statistical Review of World Energy 2021

Major Oil Trade Movements (2021)



BP Statistical Review of World Energy 2022

Crude Oil Prices (Nominal and Real)



BP Statistical Review of World Energy 2022

Short-to-medium Term Oil Price Forecast Methodology

Demand

- GDP Growth
- Mobility
- Industry Activity

Supply

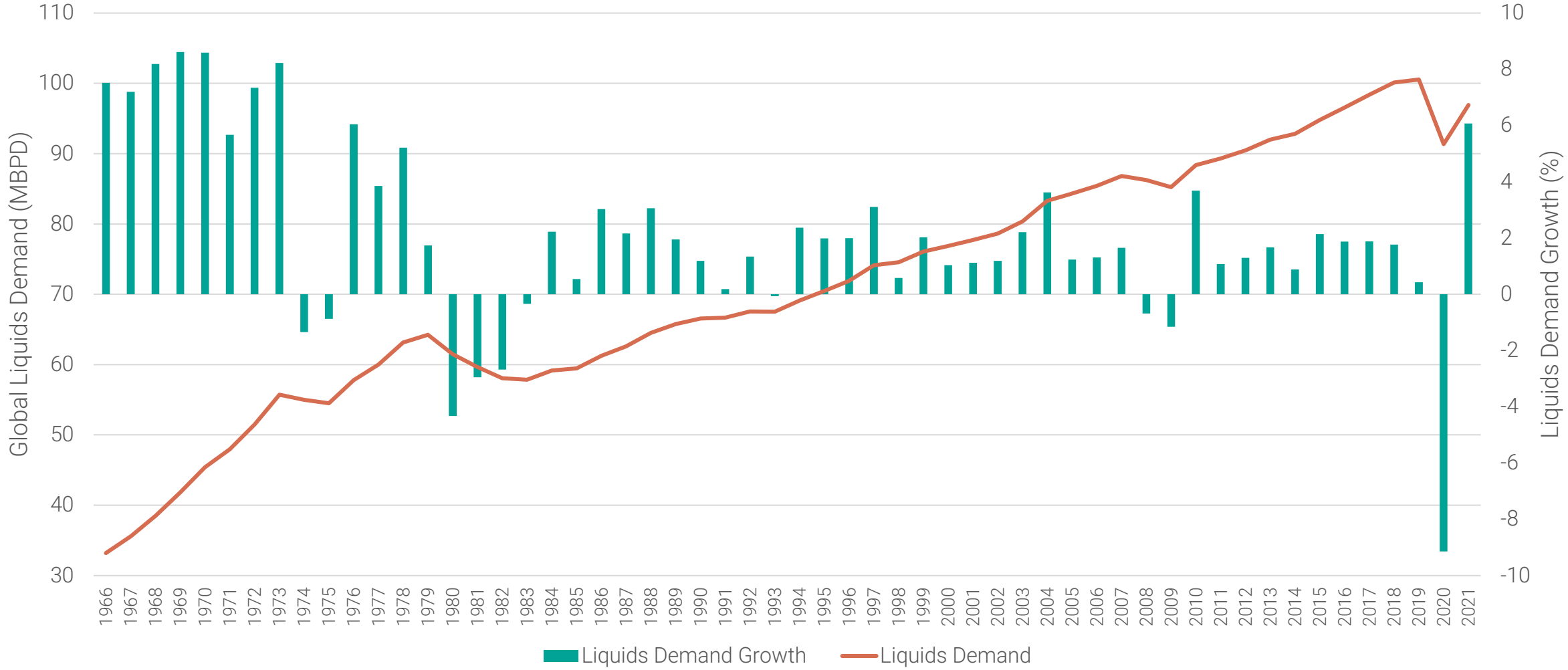
- Non-OPEC+
- Shale Oil
- OPEC+

Stocks

- OECD Commercial Stocks
- SPR
- Major Hubs

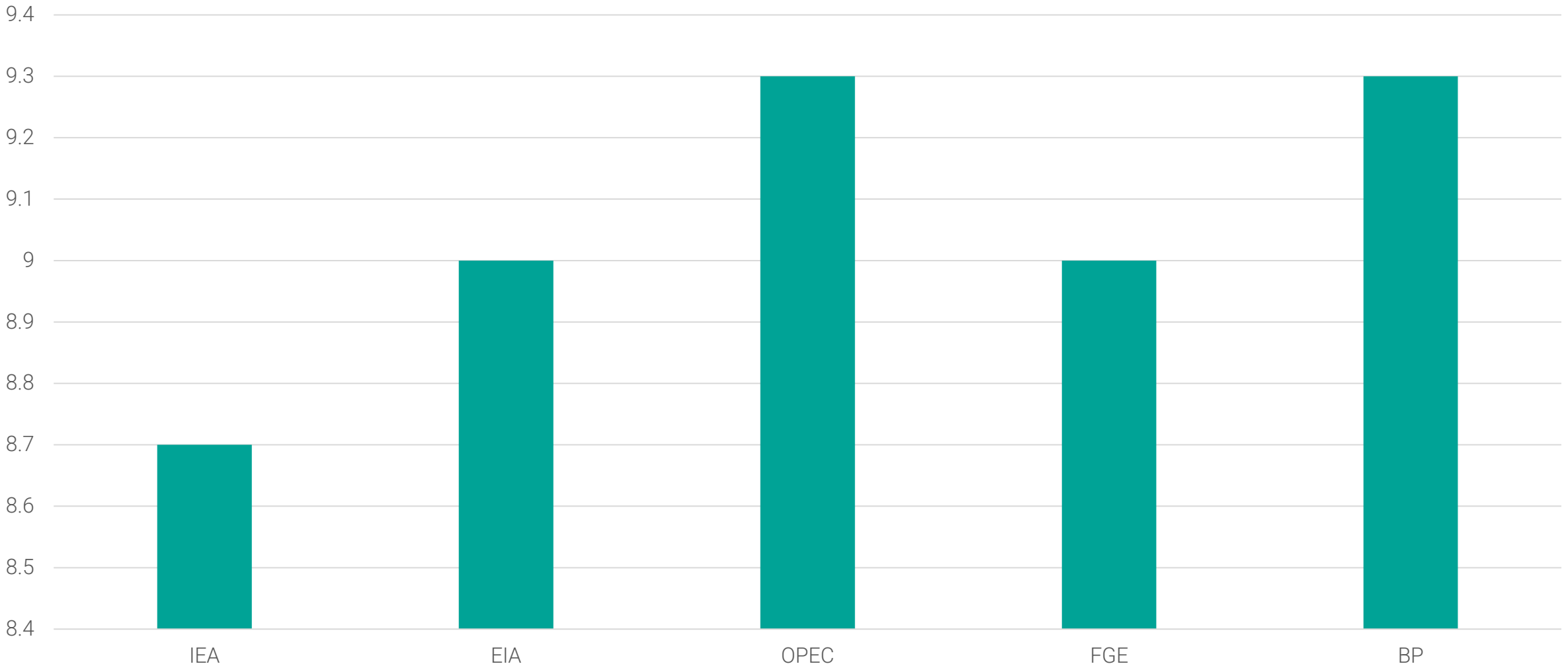
Outlook

Global Liquids Demand and Demand Growth



BP Statistical Review of World Energy 2022

Demand Destruction in 2020 (MBPD)



World Oil Demand (MBPD)

World oil demand	2021	1Q22	2Q22	3Q22	4Q22	2022	Change 2022/21 Growth	Change 2022/21 %
Americas	24.28	24.84	24.99	25.49	25.76	25.27	1.00	4.11
of which US	*19.93*	*20.38*	*20.57*	*20.99*	*21.21*	*20.79*	*0.86*	*4.34*
Europe	13.08	13.09	13.31	14.29	14.15	13.71	0.63	4.81
Asia Pacific	7.41	7.91	7.19	7.25	7.93	7.57	0.16	2.16
Total OECD	**44.77**	**45.83**	**45.49**	**47.03**	**47.84**	**46.55**	**1.79**	**3.99**
China	14.94	14.67	14.96	15.42	15.97	15.26	0.32	2.14
India	4.77	5.18	4.95	5.01	5.39	5.13	0.36	7.53
Other Asia	8.63	9.09	9.54	8.93	8.95	9.12	0.50	5.77
Latin America	6.23	6.32	6.28	6.53	6.42	6.39	0.16	2.63
Middle East	7.79	8.06	7.82	8.32	8.09	8.07	0.28	3.59
Africa	4.22	4.51	4.15	4.23	4.54	4.36	0.14	3.23
Russia	3.61	3.67	3.28	3.45	3.54	3.48	-0.13	-3.58
Other Eurasia	1.21	1.22	1.15	1.01	1.24	1.15	-0.06	-4.71
Other Europe	0.75	0.79	0.71	0.73	0.80	0.76	0.01	1.01
Total Non-OECD	**52.15**	**53.50**	**52.85**	**53.62**	**54.93**	**53.73**	**1.58**	**3.03**
Total World	**96.92**	**99.33**	**98.33**	**100.65**	**102.77**	**100.29**	**3.36**	**3.47**
Previous Estimate	96.92	99.28	98.19	100.85	102.77	100.29	3.36	3.47
Revision	0.00	0.06	0.15	-0.20	0.00	0.00	0.00	0.00

OPEC Monthly Oil Market Report July 2022

Non-OPEC Liquids Production

Non-OPEC liquids production	2021	1Q22	2Q22	3Q22	4Q22	2022	Change 2022/21 Growth	Change 2022/21 %
Americas	25.16	25.86	26.35	26.95	27.46	26.66	1.50	5.97
of which US	*17.75*	*18.26*	*18.94*	*19.27*	*19.67*	*19.04*	*1.28*	*7.23*
Europe	3.76	3.73	3.58	3.79	4.12	3.81	0.05	1.27
Asia Pacific	0.51	0.49	0.52	0.56	0.54	0.53	0.01	2.80
Total OECD	**29.43**	**30.08**	**30.45**	**31.30**	**32.12**	**30.99**	**1.56**	**5.31**
China	4.31	4.49	4.49	4.42	4.43	4.46	0.15	3.49
India	0.77	0.77	0.78	0.80	0.83	0.79	0.02	2.72
Other Asia	2.41	2.37	2.36	2.36	2.35	2.36	-0.05	-1.90
Latin America	5.95	6.14	6.22	6.21	6.43	6.25	0.30	4.96
Middle East	3.24	3.29	3.31	3.38	3.38	3.34	0.10	3.14
Africa	1.35	1.33	1.29	1.31	1.32	1.31	-0.03	-2.55
Russia	10.80	11.33	10.63	10.29	10.29	10.63	-0.17	-1.57
Other Eurasia	2.93	3.06	2.91	3.17	3.22	3.09	0.16	5.38
Other Europe	0.11	0.11	0.11	0.10	0.10	0.11	-0.01	-6.36
Total Non-OECD	**31.87**	**32.88**	**32.10**	**32.04**	**32.35**	**32.34**	**0.47**	**1.47**
Total Non-OPEC production	61.30	62.96	62.54	63.34	64.48	63.33	2.03	3.32
Processing gains	2.29	2.40	2.40	2.40	2.40	2.40	0.11	4.90
Total Non-OPEC liquids production	**63.59**	**65.36**	**64.94**	**65.74**	**66.88**	**65.73**	**2.15**	**3.37**
Previous estimate	63.60	65.37	64.80	65.79	67.00	65.74	2.15	3.38
Revision	-0.01	-0.01	0.14	-0.05	-0.12	-0.01	0.00	0.00

OPEC Monthly Oil Market Report July 2022

OPEC Crude Oil Production (Secondary Sources)

Secondary sources	2020	2021	4Q21	1Q22	2Q22	Apr 22	May 22	Jun 22	*Change* Jun/May
Algeria	904	913	959	984	1,013	1,004	1,013	1,021	*9*
Angola	1,247	1,117	1,124	1,152	1,173	1,180	1,155	1,182	*27*
Congo	293	265	265	264	266	263	270	265	*-5*
Equatorial Guinea	114	98	87	92	94	96	93	92	*-1*
Gabon	191	182	185	199	187	199	173	189	*16*
IR Iran	1,991	2,392	2,472	2,528	2,560	2,565	2,543	2,574	*31*
Iraq	4,076	4,049	4,240	4,286	4,428	4,433	4,416	4,434	*17*
Kuwait	2,439	2,419	2,531	2,612	2,689	2,660	2,688	2,718	*29*
Libya	366	1,143	1,111	1,063	743	893	707	629	*-78*
Nigeria	1,575	1,372	1,321	1,376	1,252	1,285	1,233	1,238	*5*
Saudi Arabia	9,204	9,113	9,879	10,164	10,458	10,364	10,425	10,585	*159*
UAE	2,804	2,727	2,861	2,954	3,047	3,015	3,044	3,083	*39*
Venezuela	512	555	662	684	716	721	720	706	*-14*
Total OPEC	**25,716**	**26,347**	**27,696**	**28,358**	**28,624**	**28,678**	**28,482**	**28,716**	***234***

OPEC Monthly Oil Market Report July 2022

OPEC Crude Oil Production (Direct Communications)

Direct communication	2020	2021	4Q21	1Q22	2Q22	Apr 22	May 22	Jun 22	*Change* Jun/May
Algeria	899	911	958	984	1,016	1,006	1,015	1,027	*12*
Angola	1,271	1,124	1,123	1,161	1,173	1,183	1,162	1,175	*13*
Congo	300	267	260	267	..	261	261	..	..
Equatorial Guinea	114	93	79	95	91	95	89	91	*2*
Gabon	207	181	183	197	..	174	183	..	..
IR Iran	..	..	..	..	..	..	..	..	..
Iraq	3,997	3,971	4,167	4,188	4,472	4,430	4,470	4,515	*45*
Kuwait	2,438	2,415	2,528	2,612	2,694	2,664	2,694	2,724	*30*
Libya	389	1,207	1,182	1,151	..	..	..	..	..
Nigeria	1,493	1,323	1,260	1,299	1,133	1,219	1,024	1,158	*134*
Saudi Arabia	9,213	9,125	9,905	10,224	10,542	10,441	10,538	10,646	*109*
UAE	2,779	2,718	2,854	2,949	3,042	3,011	3,032	3,083	*51*
Venezuela	569	636	817	756	745	775	735	727	*-8*
Total OPEC	..	..	..	..	..	..	..	..	..

OPEC Monthly Oil Market Report July 2022

OPEC Secondary Sources

Platts

Argus

Energy Intelligence

IHS Markit

IEA

EIA

Market Balance by OPEC

	2021	1Q22	2Q22	3Q22	4Q22	2022	Change 2022/21
(a) World oil demand	96.92	99.33	98.33	100.65	102.77	100.29	3.36
Non-OPEC liquids production	63.59	65.36	64.94	65.74	66.88	65.73	2.15
OPEC NGL and non-conventionals	5.28	5.35	5.38	5.41	5.43	5.39	0.11
(b) Total non-OPEC liquids production and OPEC NGLs	68.87	70.71	70.32	71.14	72.31	71.13	2.25
Difference (a-b)	28.05	28.63	28.01	29.50	30.46	29.16	1.11
OPEC crude oil production	26.35	28.36	28.62				
Balance	-1.70	-0.27	0.61				

*Note: * 2022 = Forecast. Totals may not add up due to independent rounding. Source: OPEC.*

	2022	1Q23	2Q23	3Q23	4Q23	2023	Change 2023/22
(a) World oil demand	100.29	101.72	101.12	103.64	105.40	102.99	2.70
Non-OPEC liquids production	65.73	67.28	67.15	67.37	67.96	67.44	1.71
OPEC NGL and non-conventionals	5.39	5.44	5.47	5.43	5.43	5.44	0.05
(b) Total non-OPEC liquids production and OPEC NGLs	71.13	72.71	72.63	72.80	73.38	72.88	1.76
Difference (a-b)	29.16	29.01	28.50	30.84	32.01	30.10	0.94

*Note: * 2022-2023 = Forecast. Totals may not add up due to independent rounding. Source: OPEC.*

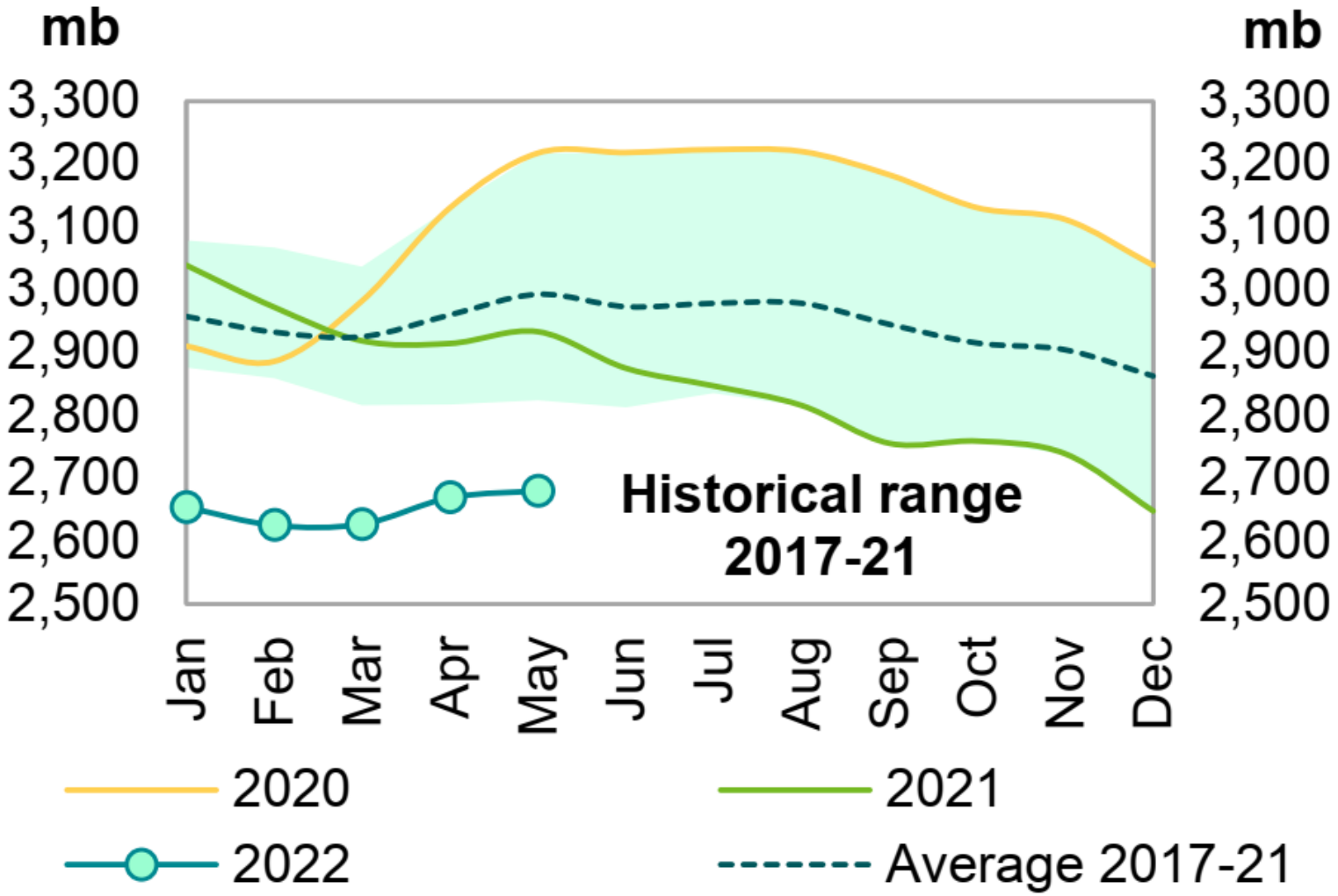
OPEC Monthly Oil Market Report July 2022

Market Balance by IEA

World oil demand and supply (mb/d)

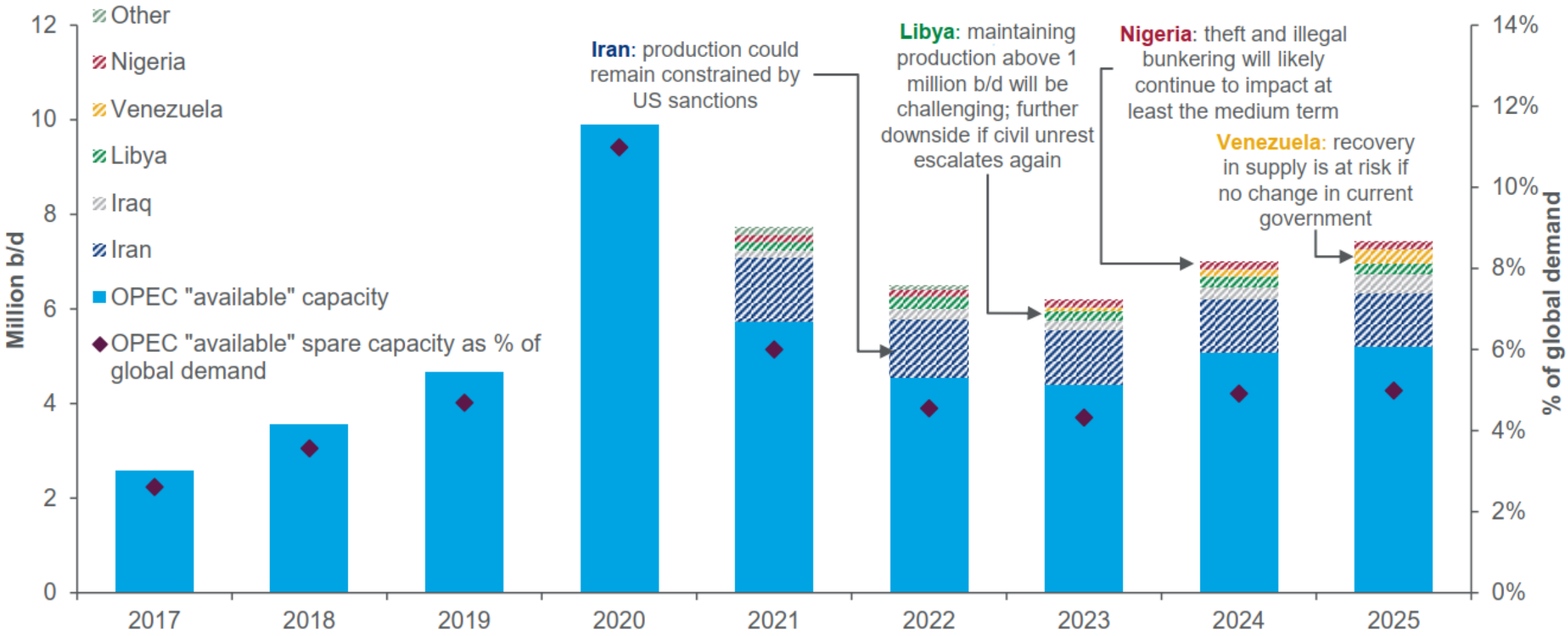
	2019	1Q20	2Q20	3Q20	4Q20	2020	1Q21	2Q21	3Q21	4Q21	2021	2022	2023	2024	2025	2026
DEMAND																
Total OECD	47.7	45.4	37.6	42.3	43.1	42.1	43.3	43.8	45.4	46.5	44.7	45.8	46.2	46.2	46.0	45.8
Total Non-OECD	52.0	48.3	45.3	50.4	51.7	48.9	50.7	51.1	52.3	52.7	51.7	53.7	55.0	56.1	57.2	58.3
Total Demand[1]	99.7	93.8	82.9	92.7	94.7	91.0	93.9	94.9	97.7	99.2	96.5	99.4	101.2	102.3	103.2	104.1
SUPPLY																
Total OECD	28.5	29.9	26.9	27.1	27.8	27.9	27.8	28.1	28.3	28.7	28.2	29.0	29.6	29.9	29.9	29.7
Total Non-OECD	32.0	32.3	30.0	29.7	29.9	30.5	30.3	30.8	30.8	30.7	30.6	31.5	32.0	32.0	32.1	32.1
Processing Gains[2]	2.4	2.3	2.0	2.1	2.1	2.1	2.1	2.2	2.3	2.3	2.2	2.4	2.4	2.4	2.5	2.5
Global Biofuels	2.8	2.2	2.5	3.1	2.6	2.6	2.3	2.9	3.2	2.9	2.8	3.0	3.1	3.2	3.3	3.3
Total Non-OPEC[3]	65.6	66.7	61.3	61.9	62.4	63.1	62.5	63.9	64.5	64.6	63.9	66.0	67.1	67.5	67.7	67.6
OPEC																
Crude	29.5	28.2	25.6	24.1	24.9	25.7										
OPEC NGLs	5.4	5.4	5.2	5.1	5.2	5.2	5.2	5.3	5.3	5.3	5.3	5.5	5.5	5.6	5.6	5.7
Total OPEC[3]	34.9	33.6	30.8	29.2	30.0	30.9										
Total Supply	100.5	100.2	92.1	91.1	92.4	93.9										
Memo items:																
Call on OPEC crude + Stock ch.[4]	28.7	21.7	16.4	25.7	27.2	22.8	26.2	25.7	27.9	29.3	27.3	28.0	28.6	29.2	29.9	30.8

OECD Commercial Stocks



OPEC Monthly Oil Market Report July 2022

OPEC Spare Capacity



Wood Mackenzie Macro Oils long-term 2021 outlook to 2050 November 2021

Long-term Oil Demand Outlook by Region

	2019	2020	2025	2030	2035	2040	2045	Growth 2019–2045
OECD Americas	25.6	23.3	25.7	24.8	23.1	21.2	19.3	–6.3
OECD Europe	14.3	12.6	13.7	12.9	12.0	11.1	10.2	–4.1
OECD Asia Oceania	7.9	7.1	7.4	6.9	6.4	5.8	5.2	–2.7
OECD	**47.9**	**43.0**	**46.8**	**44.6**	**41.5**	**38.0**	**34.8**	**–13.1**
Latin America	6.2	5.8	6.6	7.1	7.4	7.6	7.9	1.6
Middle East & Africa	4.3	3.9	4.8	5.5	6.2	6.9	7.6	3.3
India	4.8	4.3	5.8	7.2	8.6	9.9	11.1	6.3
China	13.1	12.1	14.4	15.5	16.2	16.7	17.1	4.0
Other Asia	9.0	8.5	9.9	10.9	11.7	12.4	13.0	3.9
OPEC	8.7	8.2	9.5	10.5	11.3	11.7	11.7	3.0
Russia	3.6	3.2	3.7	3.8	3.8	3.8	3.7	0.1
Other Eurasia	2.0	1.8	2.1	2.2	2.3	2.3	2.3	0.2
Non-OECD	**51.8**	**47.8**	**56.9**	**62.6**	**67.4**	**71.2**	**74.3**	**22.5**
World	**99.7**	**90.7**	**103.7**	**107.2**	**108.9**	**109.3**	**109.1**	**9.4**

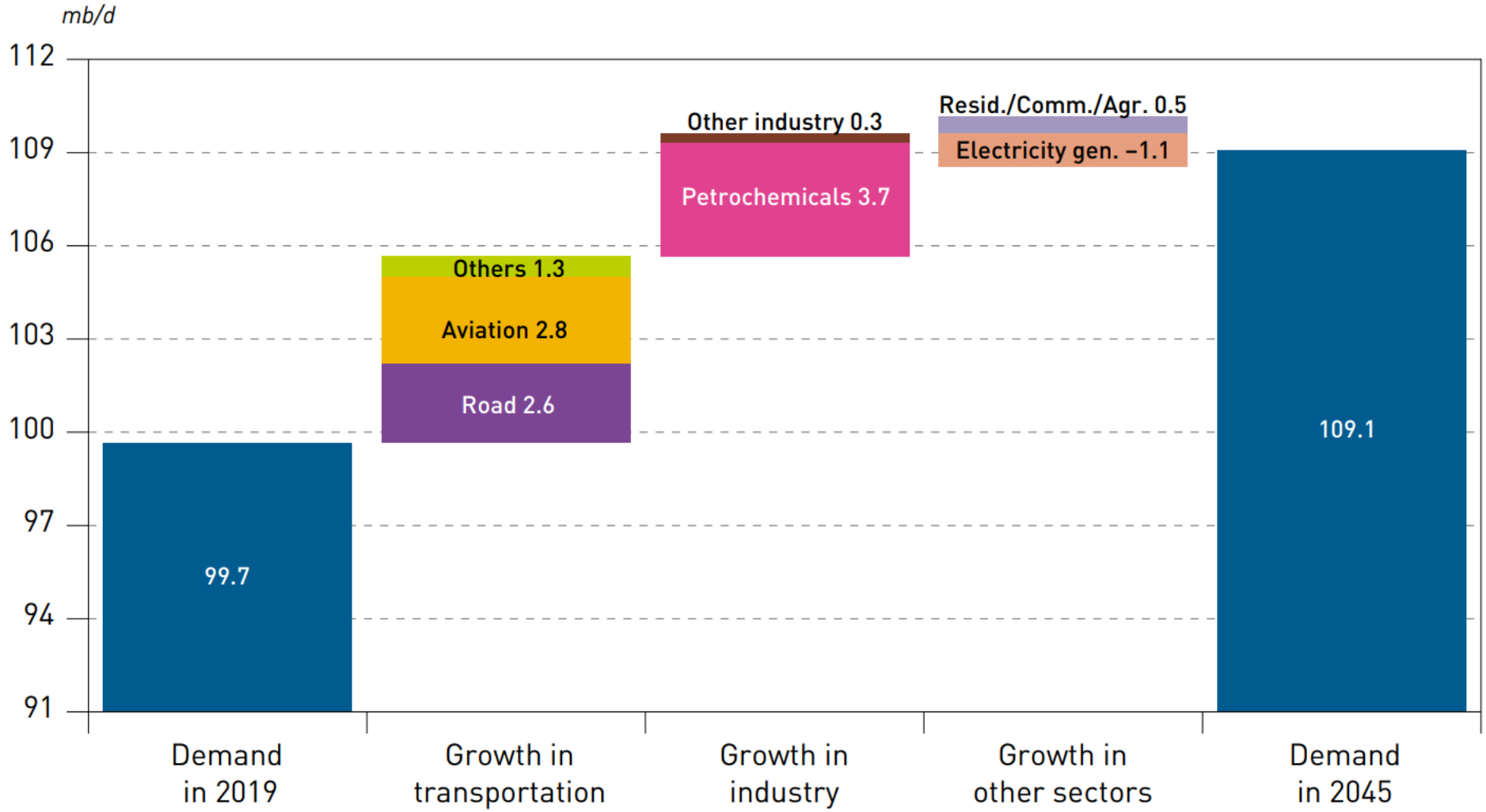
OPEC World Oil Outlook 2021

Long-term Oil Demand Outlook by Sector

	2019	2020	2025	2030	2035	2040	2045	Growth 2019–2045
Road	44.4	40.1	46.3	46.9	47.1	47.1	47.0	2.6
Aviation	6.7	3.5	7.1	7.7	8.4	8.9	9.4	2.8
Rail/waterways	1.9	1.8	1.9	2.0	2.1	2.1	2.0	0.2
Marine bunkers	4.2	4.0	4.4	4.6	4.7	4.7	4.6	0.5
Transportation	**57.2**	**49.4**	**59.7**	**61.2**	**62.2**	**62.8**	**63.2**	**6.0**
Petrochemicals	13.7	12.9	14.7	15.9	16.7	17.0	17.3	3.7
Other industry	12.8	12.7	13.0	13.5	13.5	13.3	13.1	0.3
Industry	**26.5**	**25.6**	**27.8**	**29.4**	**30.2**	**30.3**	**30.4**	**4.0**
Resid./Comm./Agric.	11.1	10.8	11.4	12.0	12.2	12.1	11.6	0.5
Electricity generation	4.9	4.9	4.8	4.6	4.3	4.1	3.9	–1.1
Other uses	**16.0**	**15.7**	**16.1**	**16.6**	**16.5**	**16.1**	**15.5**	**–0.5**
World	**99.7**	**90.7**	**103.7**	**107.2**	**108.9**	**109.3**	**109.1**	**9.4**

OPEC World Oil Outlook 2021

Oil Demand Growth By Sector



OPEC World Oil Outlook 2021

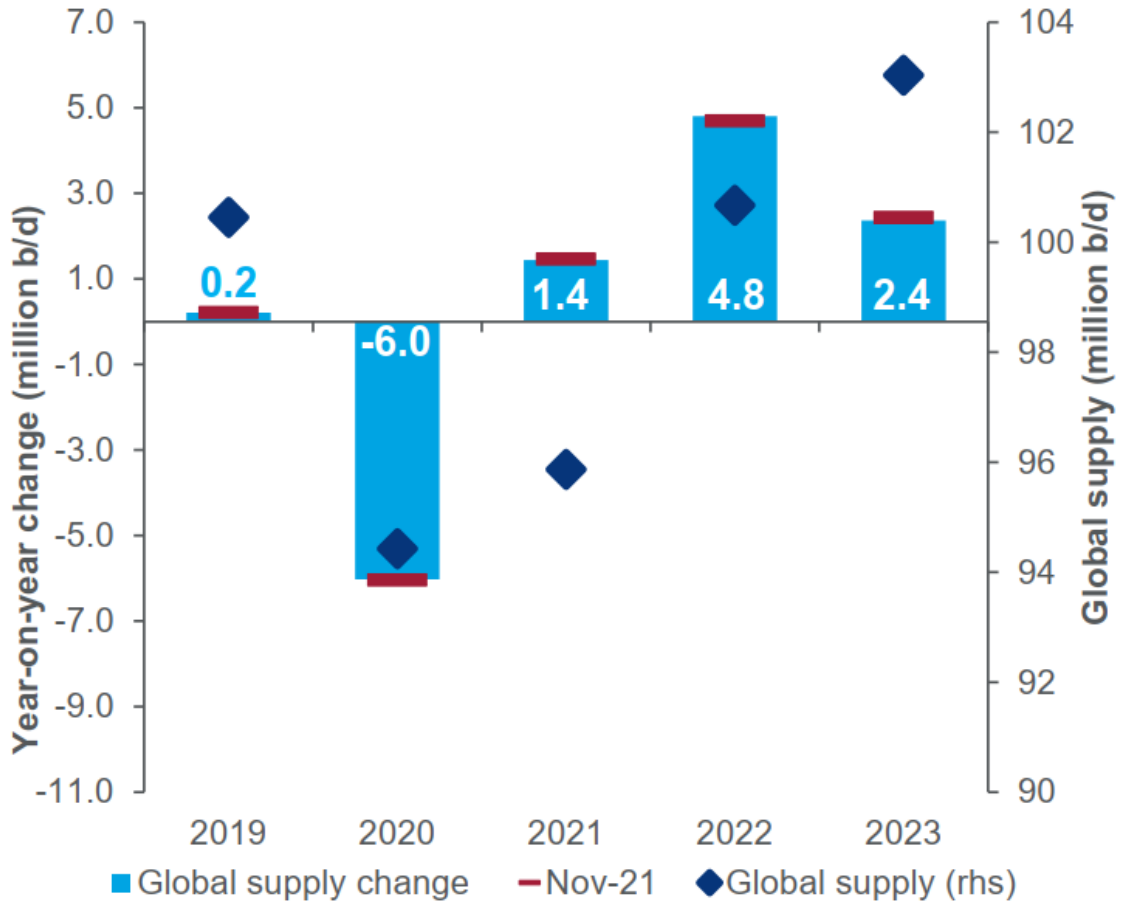
Long-term Global Liquids Supply Outlook

	2019	2020	2025	2030	2035	2040	2045	Change 2019–2045
OECD	30.0	28.5	32.5	32.3	30.8	29.1	27.7	–2.3
of which: US	*18.4*	*17.0*	*19.8*	*20.3*	*19.1*	*17.7*	*16.6*	*–1.8*
of which: tight liquids	*11.7*	*10.9*	*14.5*	*15.8*	*15.4*	*14.3*	*13.3*	*1.6*
Non-OECD	32.8	31.2	35.9	36.7	36.5	35.7	34.7	2.0
Processing gains	2.3	2.1	2.4	2.6	2.7	2.8	3.0	0.7
Non-OPEC	**65.0**	**61.8**	**70.7**	**71.5**	**69.9**	**67.6**	**65.4**	**0.4**
of which: crude*	*45.9*	*43.5*	*50.0*	*48.9*	*46.0*	*43.0*	*40.3*	*–5.6*
NGLs	*10.5*	*10.3*	*11.3*	*12.5*	*13.0*	*13.2*	*13.2*	*2.7*
global biofuels	*2.5*	*2.3*	*2.8*	*3.1*	*3.3*	*3.5*	*3.6*	*1.0*
other liquids	*3.8*	*3.6*	*4.3*	*4.6*	*4.9*	*5.1*	*5.4*	*1.6*
Total OPEC liquids	**33.8**	**30.7**	**33.2**	**35.9**	**39.2**	**41.9**	**43.9**	**10.1**
World	**98.9**	**92.4**	**103.9**	**107.4**	**109.1**	**109.5**	**109.3**	**10.4**

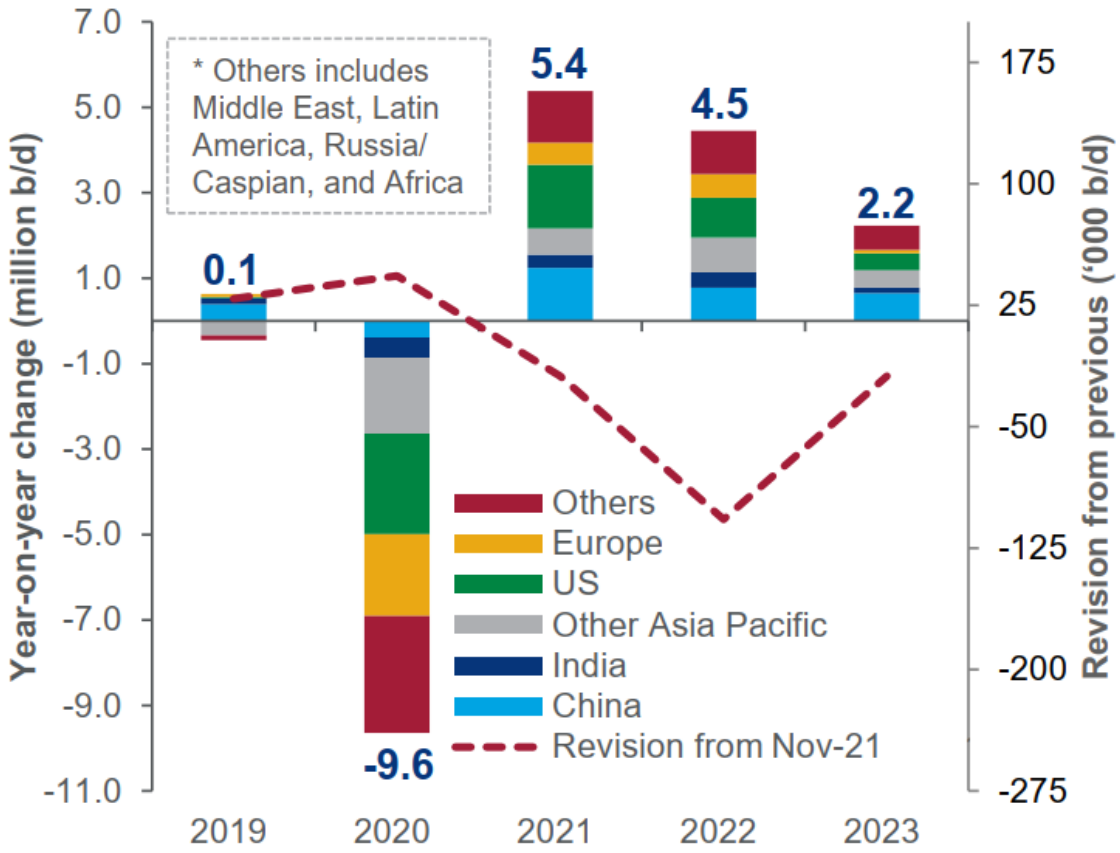
OPEC World Oil Outlook 2021

Demand and Supply Growth

Global liquids supply

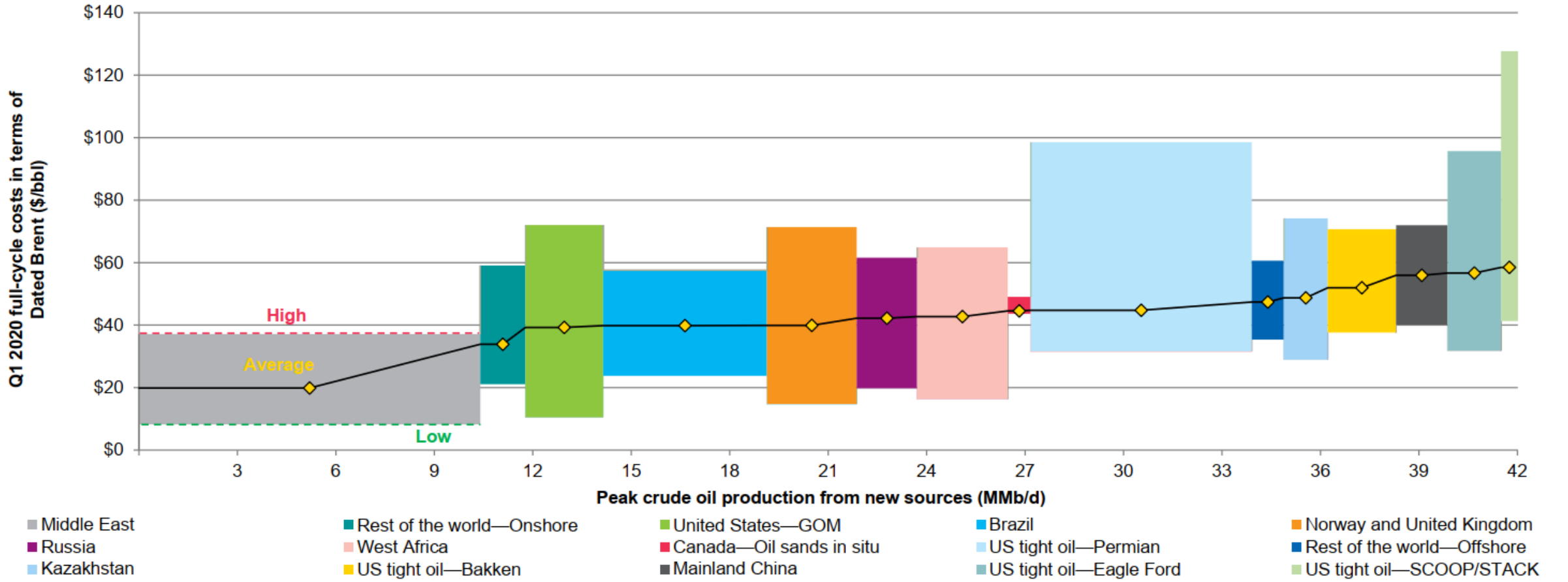


Global liquids demand



Wood Mackenzie Macro Oils long-term 2021 outlook to 2050 November 2021

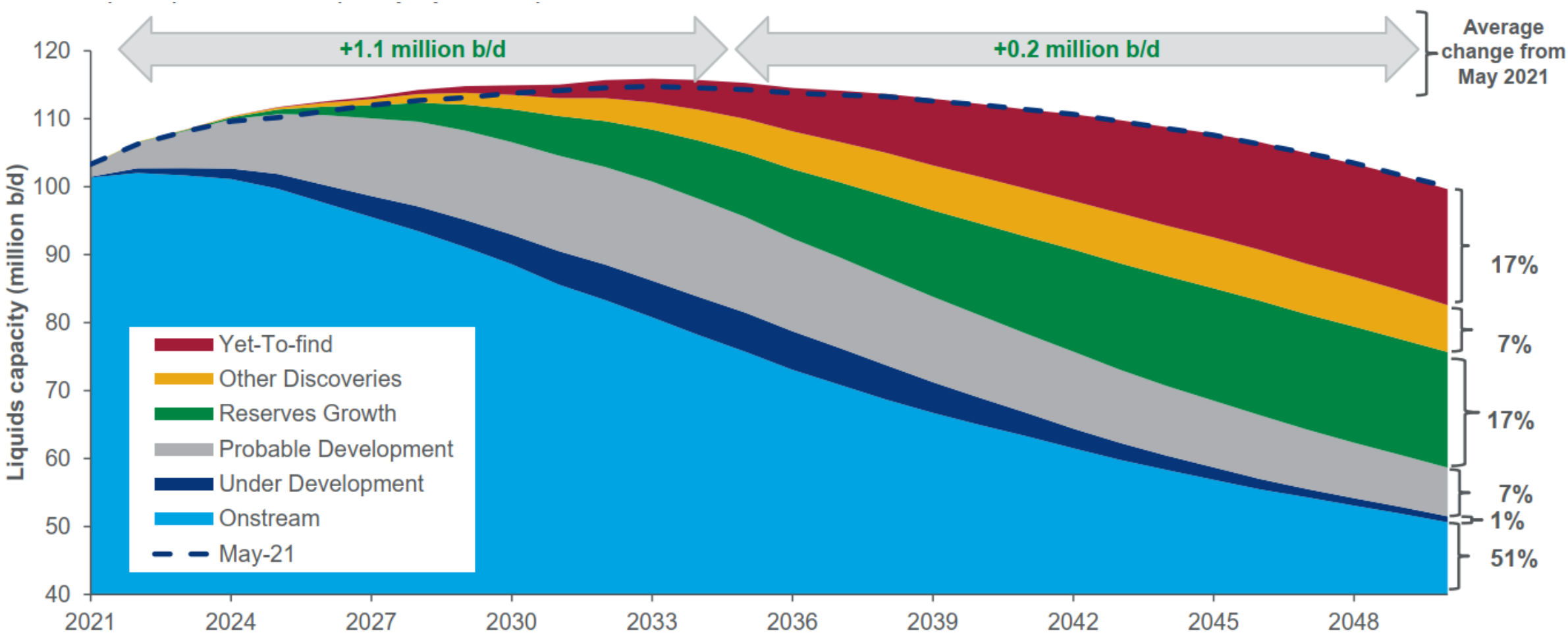
Cost Curve Of New Global Crude Oil Supply In Select Areas To 2040



Note: Details about the methodology behind the curve are provided in slides 84–85 in the Appendix in this slide deck.
Source: IHS Markit

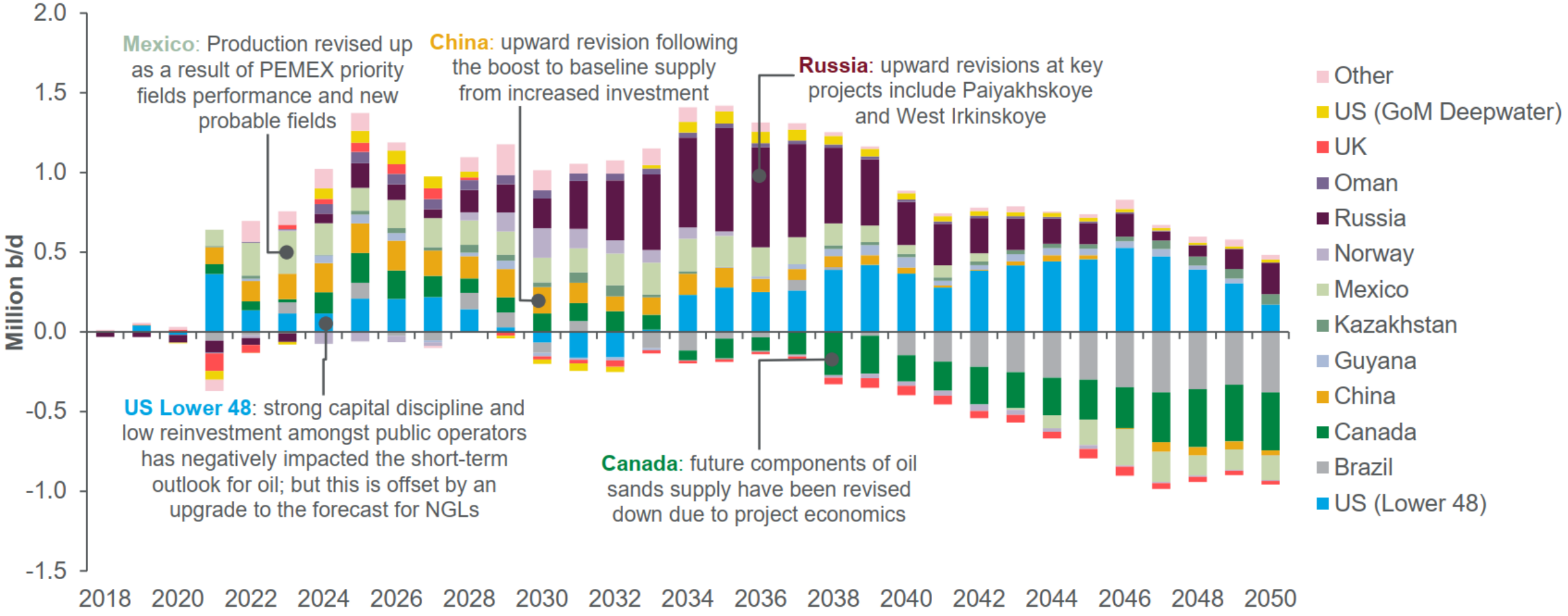
IHS Markit

Global Liquids Production Capacity



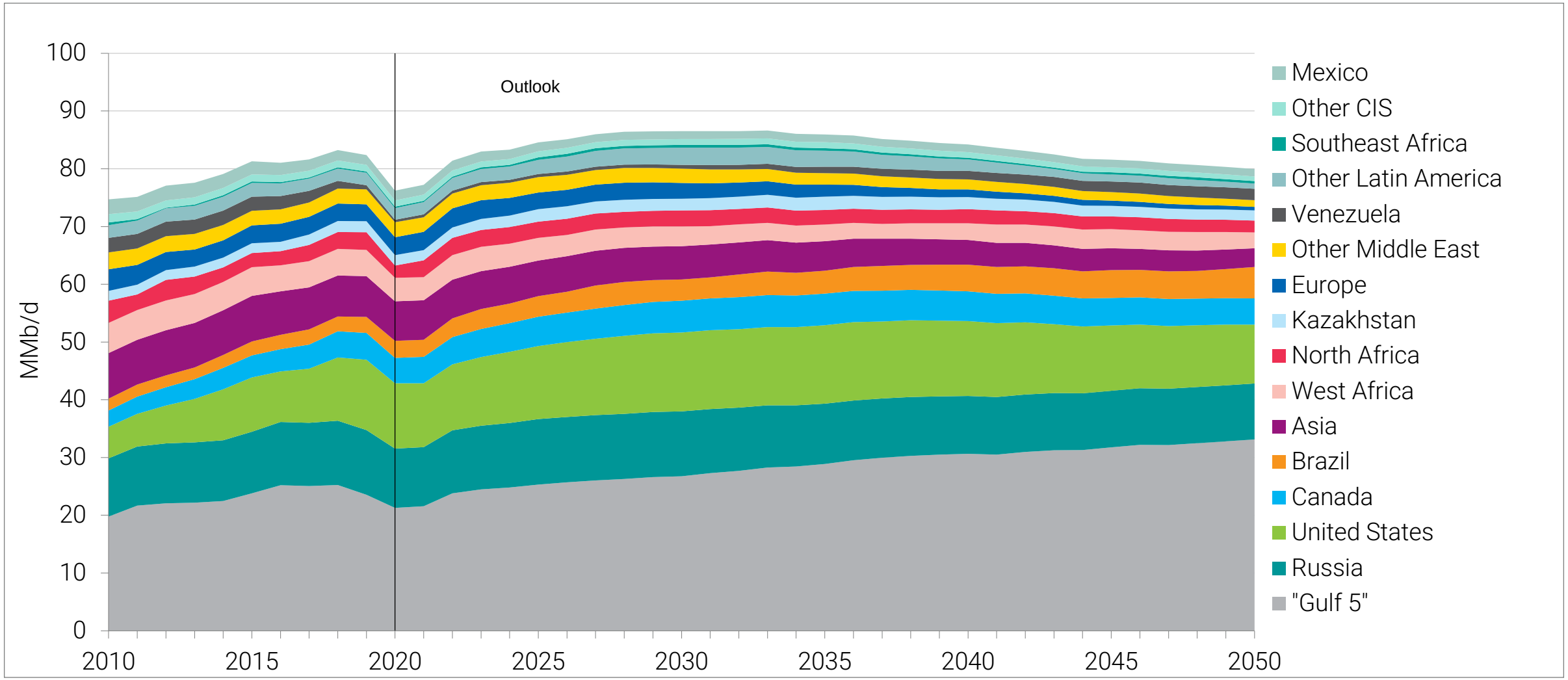
Wood Mackenzie Macro Oils long-term 2021 outlook to 2050 November 2021

Non-OPEC Key Country Production Change from May 2021



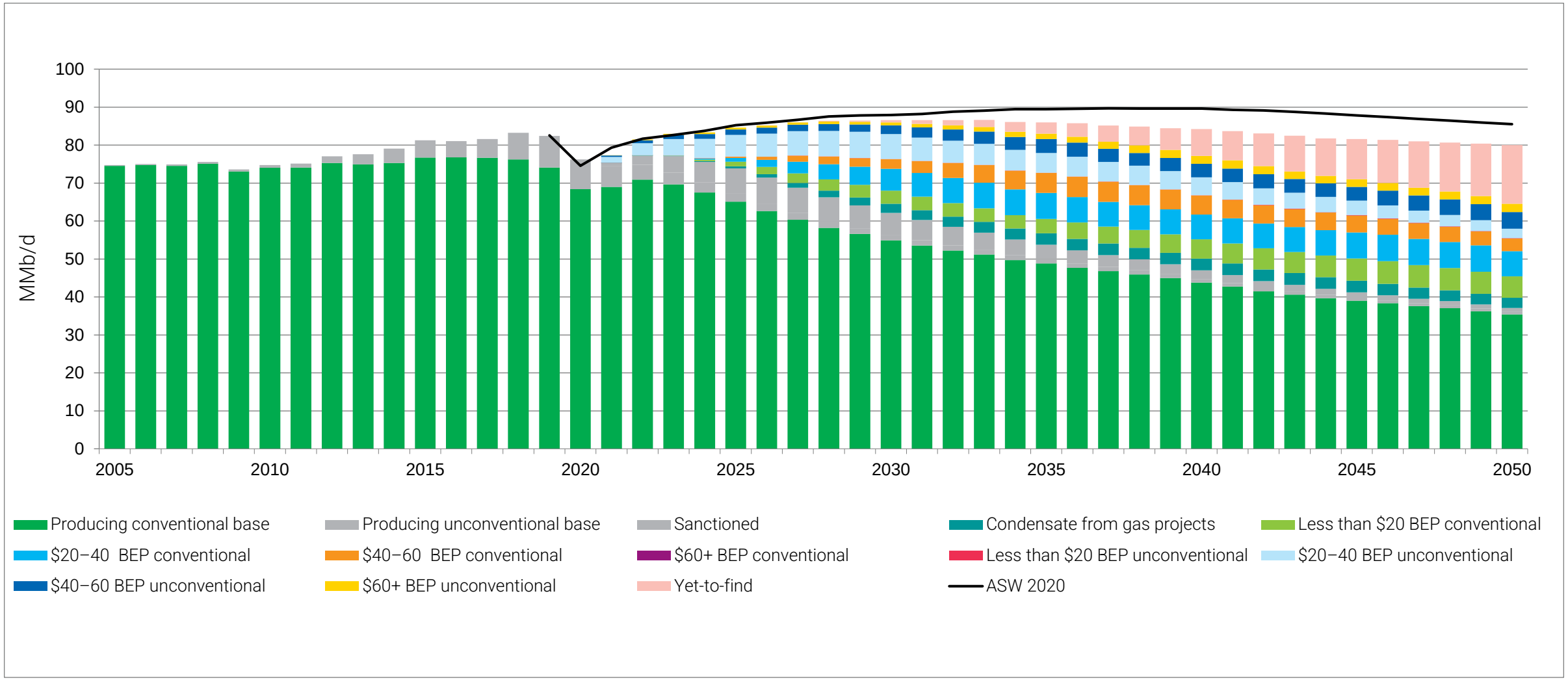
Wood Mackenzie Macro Oils long-term 2021 outlook to 2050 November 2021

World Crude and Condensate Production



IHS Markit

Global Crude and Condensate Supply Outlook by Category and Breakeven Price



IHS Markit

US Shale Oil

To provide an overview of US shale oil dynamics

An Old Story

مجله ی 29 - توصیه های پسران اخبار بین الملل (انرژی)

تاریخ انتشار: هنبه ۱۴ بهمن ۱۳۹۱

چگونه ذخایر نامتعارف، تولید انرژی در آمریکا را متحول کرده است؟

انقلاب رُسی

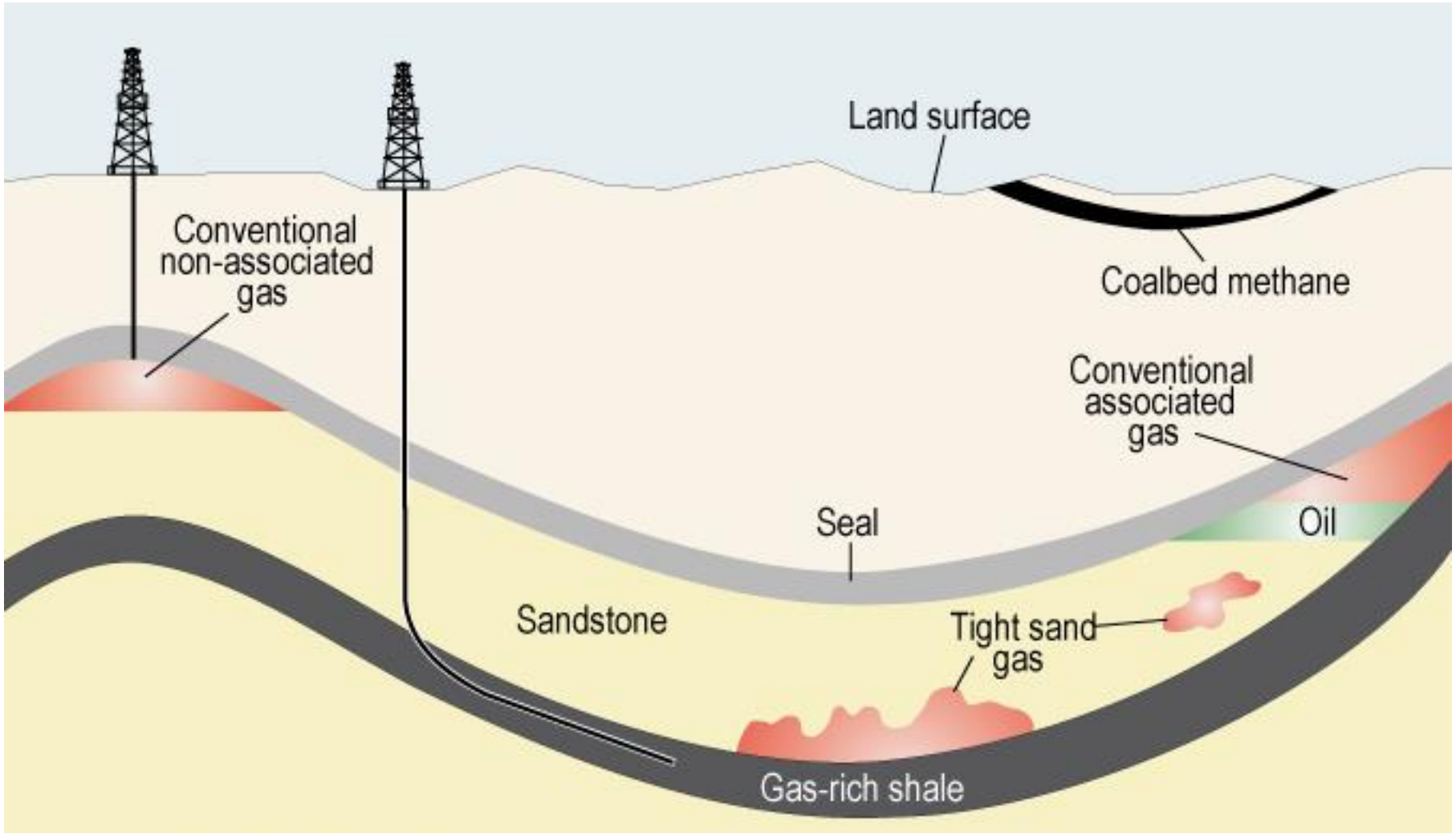
رامین فروزنده

«آمریکا احتمالاً در سال ۲۰۱۳ با پشت سر گذاشتن روسیه و عربستان، به بزرگ‌ترین تولیدکننده سوخت‌های مایع در جهان تبدیل خواهد شد.»

«آمریکا احتمالاً در سال 2013 با پشت سر گذاشتن روسیه و عربستان، به بزرگ‌ترین تولیدکننده سوخت‌های مایع در جهان تبدیل خواهد شد.» این جمله، شاید مهم‌ترین پیش‌بینی گزارش جدید شرکت بریتیش پترولیوم باشد؛ به خصوص اگر بدانیم سهم اصلی در افزایش تولید نفت و گاز را در آمریکا، ذخایر نامتعارف خواهند داشت. گزارش چشم‌انداز انرژی 2030 که در اواسط ژانویه سال جدید میلادی منتشر شد، نخستین گزارشی نیست که بر نقش تولید نفت و گاز از منابعی مثل شیل1 (سنگ حاوی ذخایر هیدروکربن که از رُس تشکیل شده است) متمرکز شده است. گفته می‌شود تولید از ذخایر نامتعارف که با افزایش قیمت‌های جهانی انرژی و بهبود فناوری‌های صنعت نفت اقتصادی همراه شده است، چشم‌انداز جدیدی را به روی صنعت نفت و گاز جهان گشوده است که می‌توان از آن به « انقلاب رُسی» یاد کرد.

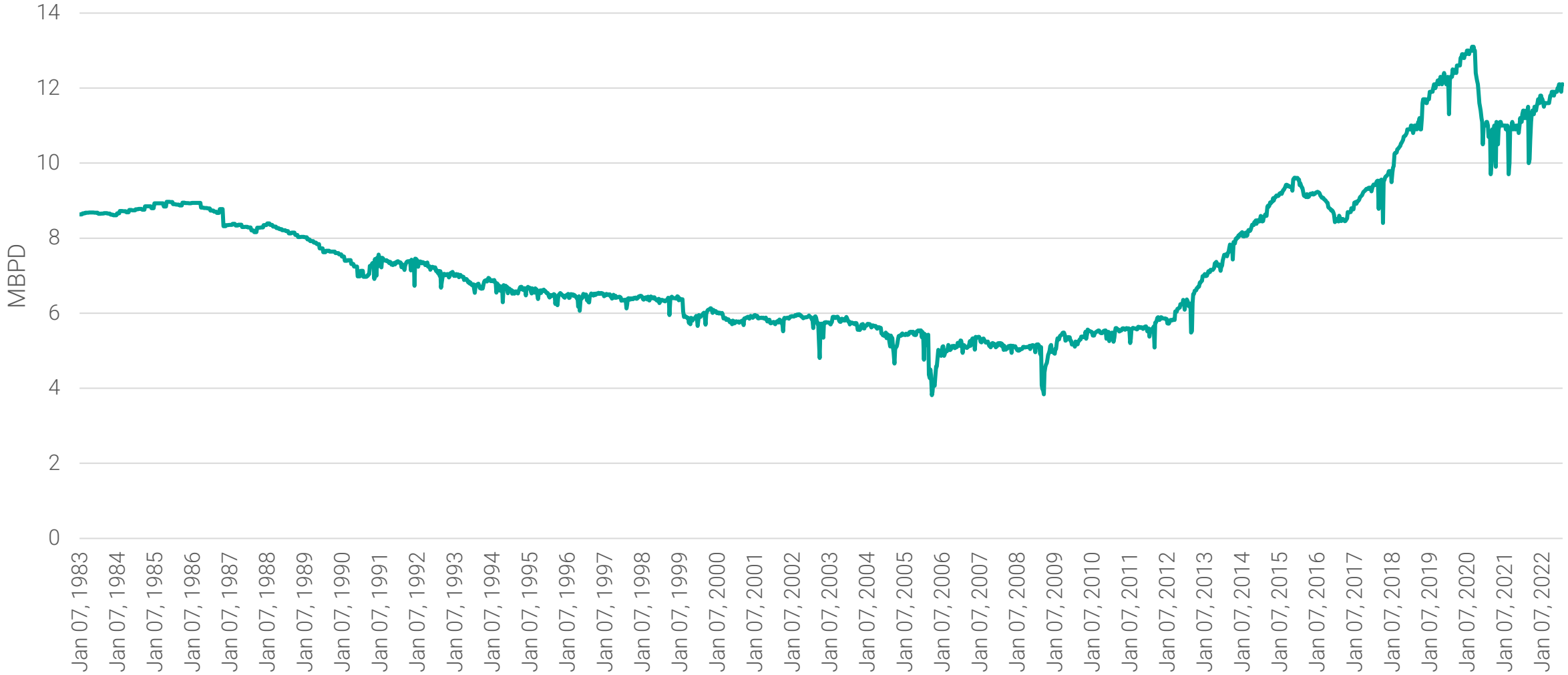
Tejarat-e Farda Magazine

Definition



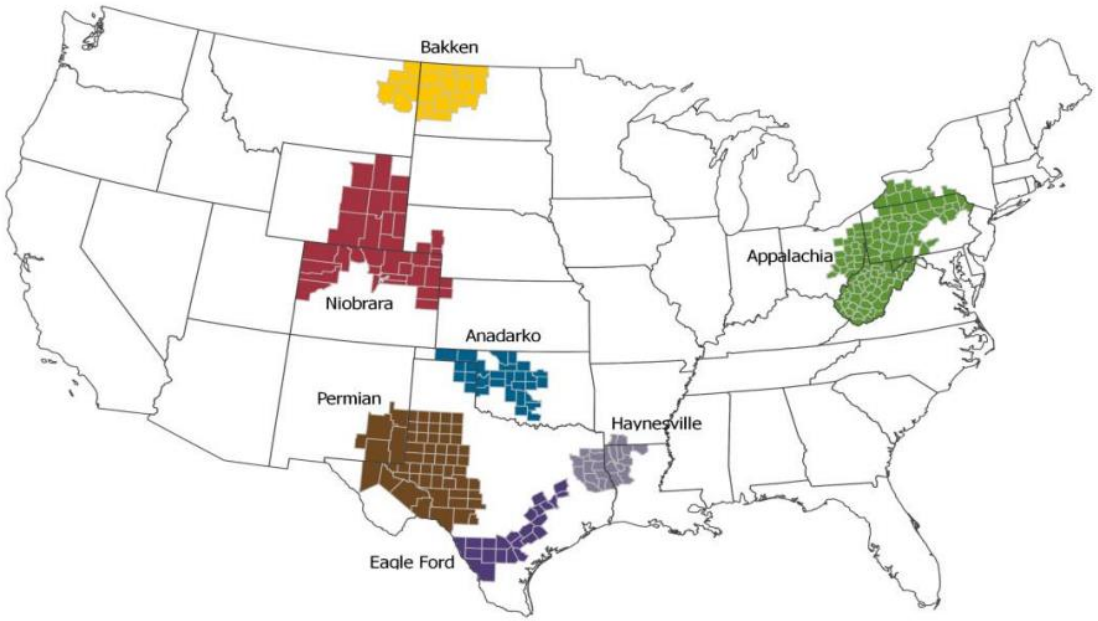
EIA

Weekly US Crude Oil Production



EIA

EIA Drilling Productivity Report



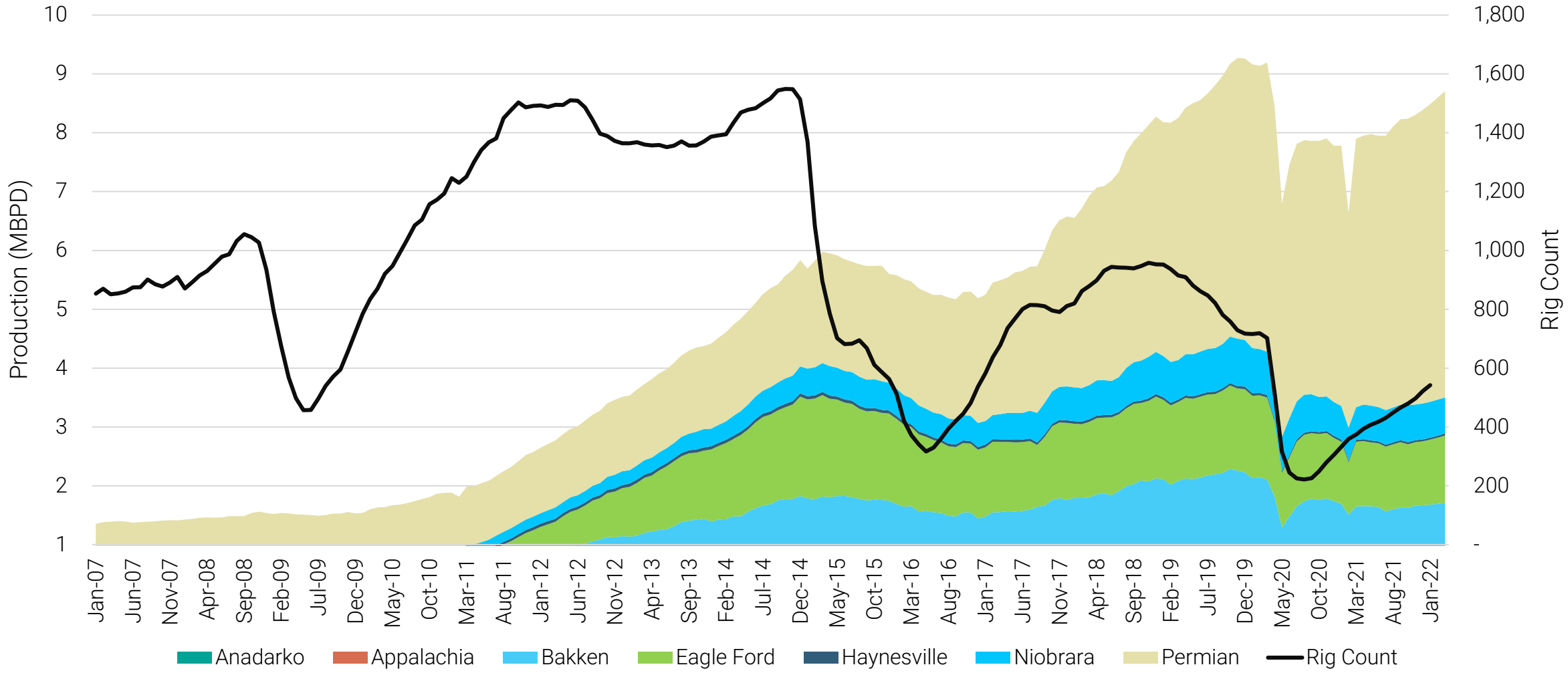
Note:

The DPR rig productivity metric *new-well oil/gas production per rig* can become unstable during periods of rapid decreases or increases in the number of active rigs and well completions. The metric uses a fixed ratio of estimated total production from new wells divided by the region's monthly rig count, lagged by two months. The metric does not represent new-well oil/natural gas production per newly completed well.

The DPR metric *legacy oil/gas production change* can become unstable during periods of rapid decreases or increases in the volume of well production curtailments or shut-ins. This effect has been observed during winter weather freeze-offs, extreme flooding events, and the 2020 global oil demand contraction. The DPR methodology involves applying smoothing techniques to most of the data series because of inherent noise in the data.

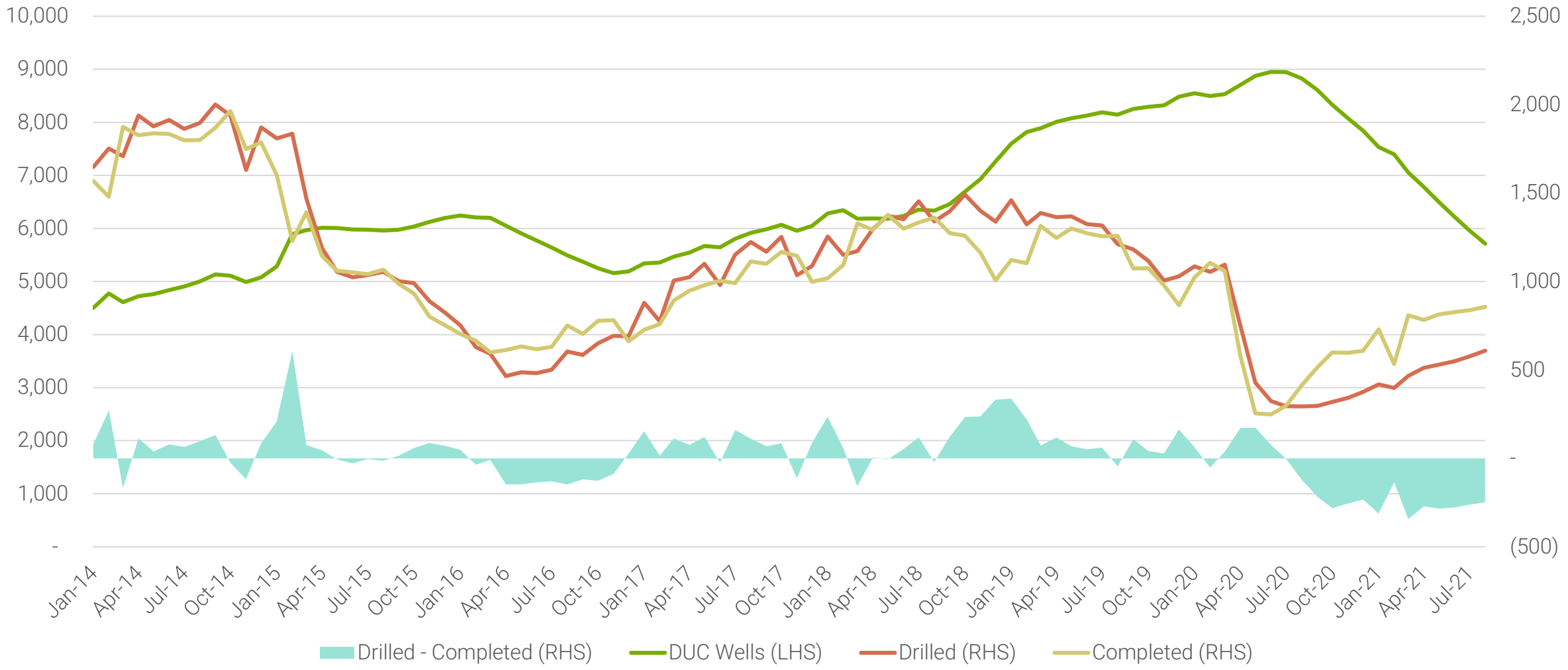
EIA DPR

US Tight Oil Production & Total Rig Count



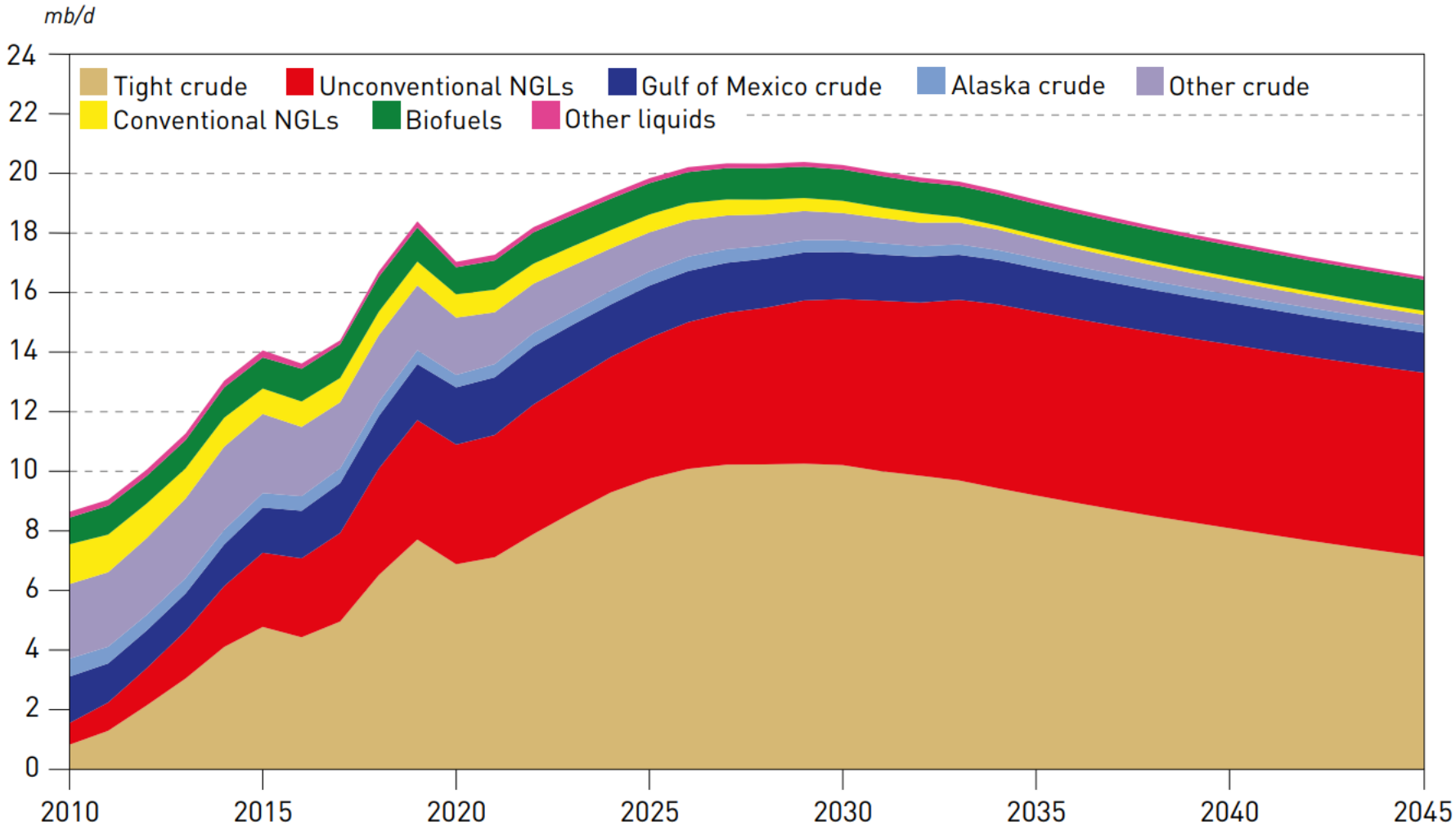
EIA DPR

DUC Wells



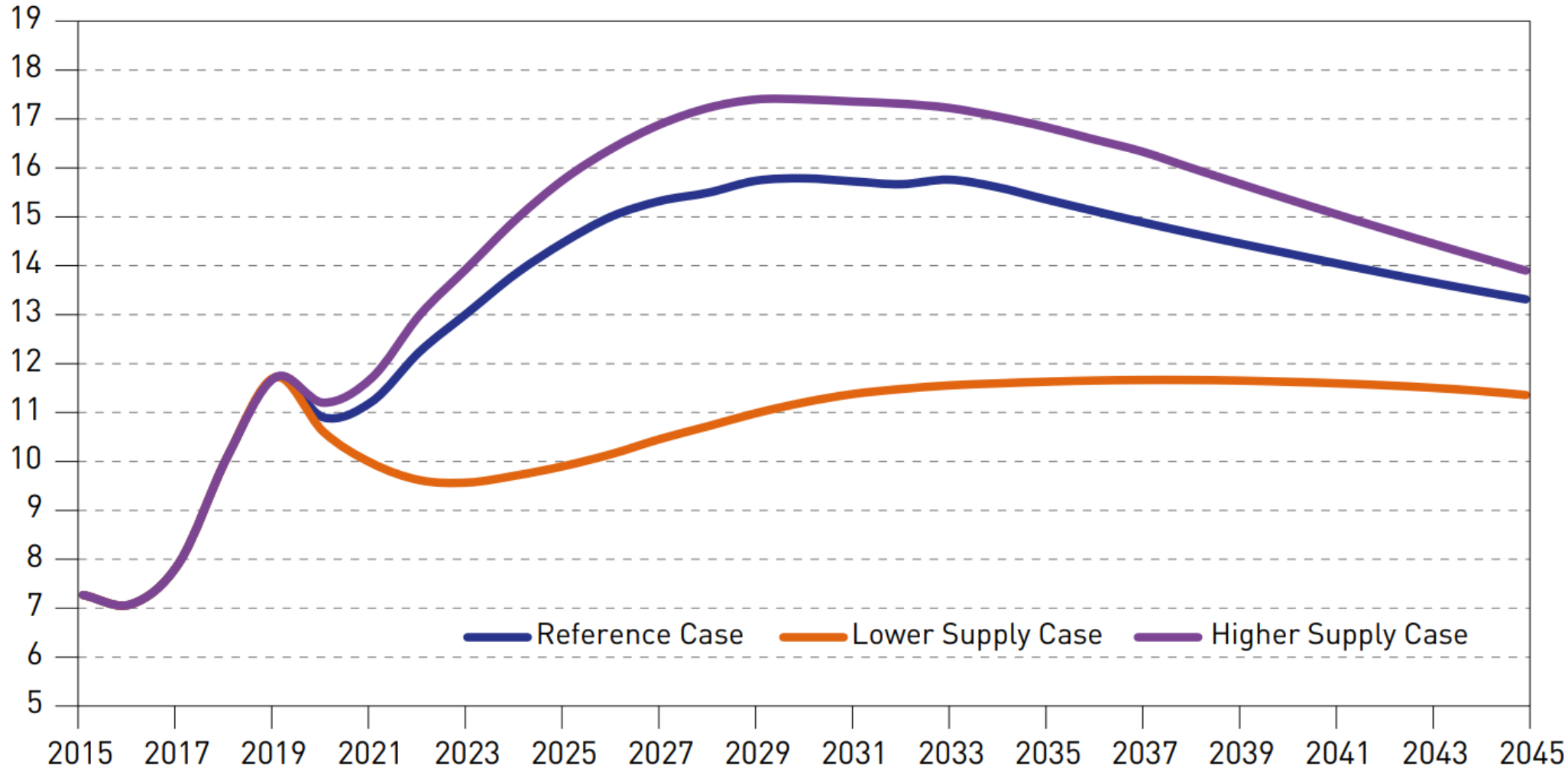
EIA DPR

US Liquids Supply Outlook



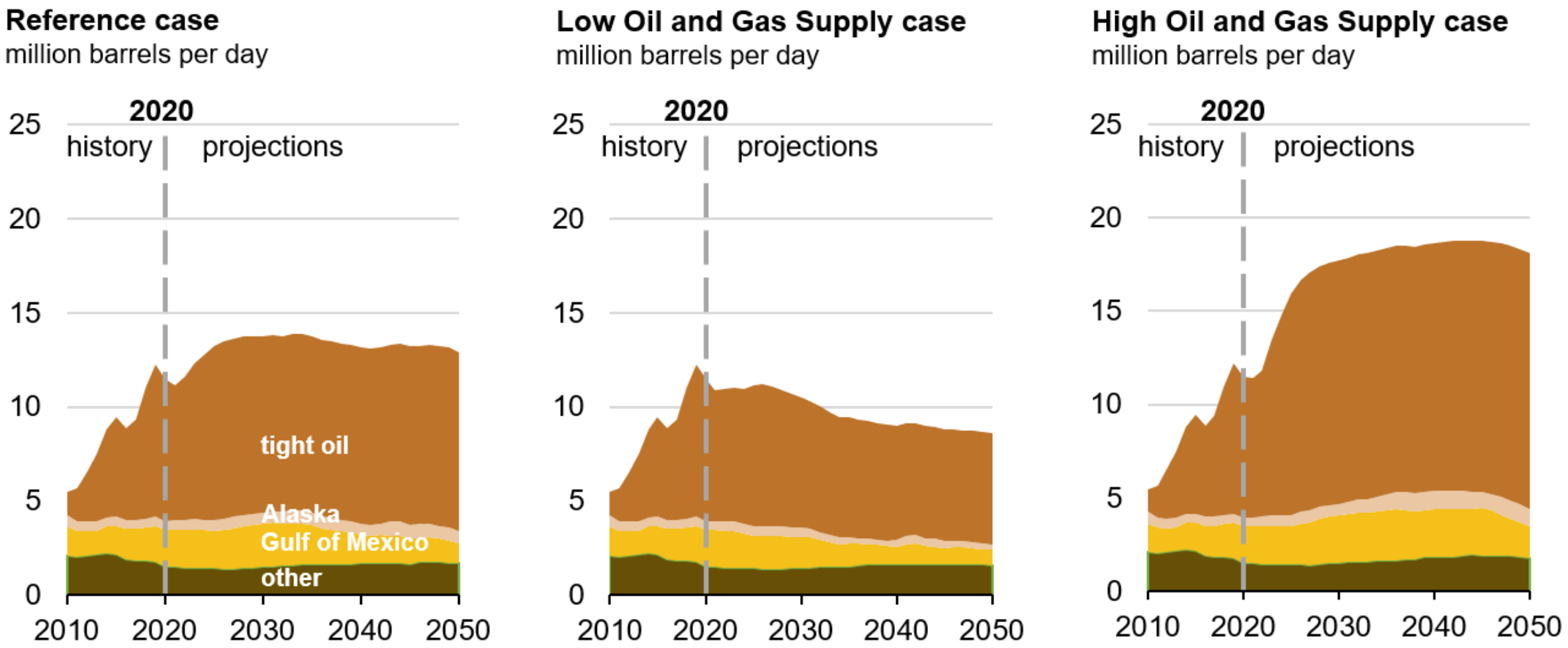
OPEC World Oil Outlook 2021

Long-term US Tight Oil Sensitivities



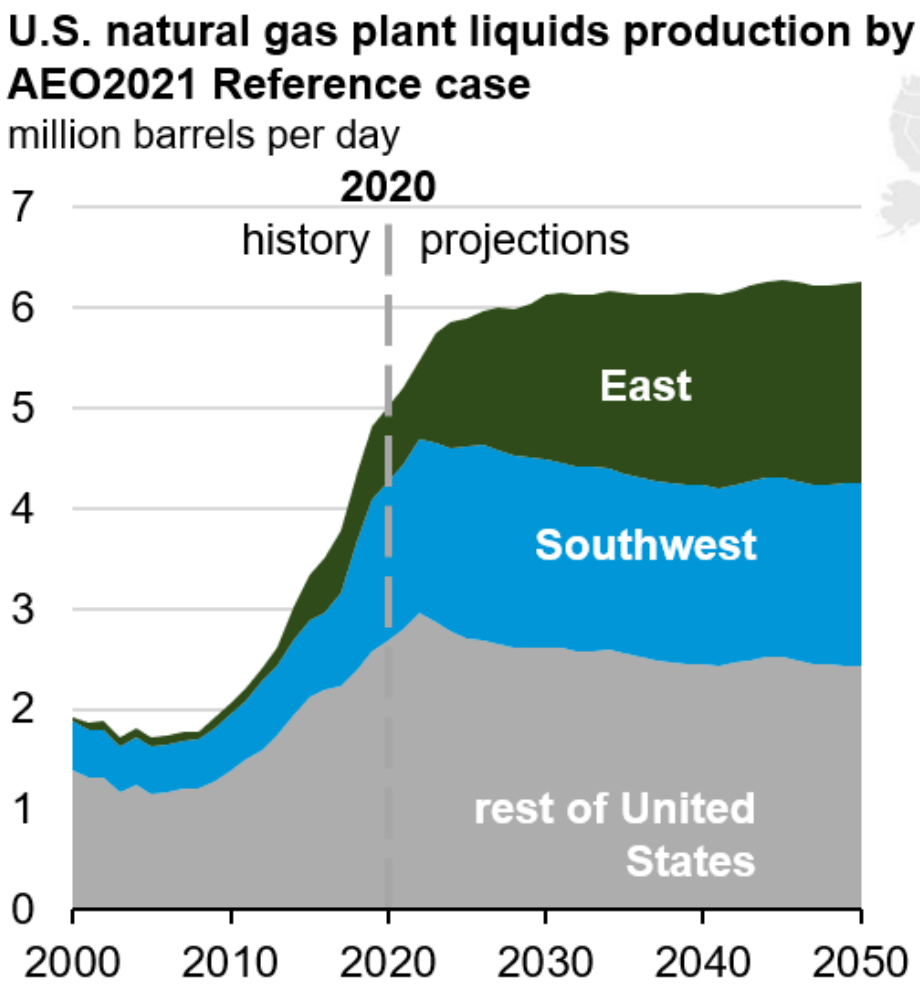
OPEC World Oil Outlook 2021

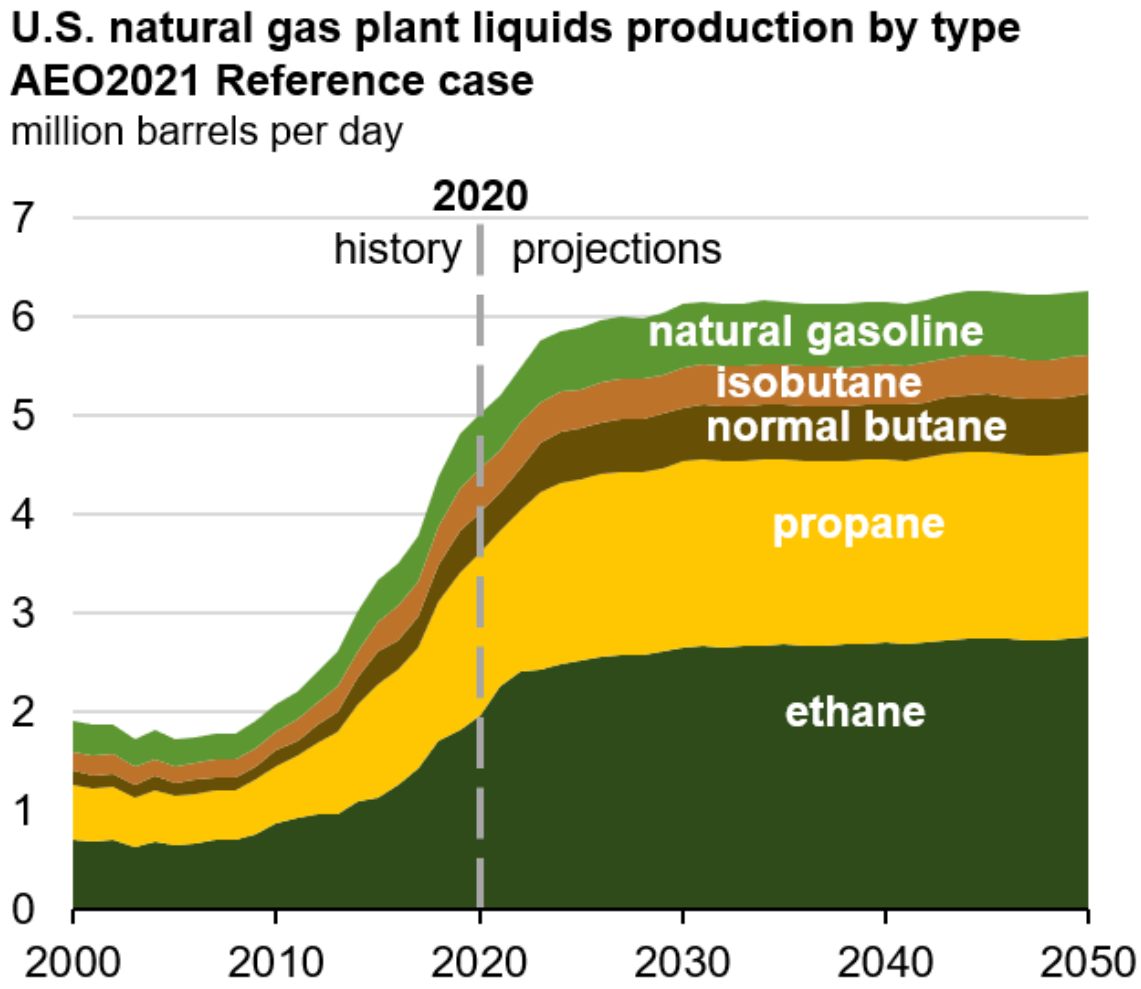
U.S. Crude Oil Production



EIA

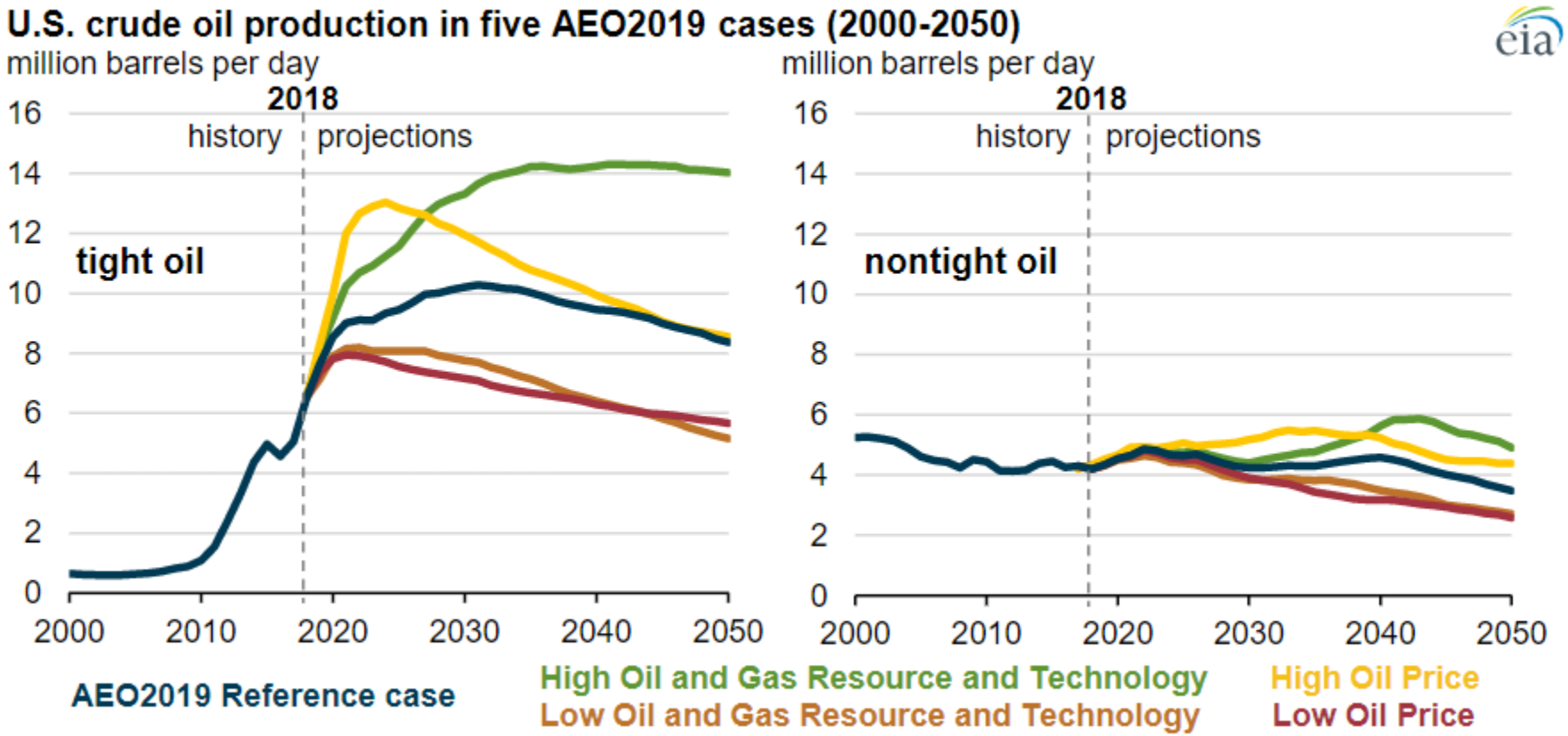
Natural Gas Plant Liquids Production By Region And Type





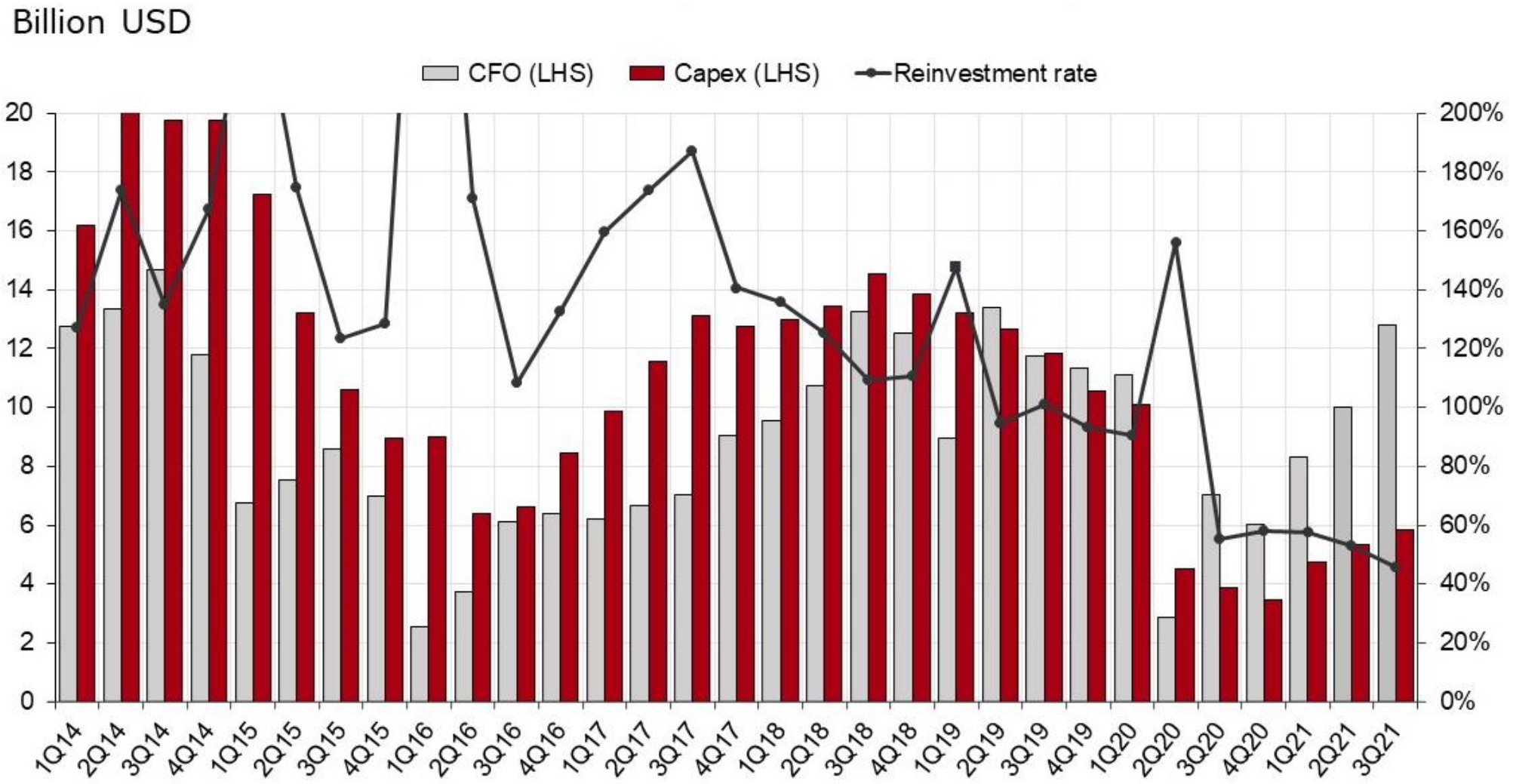
EIA

Tight Oil Development



EIA

US Shale Oil CFO and Capex



Rystad Energy

Breakeven Reduction

Structural

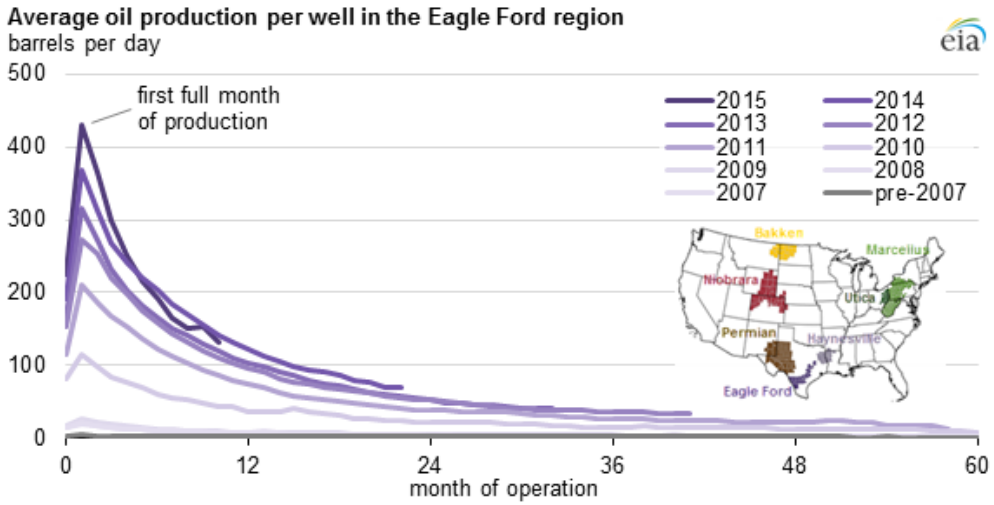
- Wells Productivity
- Drilling & Completion Efficiency

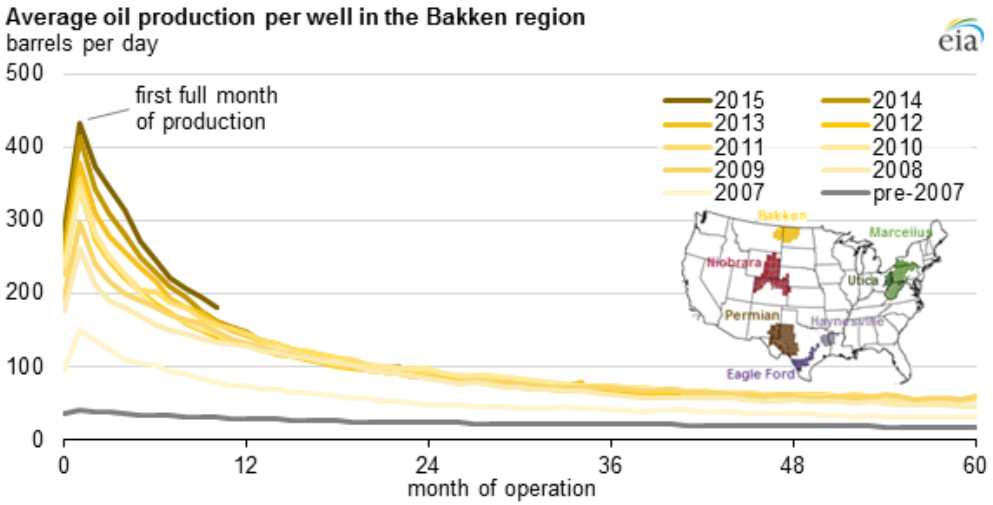
Cyclical

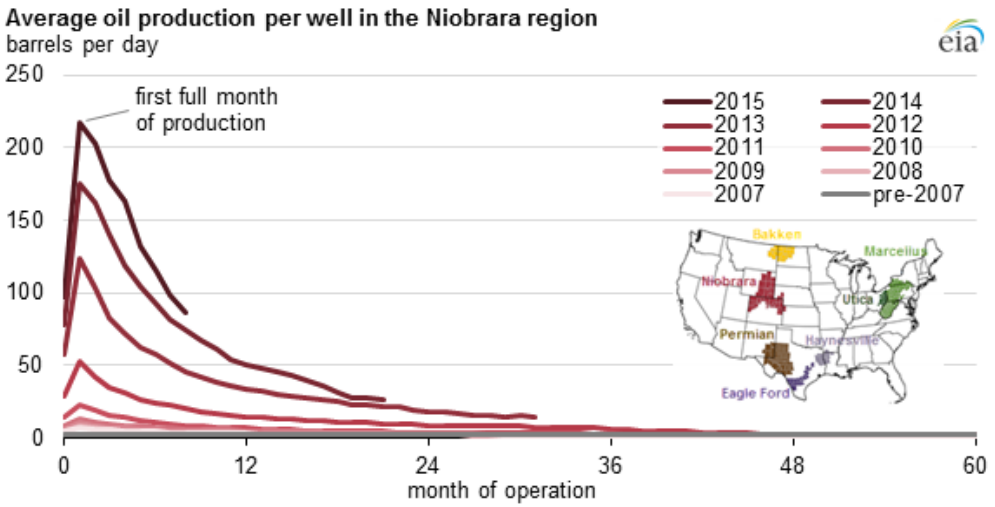
- Cost of Drilling & Operating
- High-grading

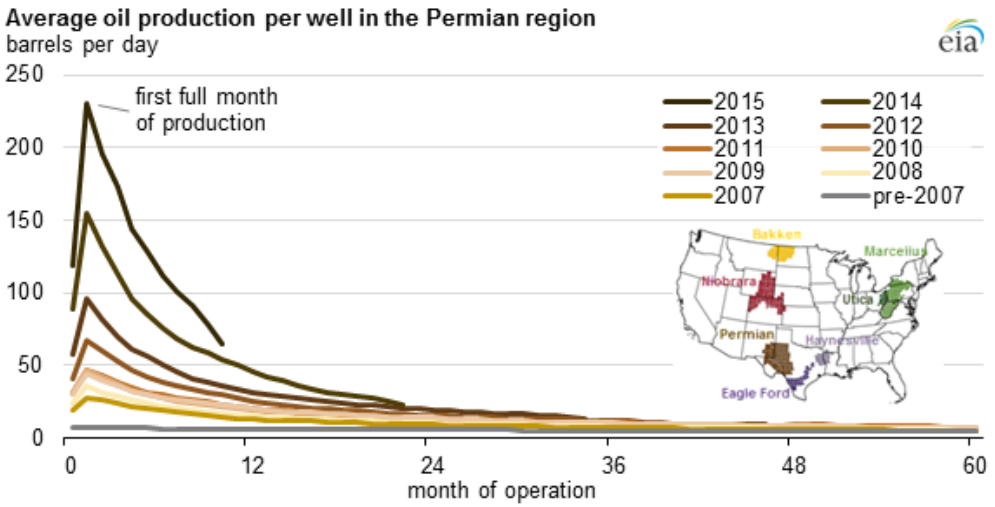
Petroleum Economist

Initial Production Rates In Tight Oil Formations



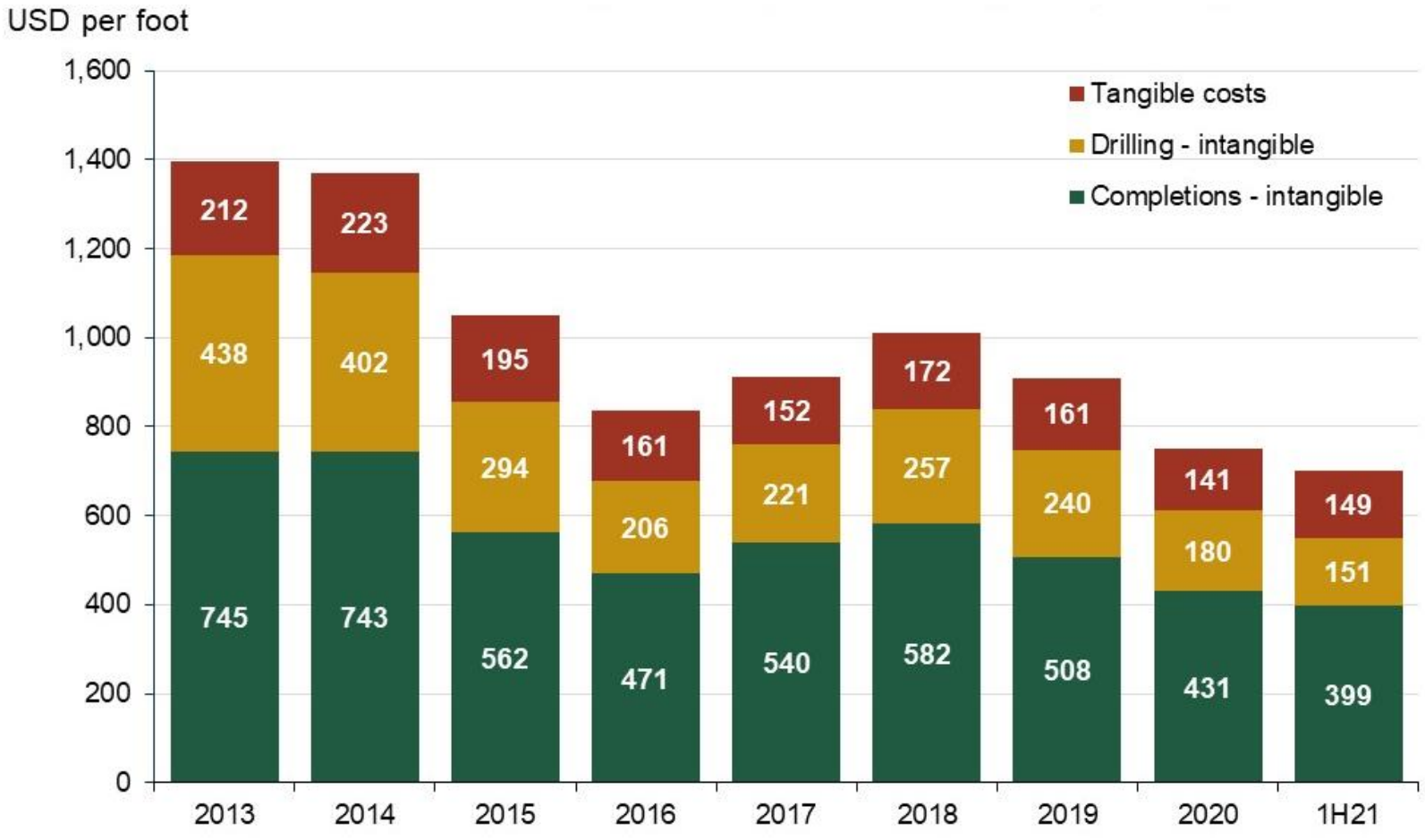






EIA

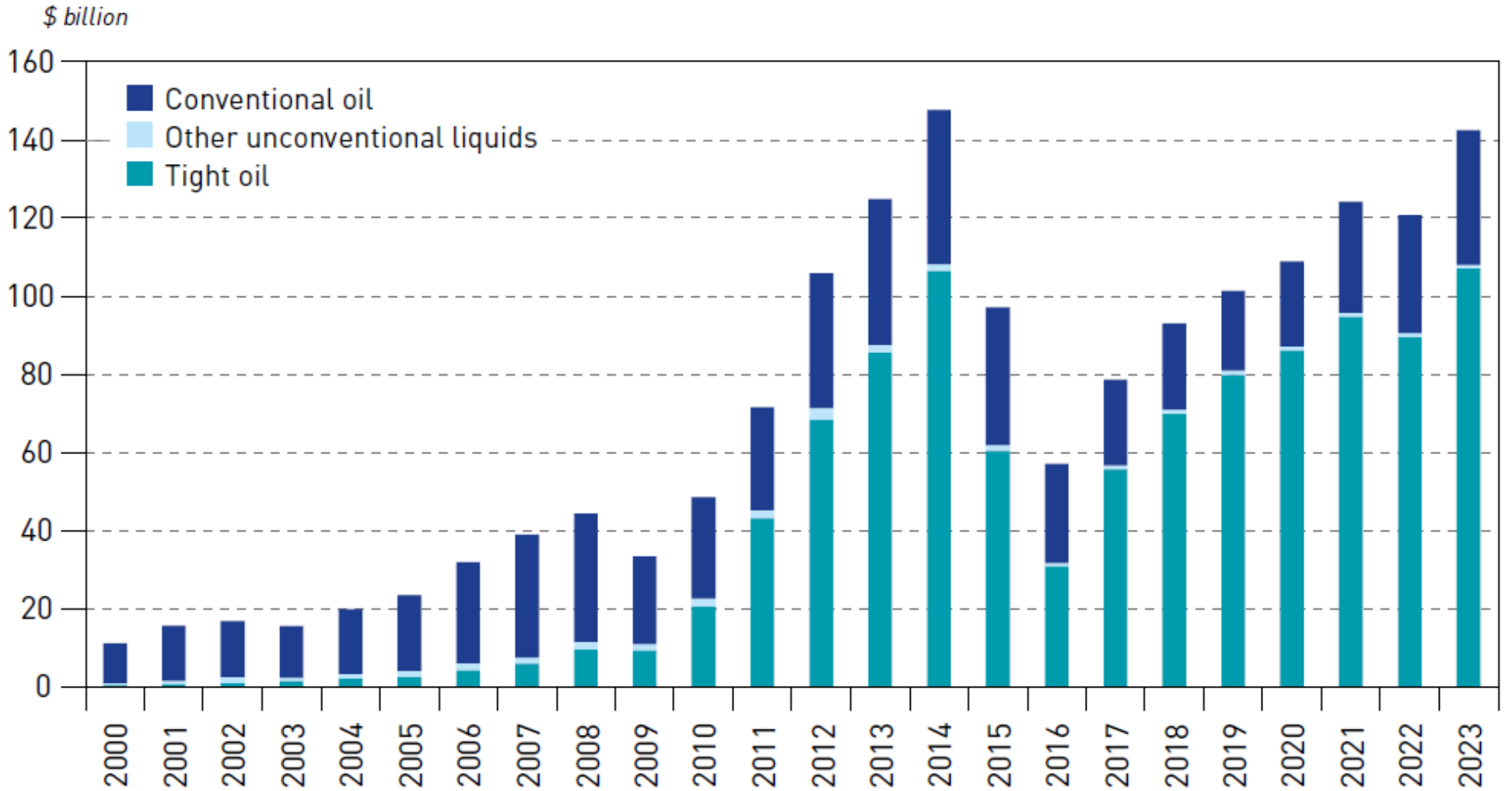
Permian Basin P50 Drilling and Completion Cost by Completion Year



*Tangible cost consist primarily of OCTG and facilities
**The chart includes all horizontal wells with perforated length greater than 3,000'
Source: Rystad Energy ShaleWellCube, July 2021

Rystad Energy

US Upstream Investment

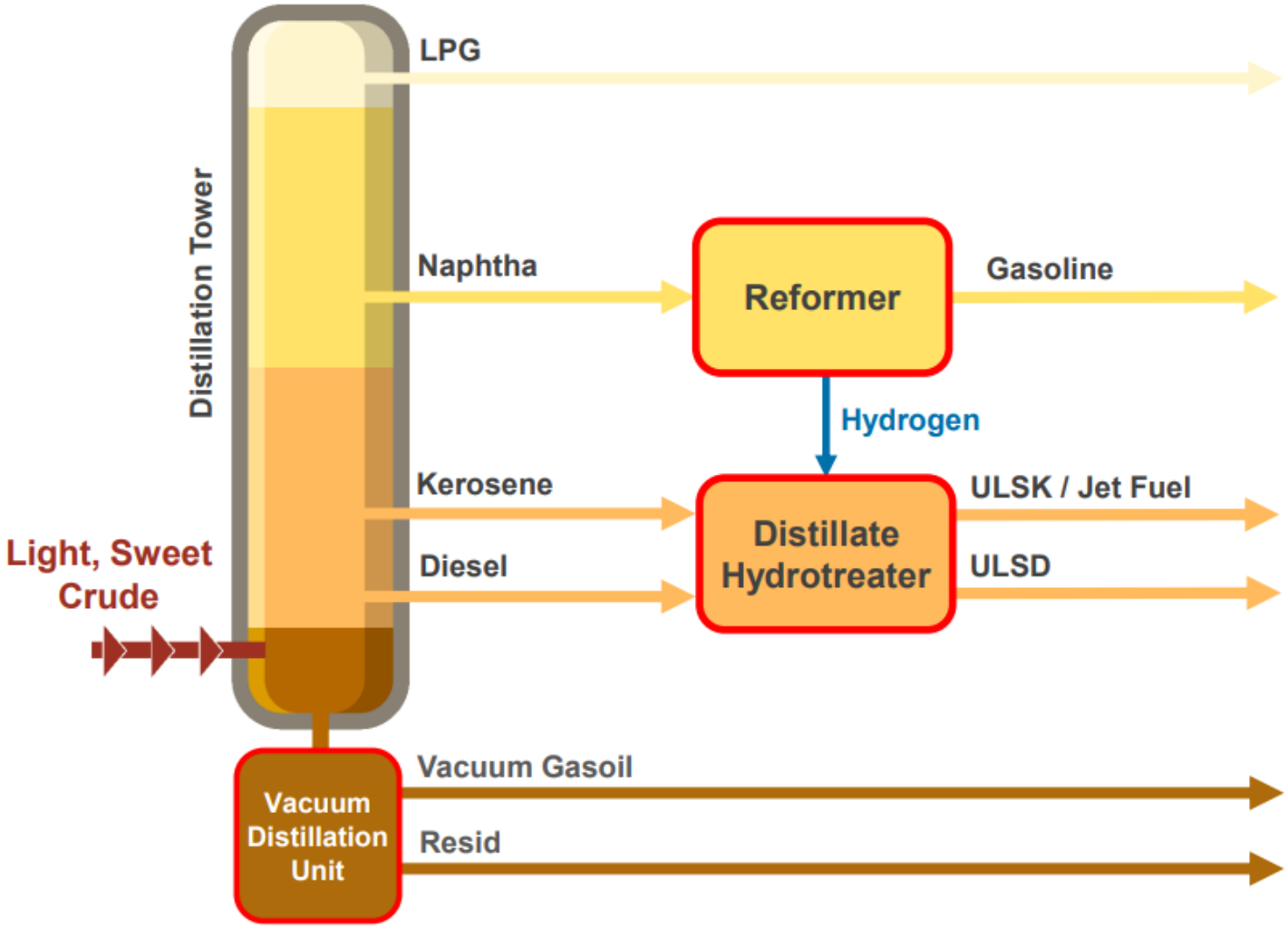


OPEC World Oil Outlook 2021

Refining & Chemicals

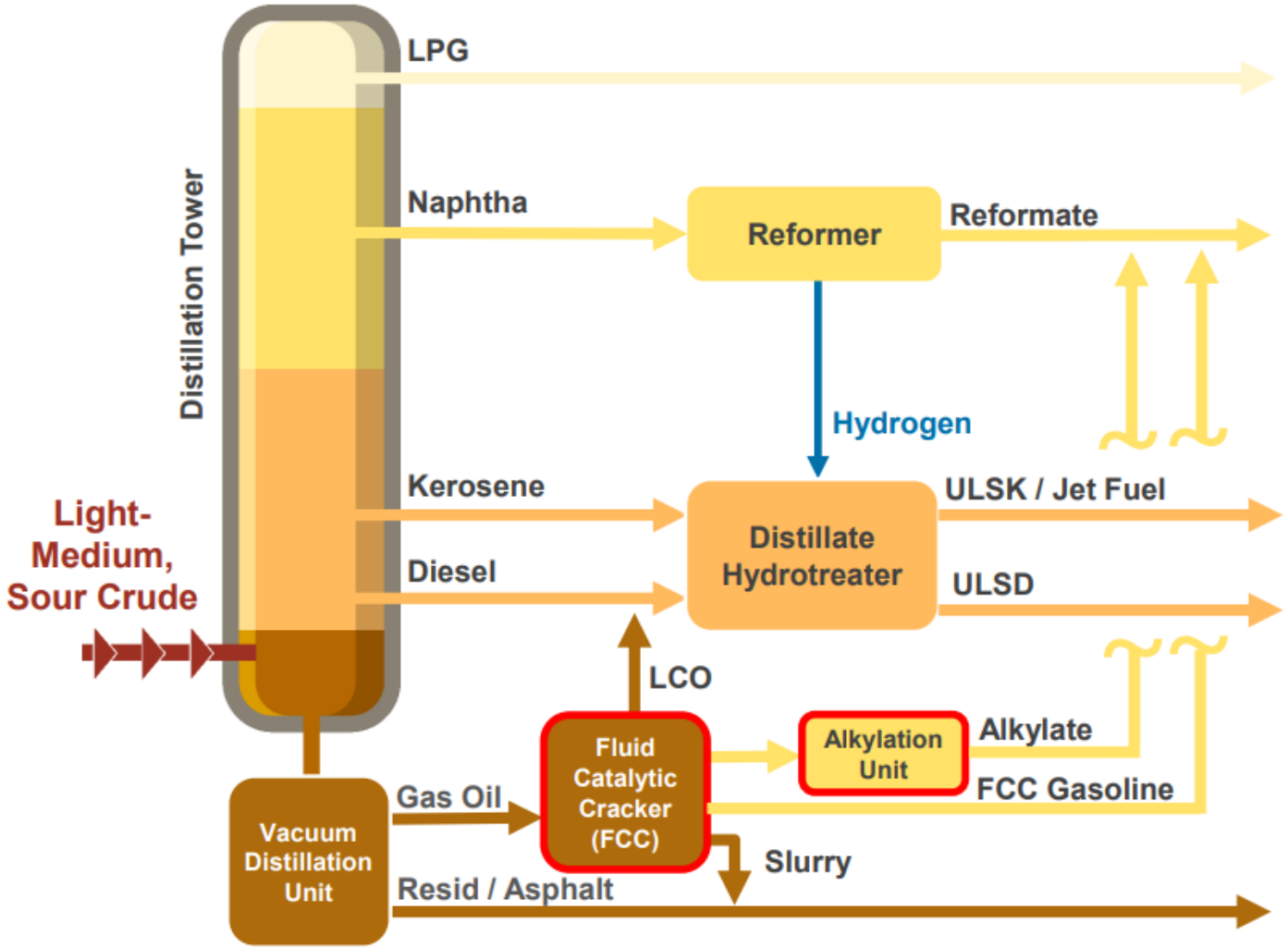
To draw a comprehensive picture of refining and chemicals sectors

Low Complexity: Hydroskimming (Topping)



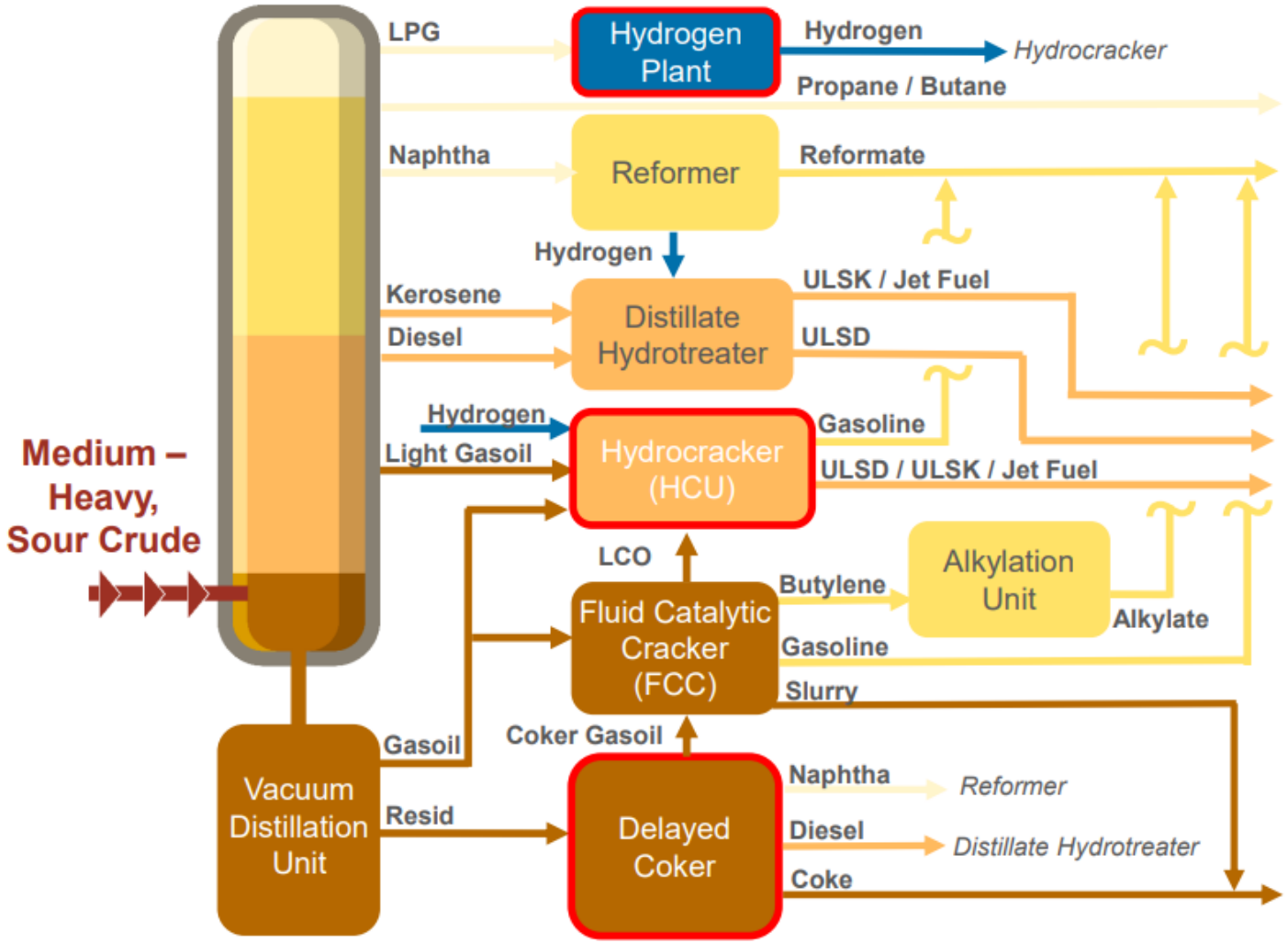
Valero

Medium Complexity: Catalytic Cracking



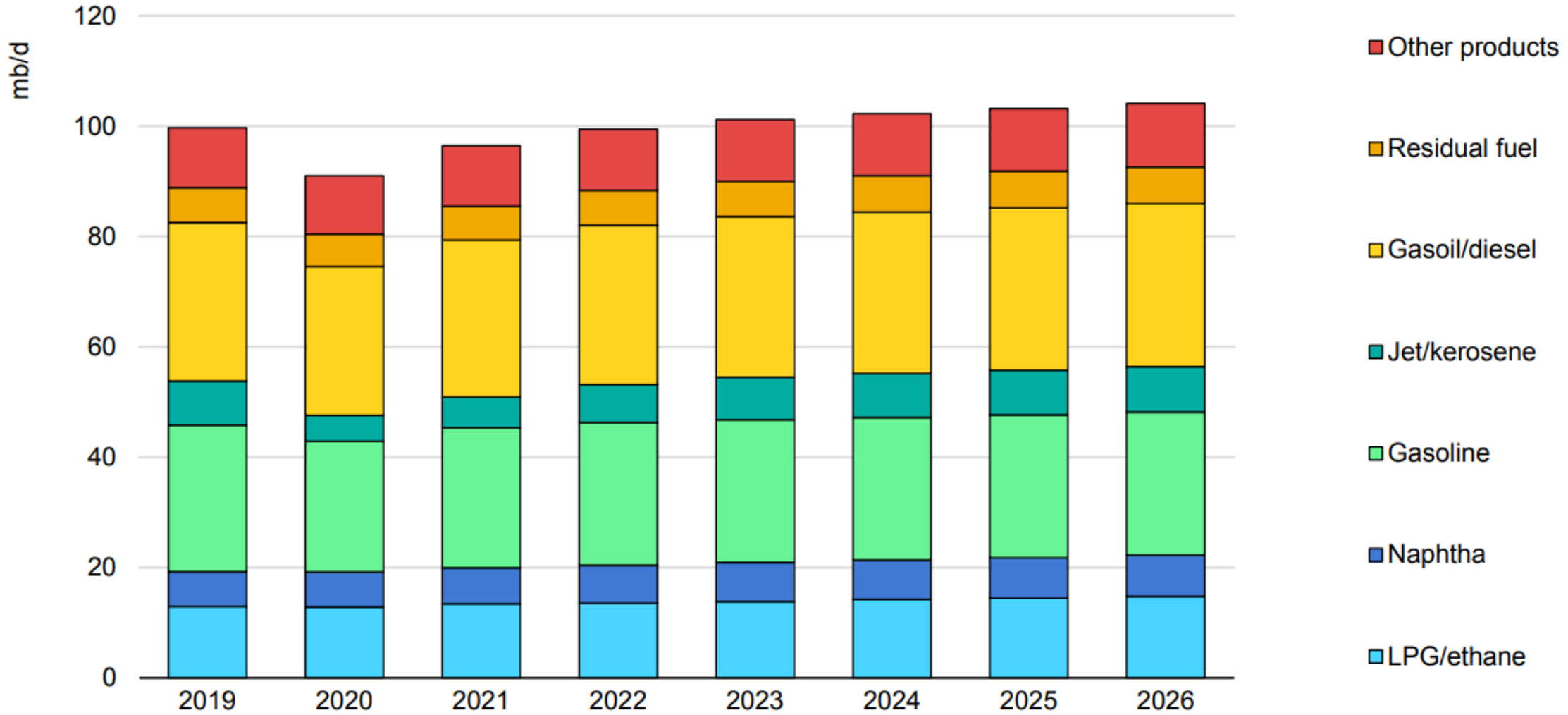
Valero

High Complexity: Coking / Reside Destruction



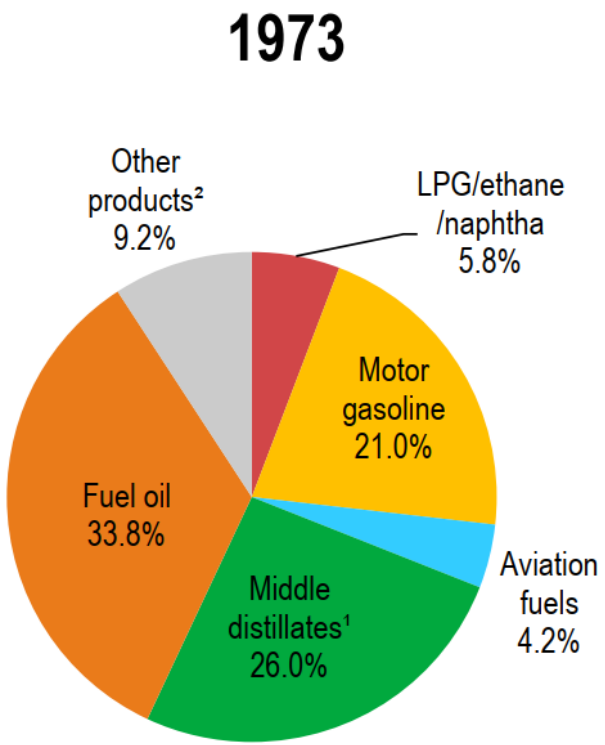
Valero

Global Oil Demand by Product

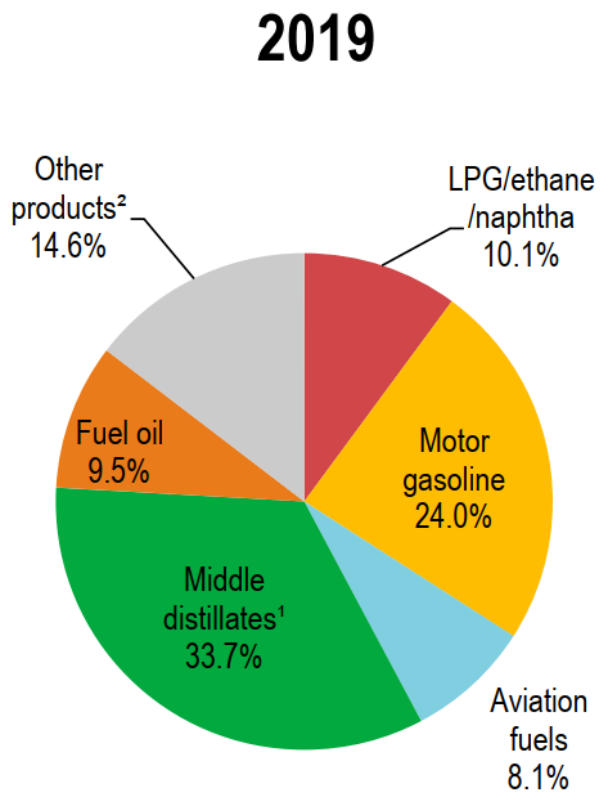


IEA Oil 2021

Refinery Output by Product



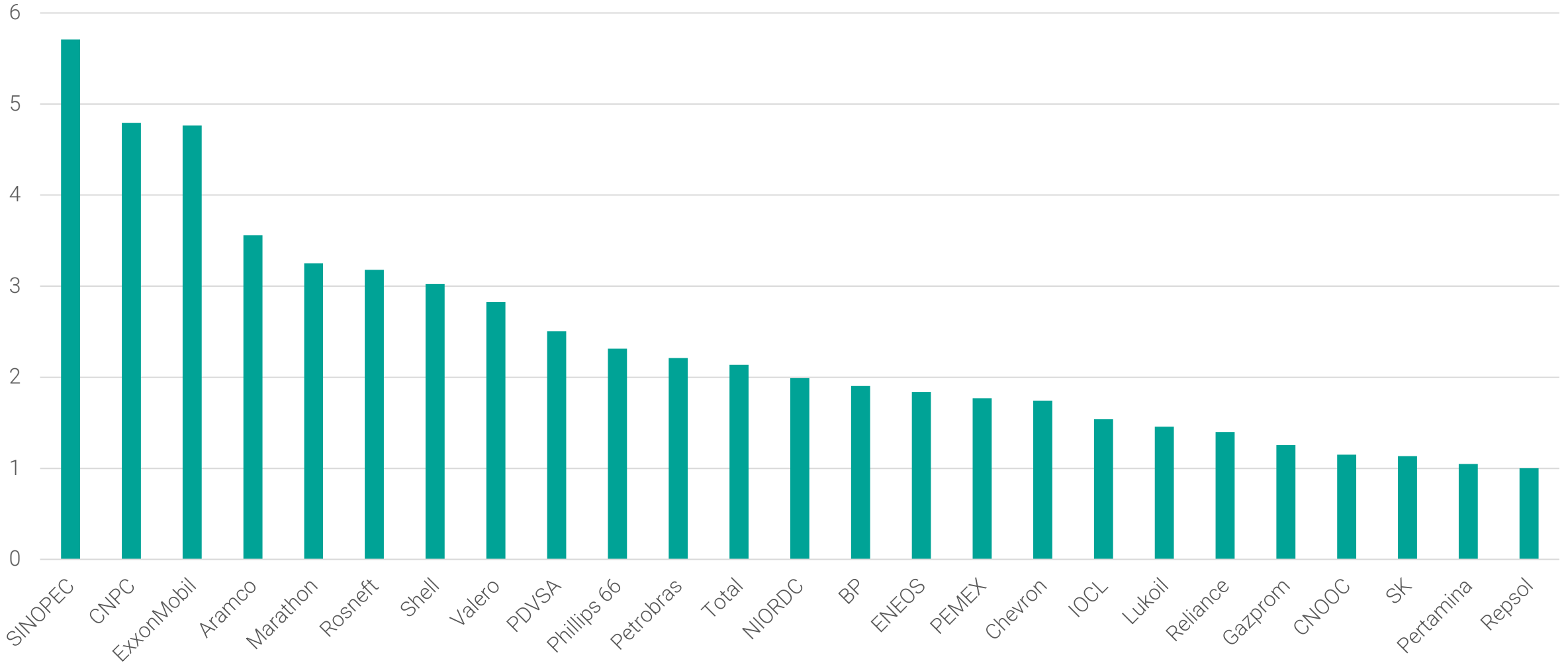
2 719 Mt



4 159 Mt

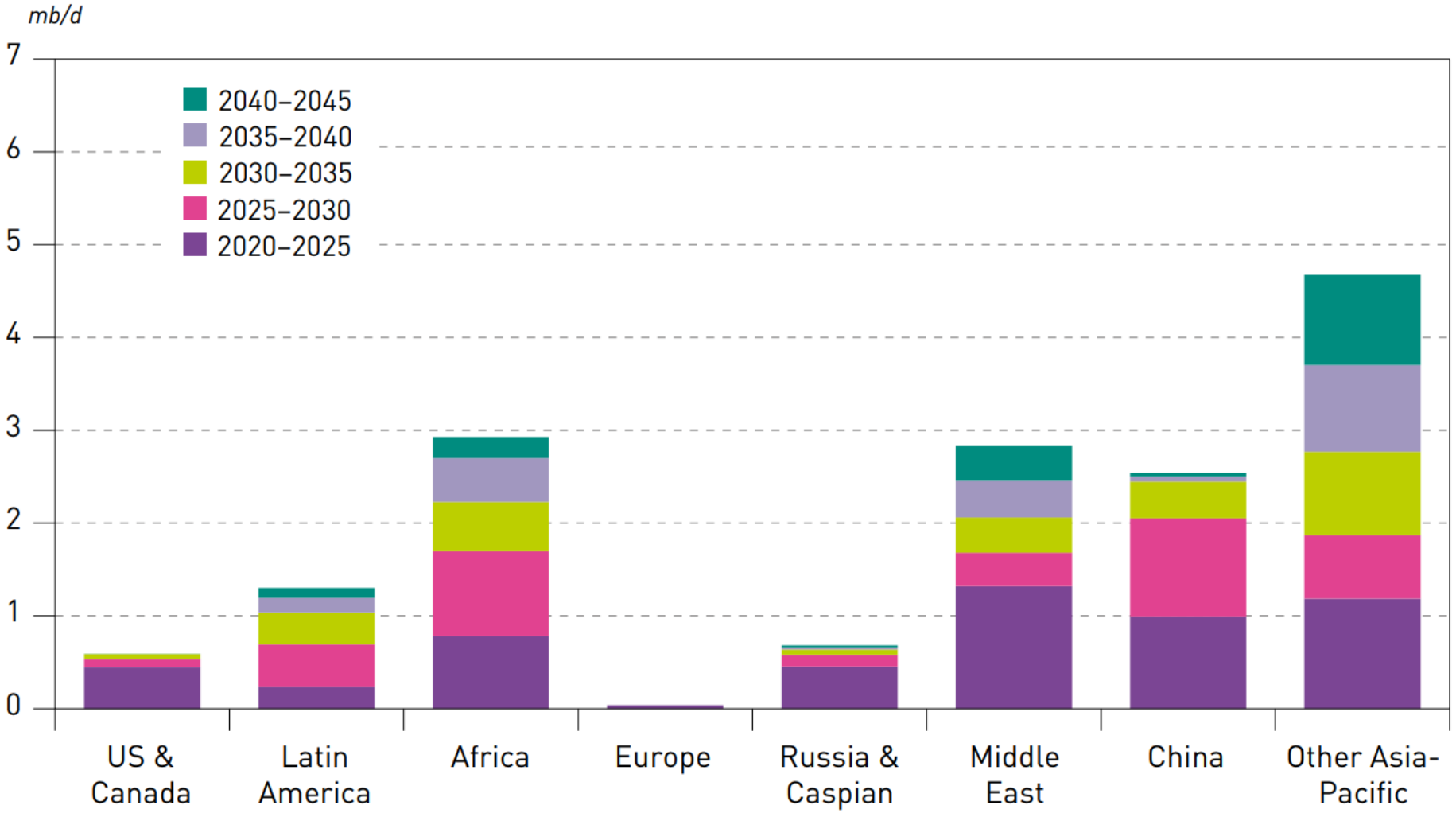
IEA Key World Energy Statistics 2021

Top Refining Companies by Capacity (MBPD)



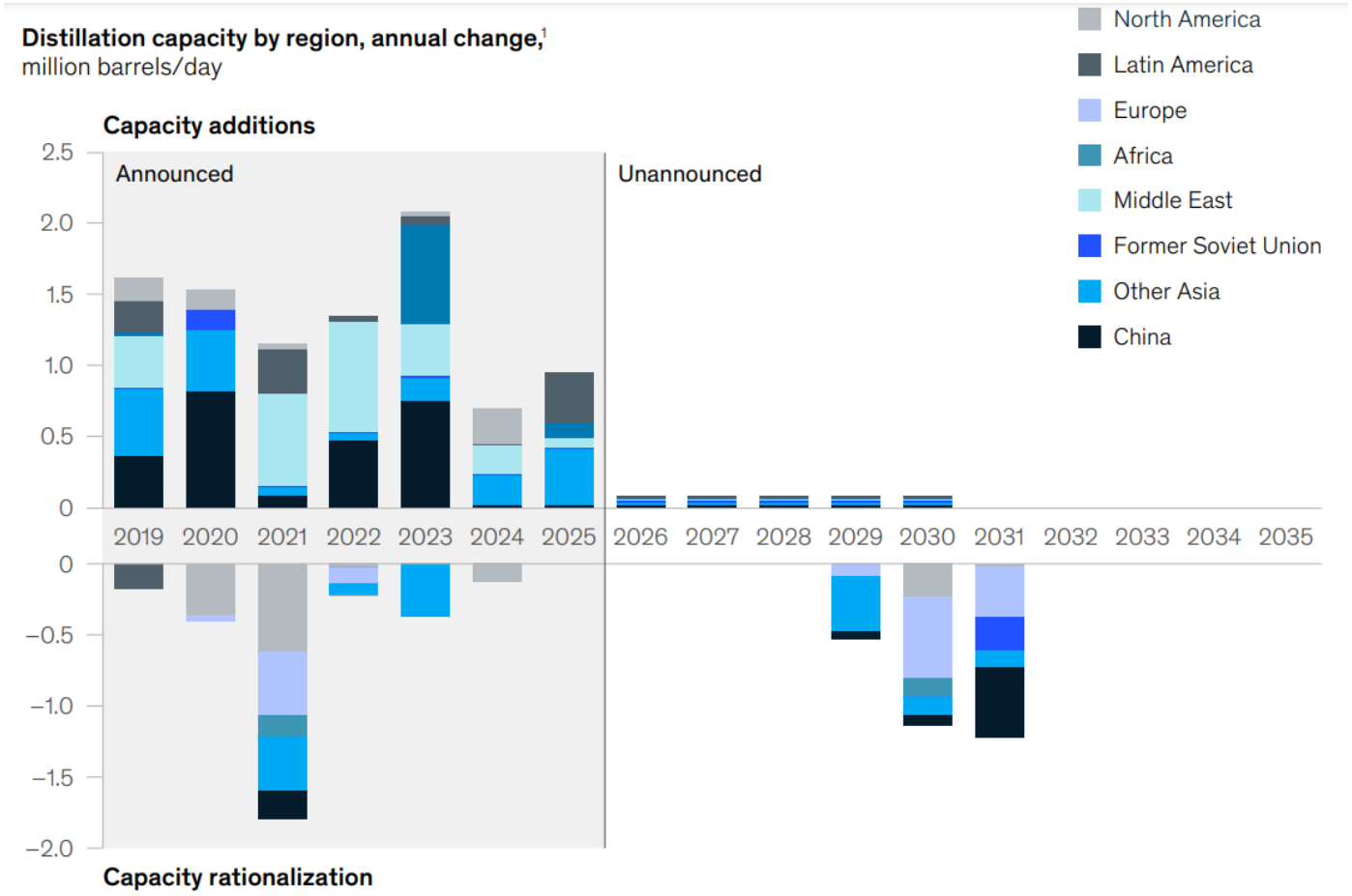
McKinsey

Distillation Capacity Additions (2019–2045)



OPEC World Oil Outlook 2021

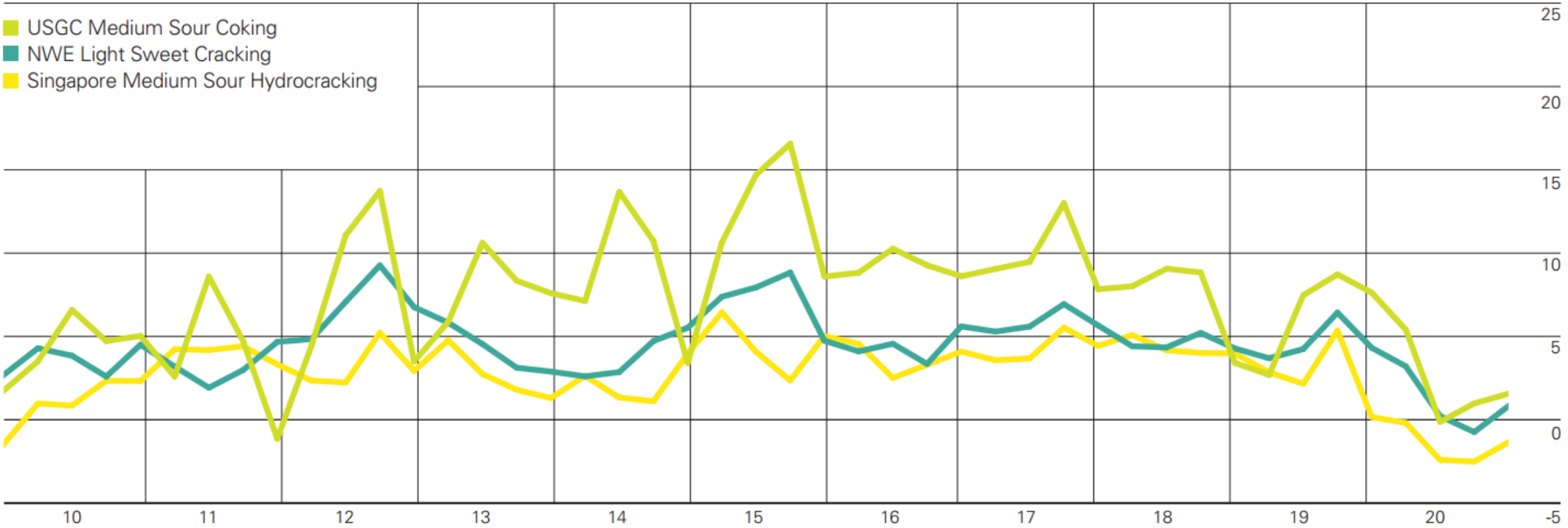
Distillation Capacity by Region, Annual Change



[1]Start and closure dates defined as first full year; additions include only projects classified as firm and probable; includes 0.125% per annum creep in growing markets.
Source: McKinsey Energy Insights Global Downstream Model 2021; McKinsey Refining Capacity Database

McKinsey Global downstream outlook to 2035 June 2021

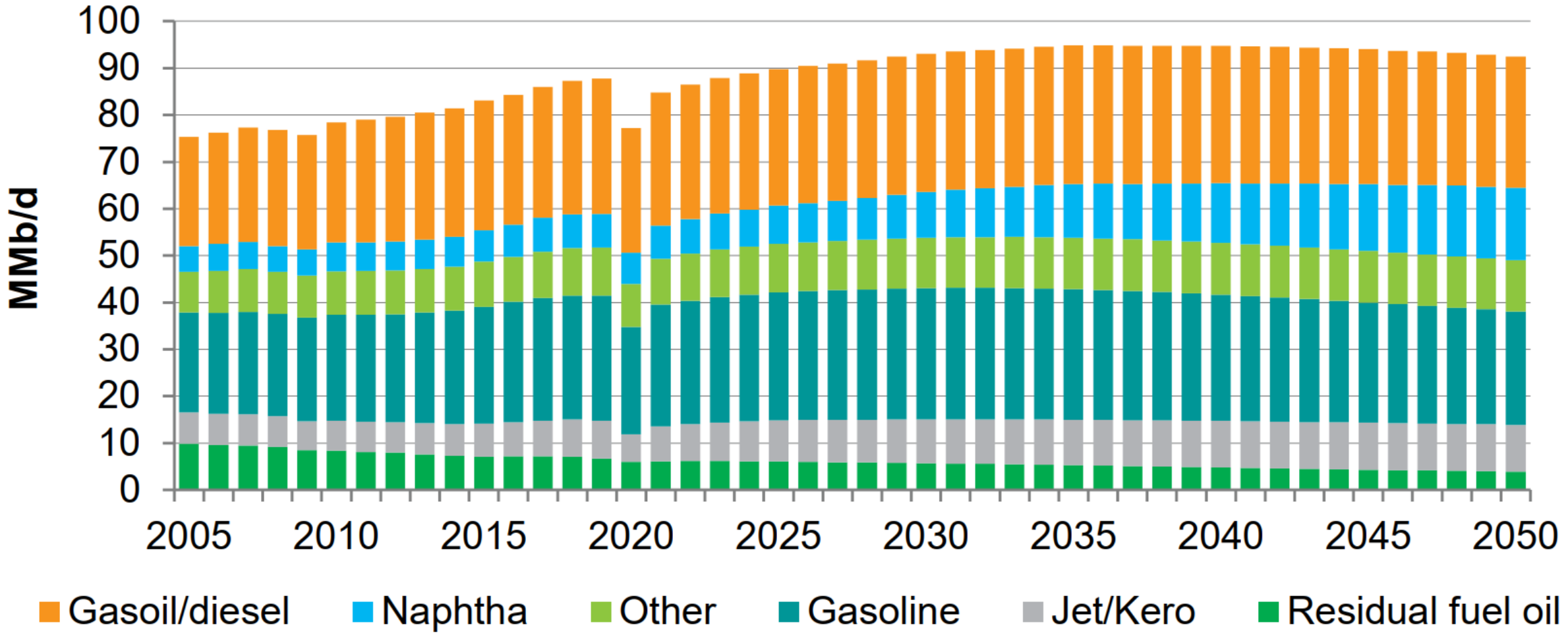
Refining Margins by Region



Note: The refining margins presented are benchmark margins for three major global refining centres. US Gulf Coast (USGC), North West Europe (NWE – Rotterdam) and Singapore. In each case they are based on a single crude oil appropriate for that region and have optimized product yields based on a generic refinery configuration (cracking, hydrocracking or coking), again appropriate for that region. The margins are on a semi-variable basis, i.e. the margin after all variable costs and fixed energy costs.

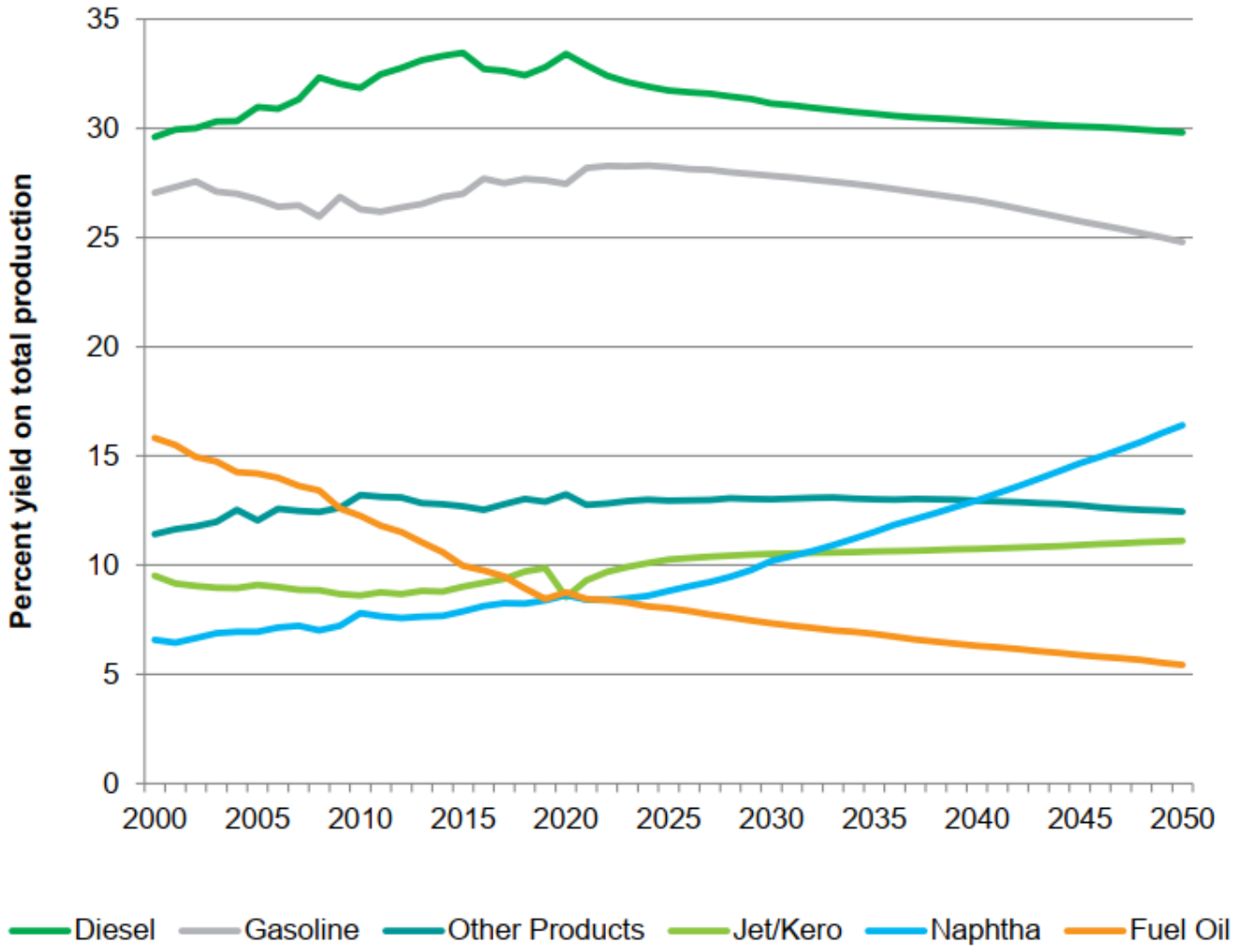
BP Statistical Review of World Energy 2021

World Refined Product Demand



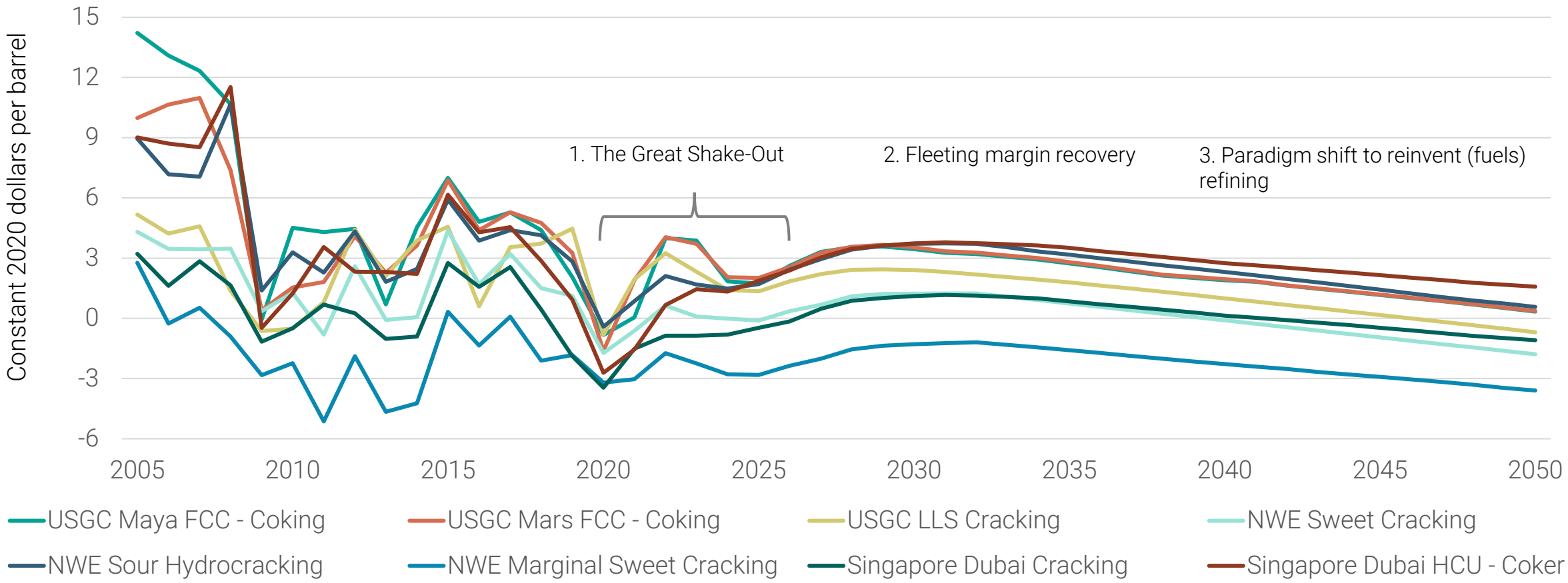
IHS Markit

World Refinery Yields



IHS Markit

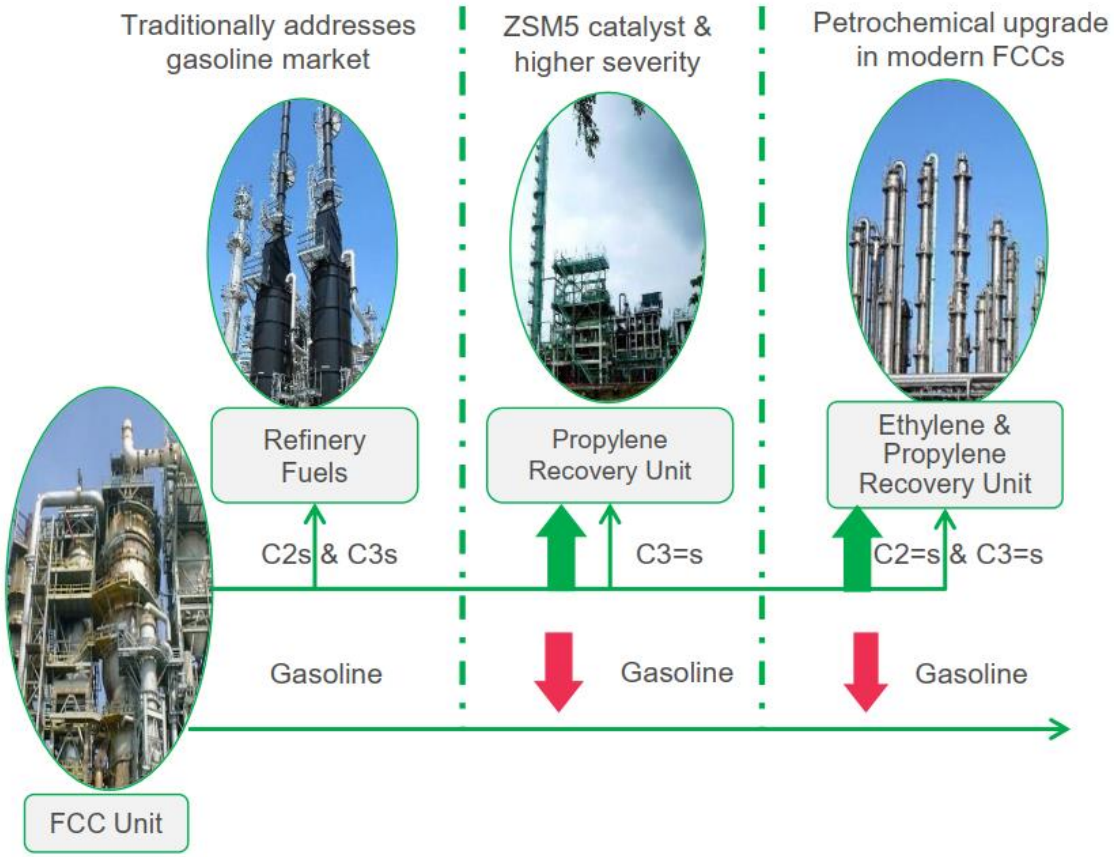
Long-term Benchmark Margin Outlook (USGC Margins Include RIN Costs)



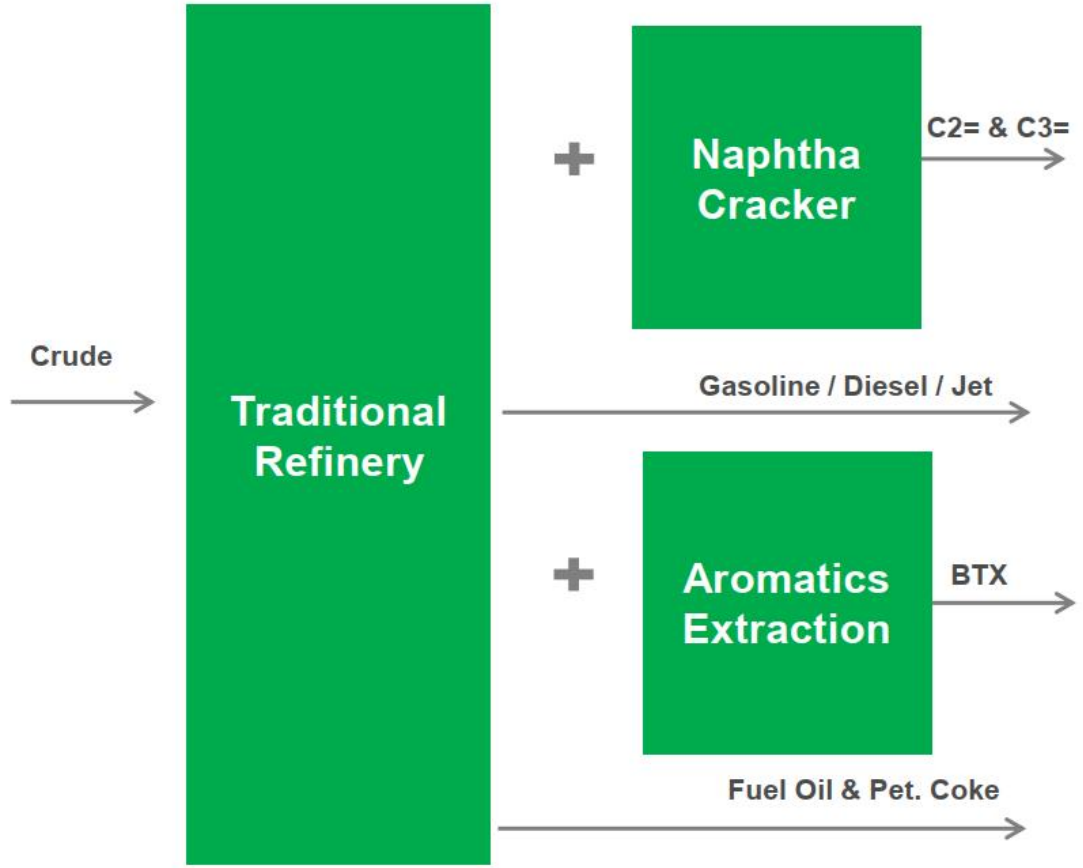
IHS Markit

Refining Petrochemical Integration

"Re-inventing" the FCC can potentially be the first move

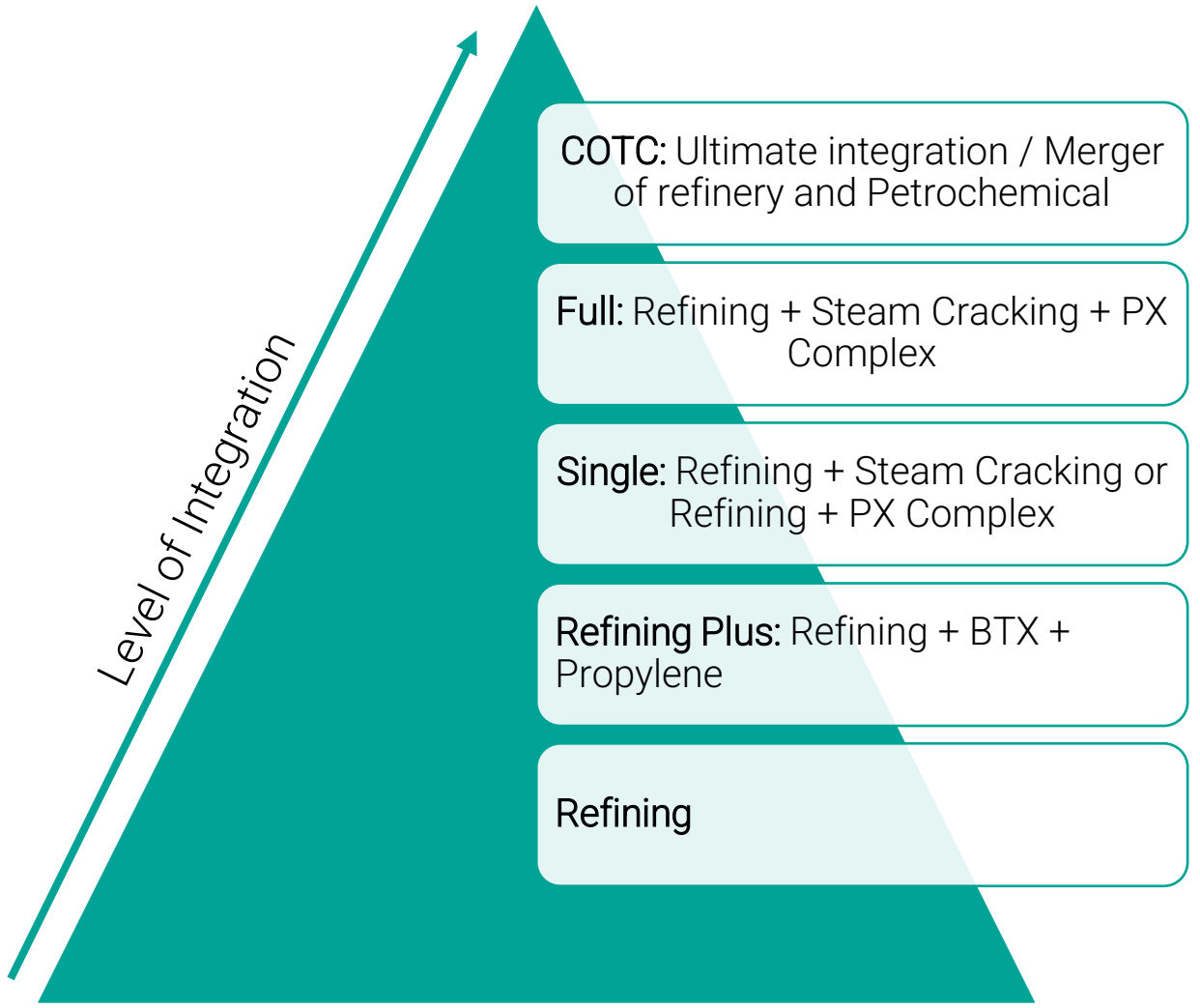


Long term plan to "bolt-on" petrochemical production



IHS Markit Crude Oil to Chemicals (COTC): A Major Disruptor

COTC Configures a Refinery to Produce Maximum Chemicals



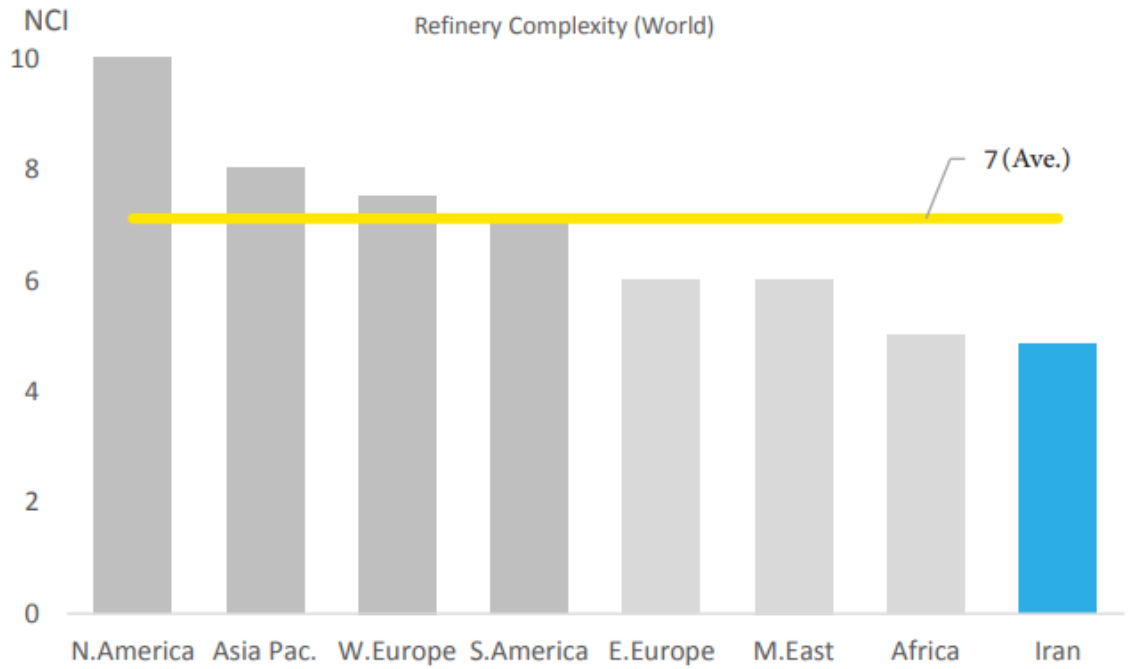
IHS Markit Crude Oil to Chemicals (COTC): A Major Disruptor

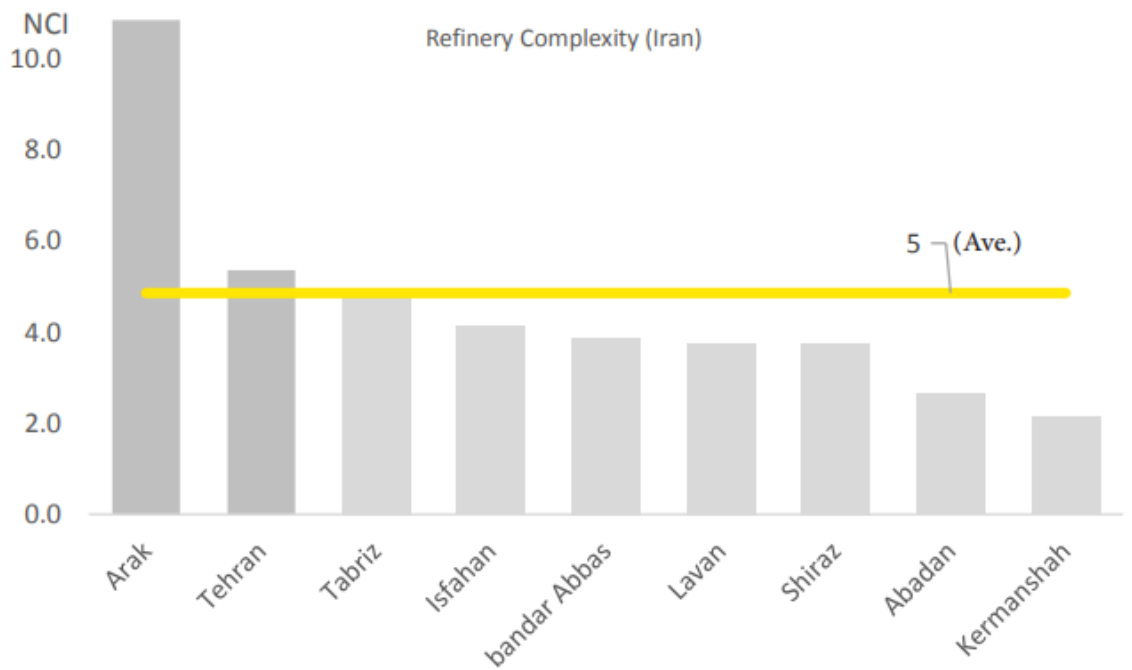
COTC Projects (2019)

Project	Refinery Capacity (MMTPA)	P-Xylene Capacity (MMTPA)	Olefin Capacity (MMTPA)	Est. Chemical conversion/ bbl of oil (%)	Investment ($bn)	Start Trial Operation
Hengli Petrochemical	20	4.3	1.5	42	11.4	Dec 2018
Zhejiang Petroleum and Chemical (ZPC) Phase 1	20	4.0	1.4	45	12	Est. Q2 2019
Hengyi (Brunei) PMB Refinery-Petrochem	8	1.5	0.5	>40	3.45	Est. 2019
Zhejiang Petroleum and Chemical (ZPC) Phase 2	20	4.8*	1.2	50*	12	Est. 2021
Shenghong refinery and Integrated Petrochem	16	2.8	1.1	60**	11.0	H2** 2021
Aramco/SABIC JV	20	--	3.0	45	20	2025

IHS Markit Crude Oil to Chemicals (COTC): A Major Disruptor

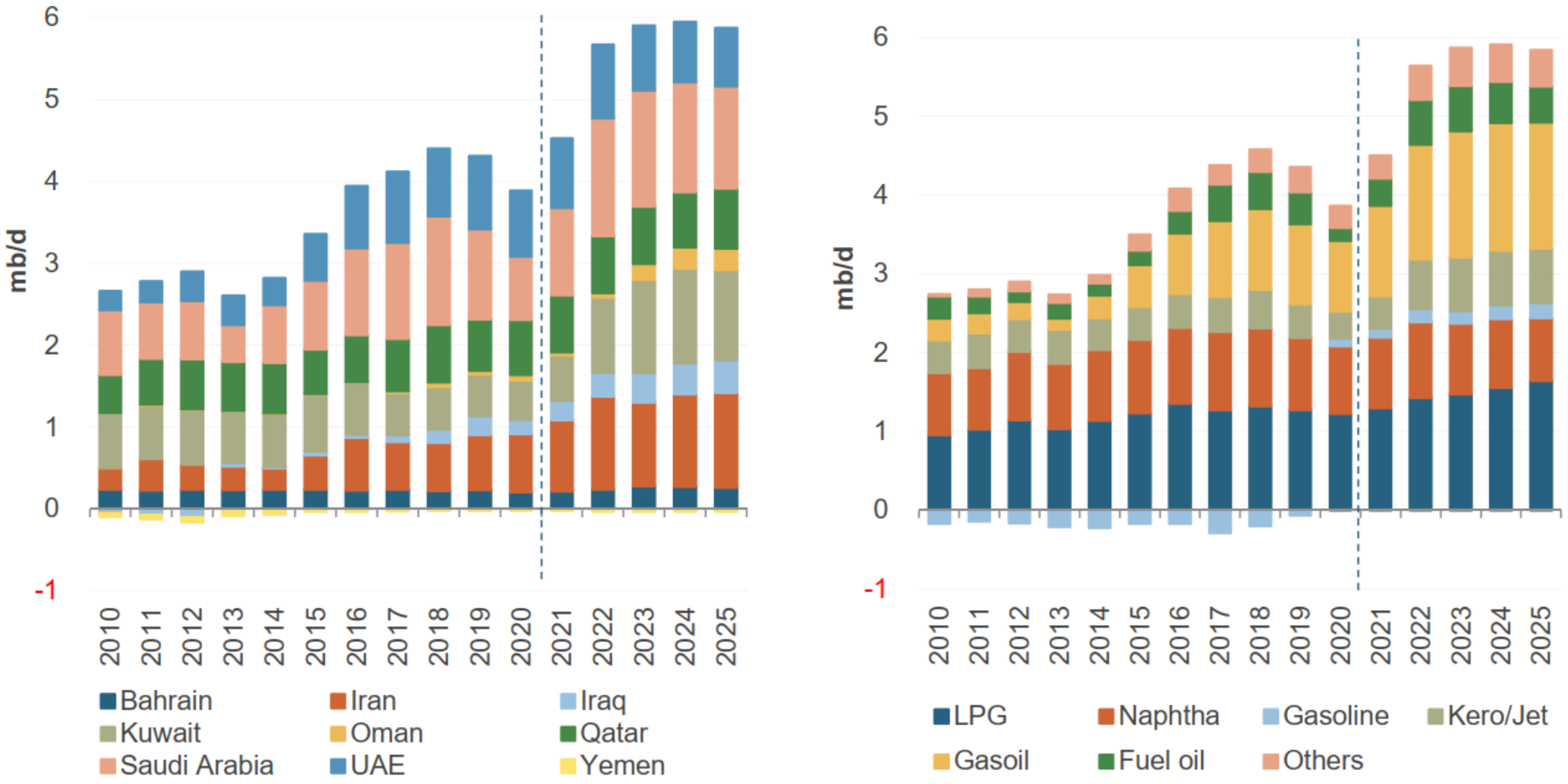
Nelson Complexity Index of Iran Refineries





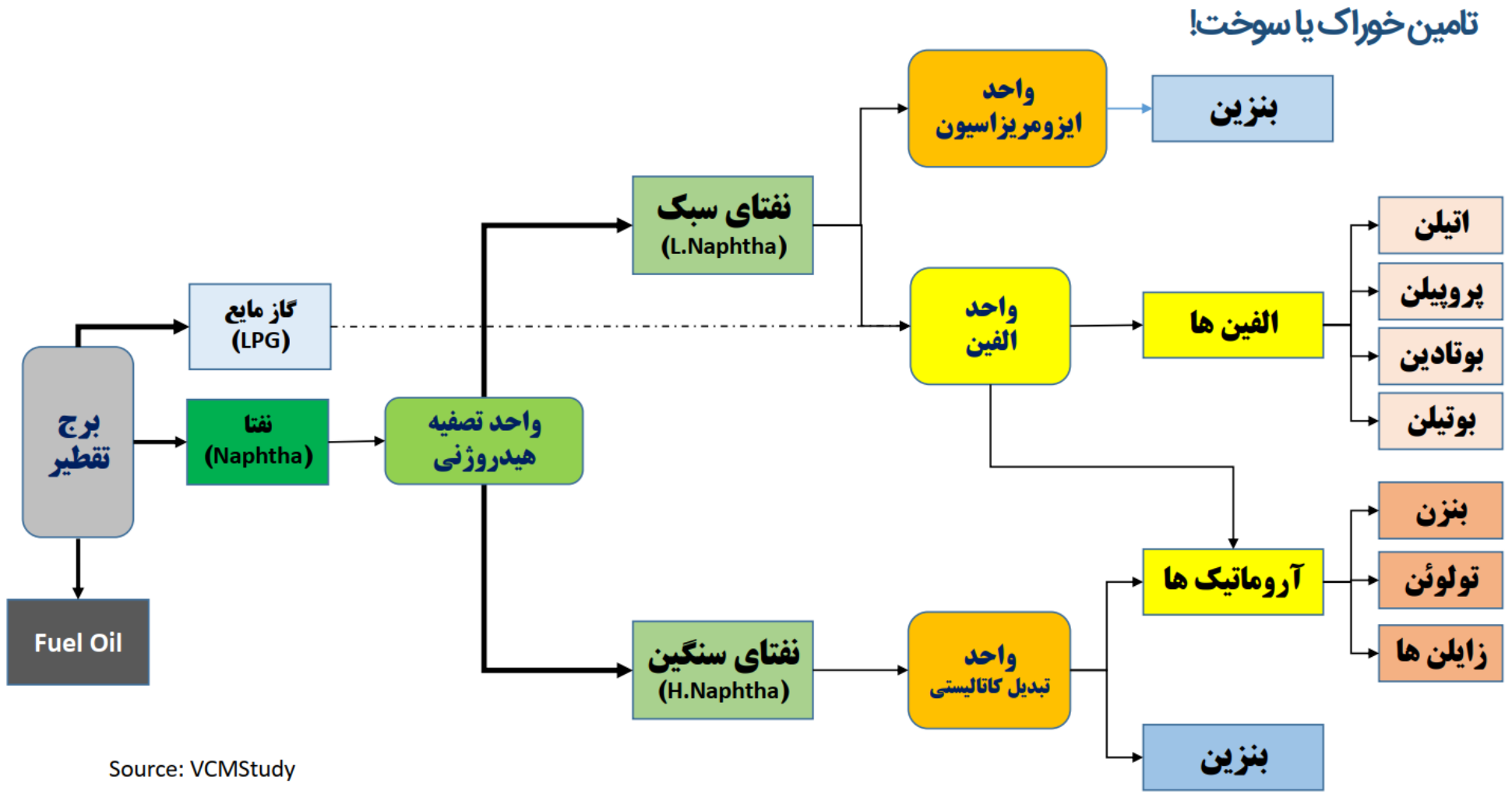
Iran's Oil Refinery Report: A modernization Necessity

Middle East Products Net Exports



OIES forum may 2021

Iran Refineries: Fuel or Feed



Source: VCMStudy

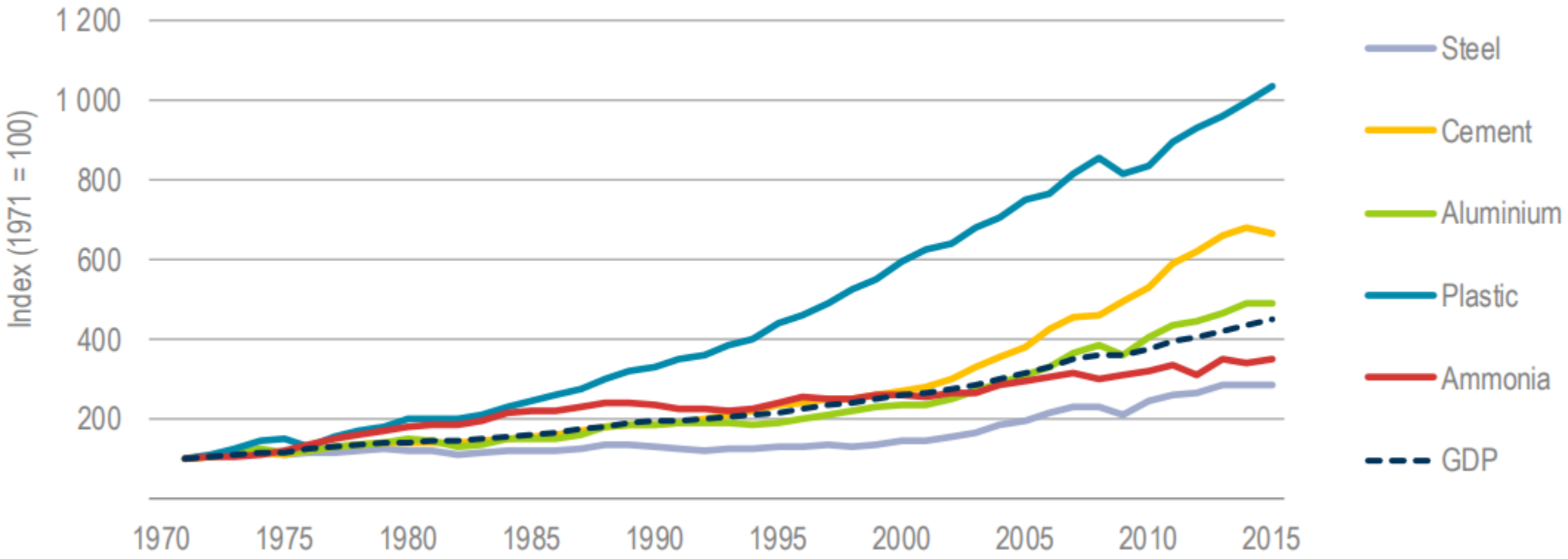
VCM Study

Oil Demand in the Petrochemical Sector

	2019	2020	2025	2030	2035	2040	2045	Growth 2019–2045
OECD Americas	3.5	3.2	3.8	4.1	3.9	3.7	3.5	0.1
OECD Europe	1.9	1.7	1.8	1.8	1.7	1.6	1.5	−0.4
OECD Asia Oceania	2.1	1.9	2.0	2.0	2.0	2.0	2.0	−0.1
OECD	**7.4**	**6.9**	**7.6**	**8.0**	**7.7**	**7.4**	**7.0**	**−0.4**
Latin America	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.1
Middle East & Africa	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
India	0.4	0.4	0.5	0.7	0.9	1.0	1.1	0.7
China	1.9	1.8	2.1	2.2	2.4	2.6	2.7	0.8
Other Asia	1.3	1.3	1.5	1.7	1.9	2.0	2.1	0.8
OPEC	1.2	1.2	1.4	1.7	2.2	2.5	2.7	1.5
Russia	0.9	0.9	1.1	1.1	1.1	1.1	1.1	0.1
Other Eurasia	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.0
Non-OECD	**6.2**	**6.0**	**7.1**	**8.0**	**9.0**	**9.7**	**10.3**	**4.1**
World	**13.7**	**12.9**	**14.7**	**15.9**	**16.7**	**17.0**	**17.3**	**3.7**

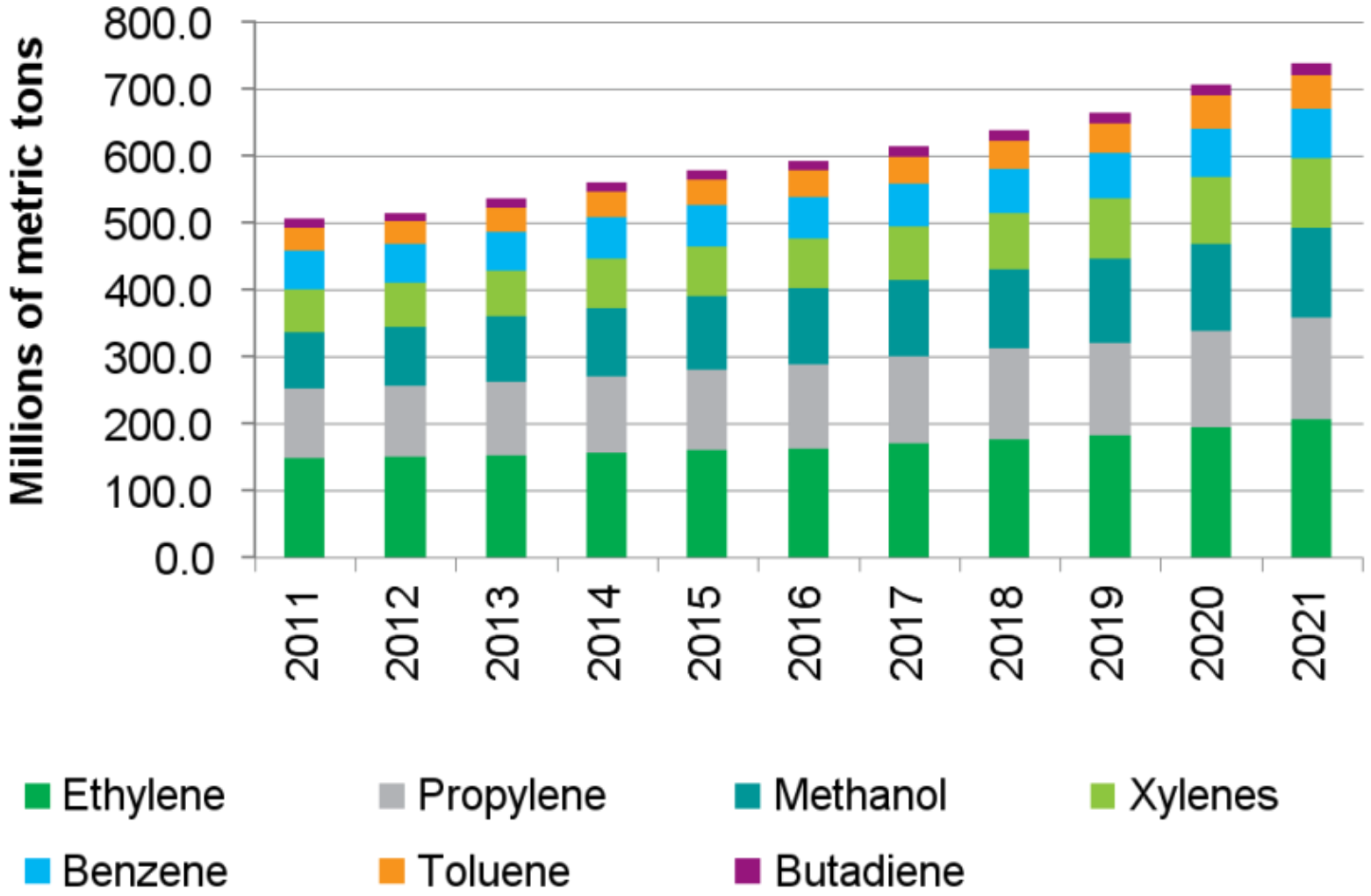
OPEC World Oil Outlook 2021

Production Growth for Selected Bulk Materials and GDP



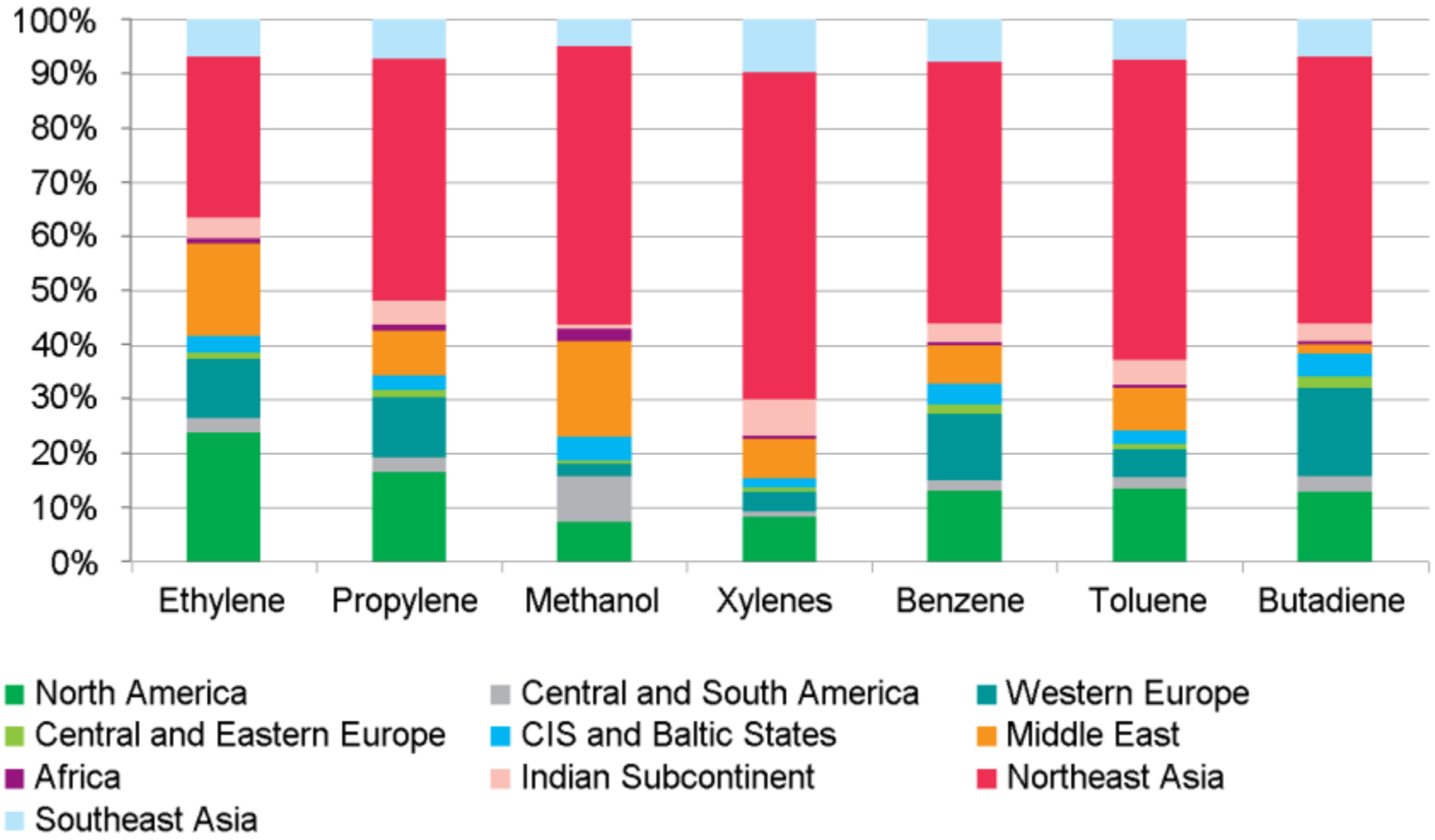
IEA The Future Of Petrochemicals

World Capacity for Primary Petrochemicals



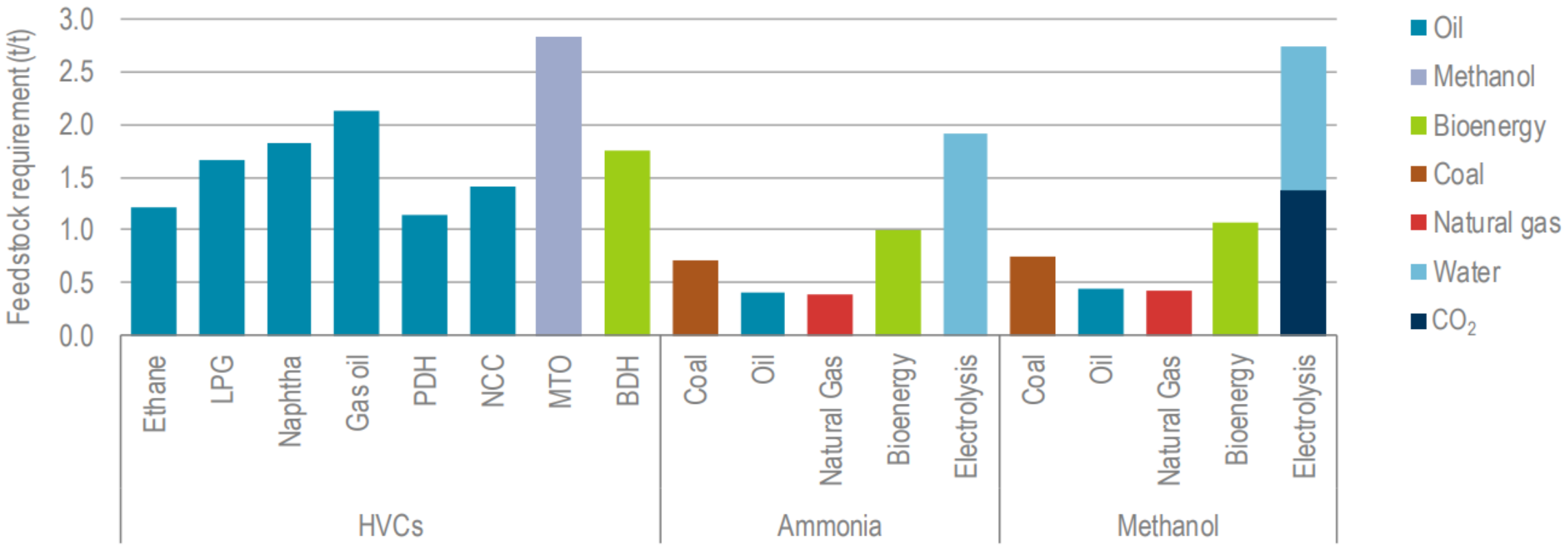
IHS Markit

Regional Share of Capacity for Primary Petrochemicals



IHS Markit

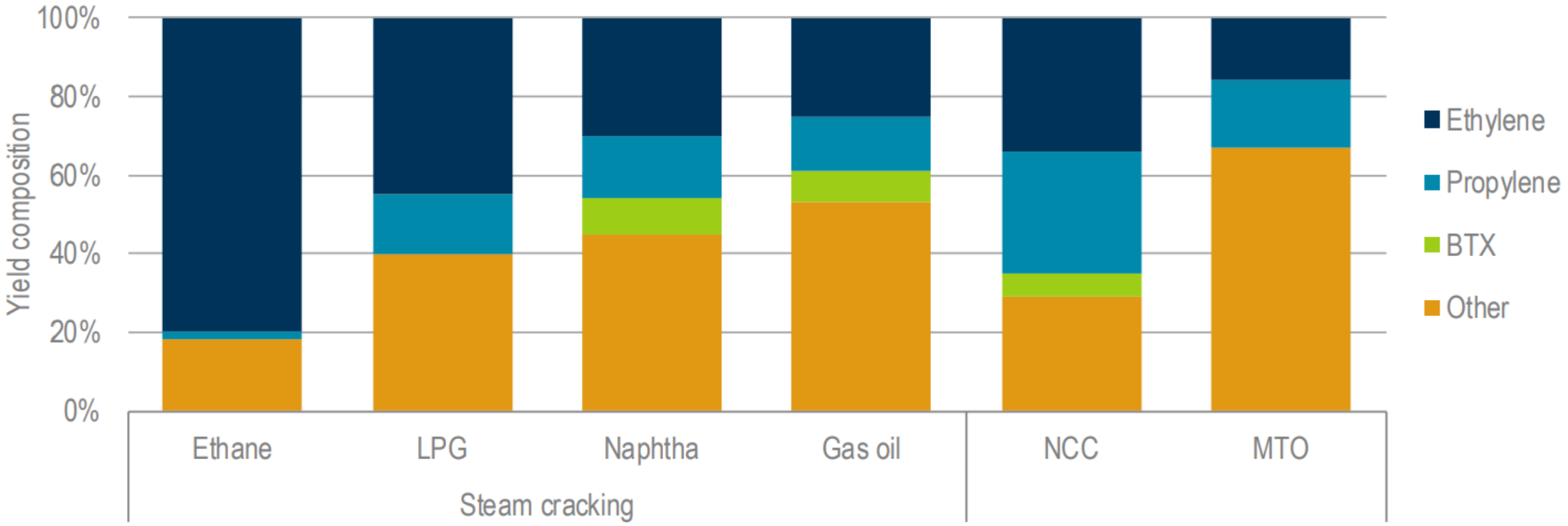
Feedstock Options by Chemical Product



Notes: BDH = bioethanol dehydration; LPG = liquefied petroleum gas; NCC = naphtha catalytic cracking. The quantity pertaining to BDH is in terms of bioethanol.

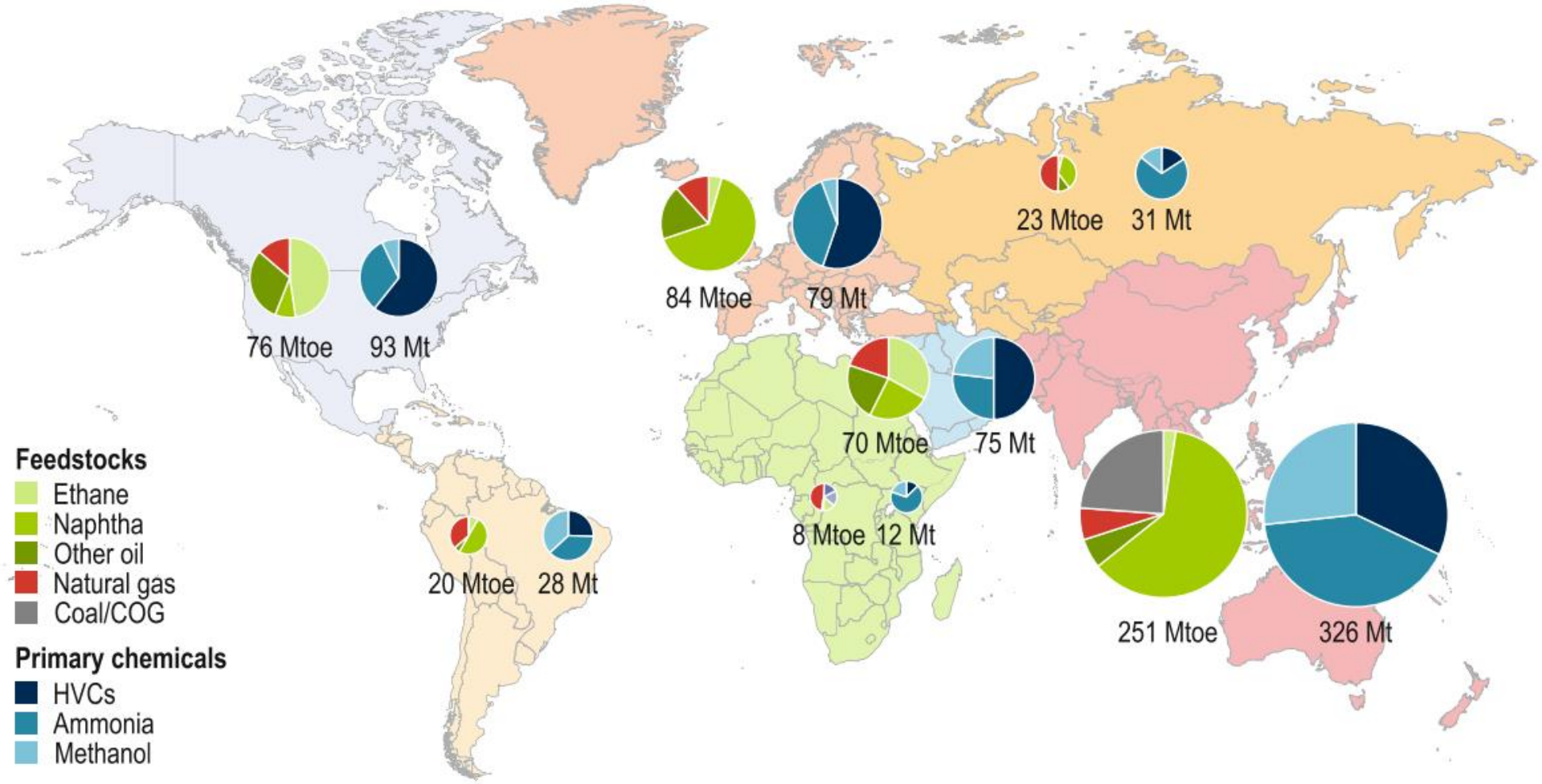
IEA The Future Of Petrochemicals

Yield of Individual HVCs in Multi-product Processes



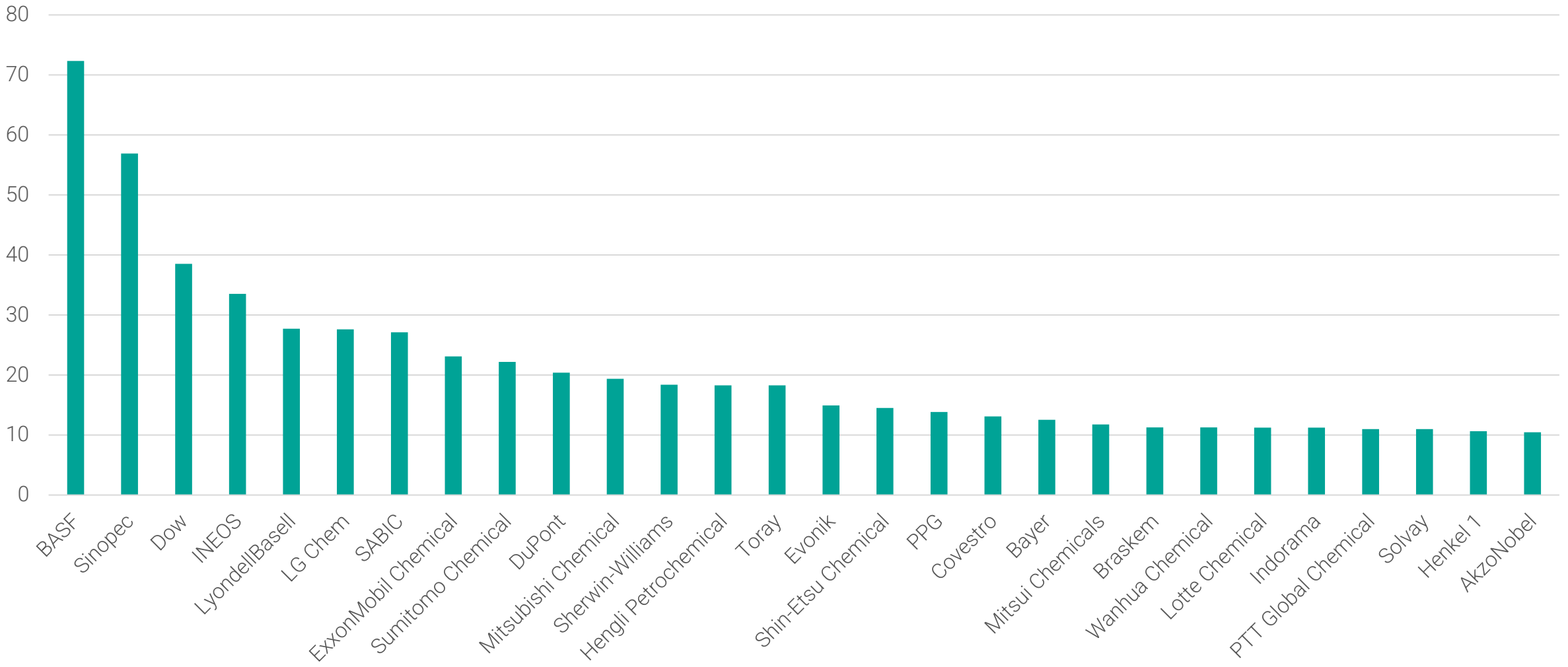
IEA The Future Of Petrochemicals

Primary Feedstock Use and Chemical Production by Region



IEA The Future Of Petrochemicals

The ICIS Top 100 Chemical Companies 2020 ($B)



ICIS

The ICIS Top 100 Chemical Companies 2020

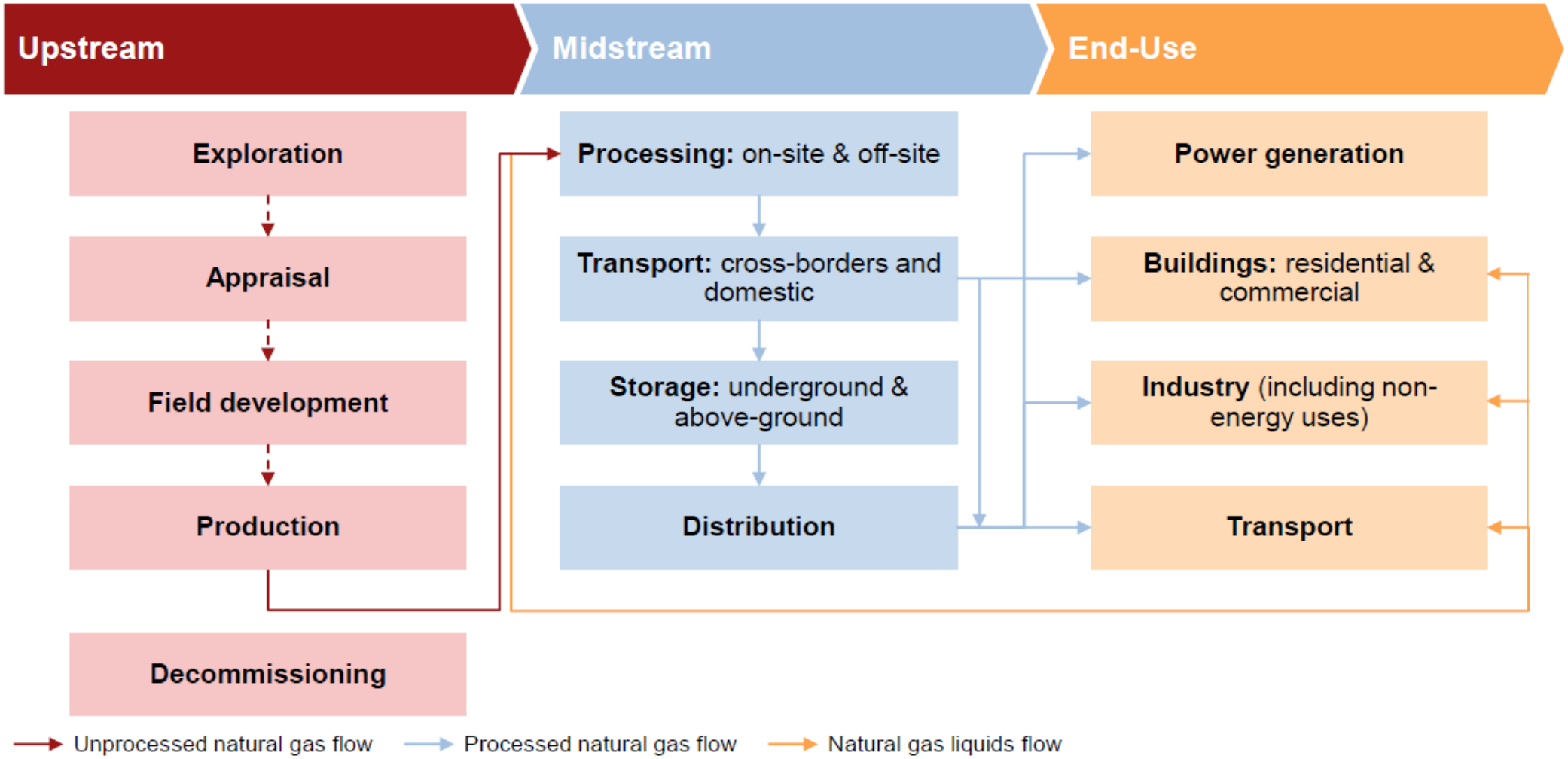
Rank 2019	Company	Sales 2019	% change	Operating profit 2019	% change	Net income 2019	% change	Total Assets 2019	% change	R&D 2019	% change	Capex 2019	% change	Employees 2019	% change
$m, change in reporting currencies															
1	BASF	66,594	-1.5	4,549	-32.2	9,454	78.9	97,619	0.5	2,423	8.2	4,310	6.2	132,061	-3.9
2	Sinopec [2]	63,244	-6.9	2,463	-36.5	-	-	-	-	-	-	-	-	-	-
3	Dow [1]	42,951	-13.4	-395	-	-1,272	-	60,524	-27.7	765	-4.4	1,961	-6.2	36,500	-32.4
4	LyondellBasell	34,727	-11.0	4,116	-21.3	3,397	-27.6	30,435	7.6	111	-3.5	2,694	28.0	19,100	-1.8
5	SABIC [2]	32,488	-19.0	3,680	-59.1	-	-	74,933	-3.2	-	-	-	-	-	-
6	INEOS [2]	32,103	-8.6	2,485	-39.0	-	-	-	-	-	-	-	-	23,015	13.9
7	ExxonMobil [2]	27,416	-15.5	-	-	592	-82.3	-	-	-	-	1,933	29.4	-	-
8	LG Chem	24,793	1.6	776	-60.1	326	-75.2	29,470	17.6	949	8.7	1,793	1.4	-	-
9	DuPont [1]	21,512	-4.8	194	-70.4	498	-87.0	69,396	-63.1	955	-10.7	1,492	19.9	35,000	-
10	Sumitomo Chemical [3]	20,480	-4.0	1,265	-24.8	501	-64.3	33,588	15.1	-	-	1,108	-31.1	-	-

ICIS

Gas and LNG

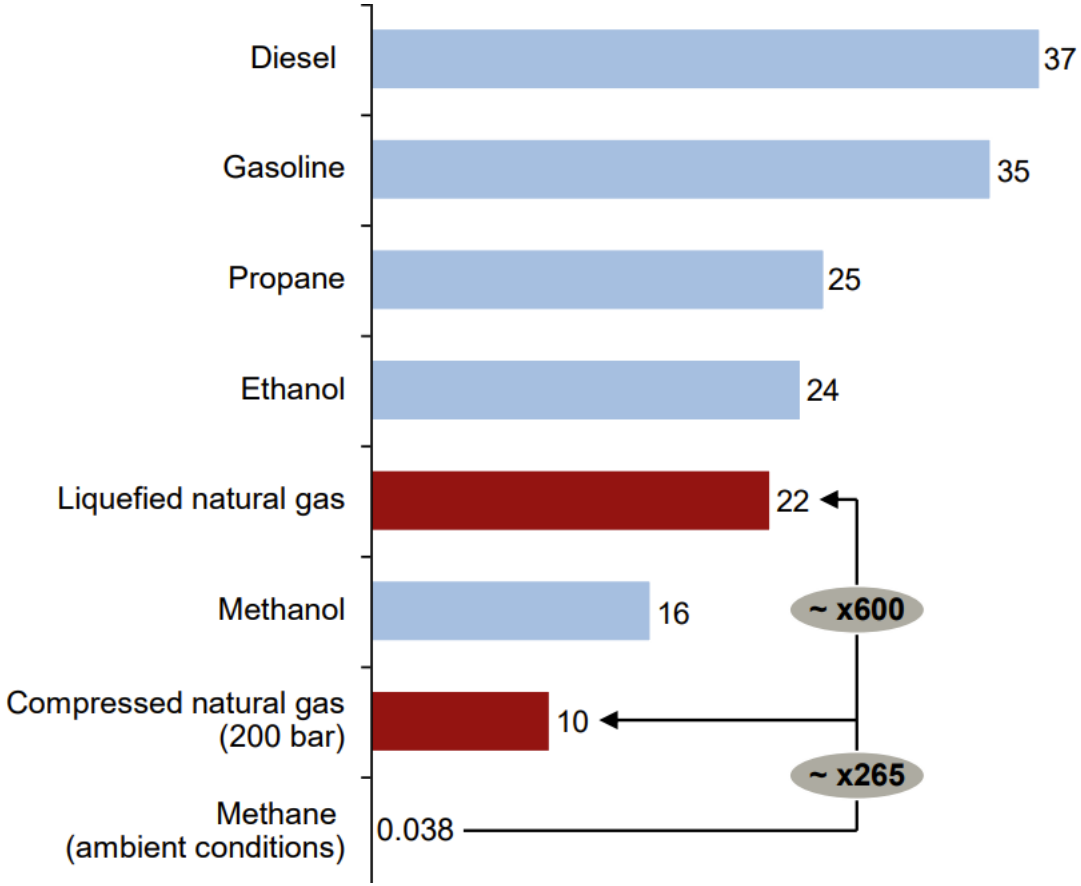
To Provide a comprehensive review of gas and LNG markets

Natural Gas Value Chain



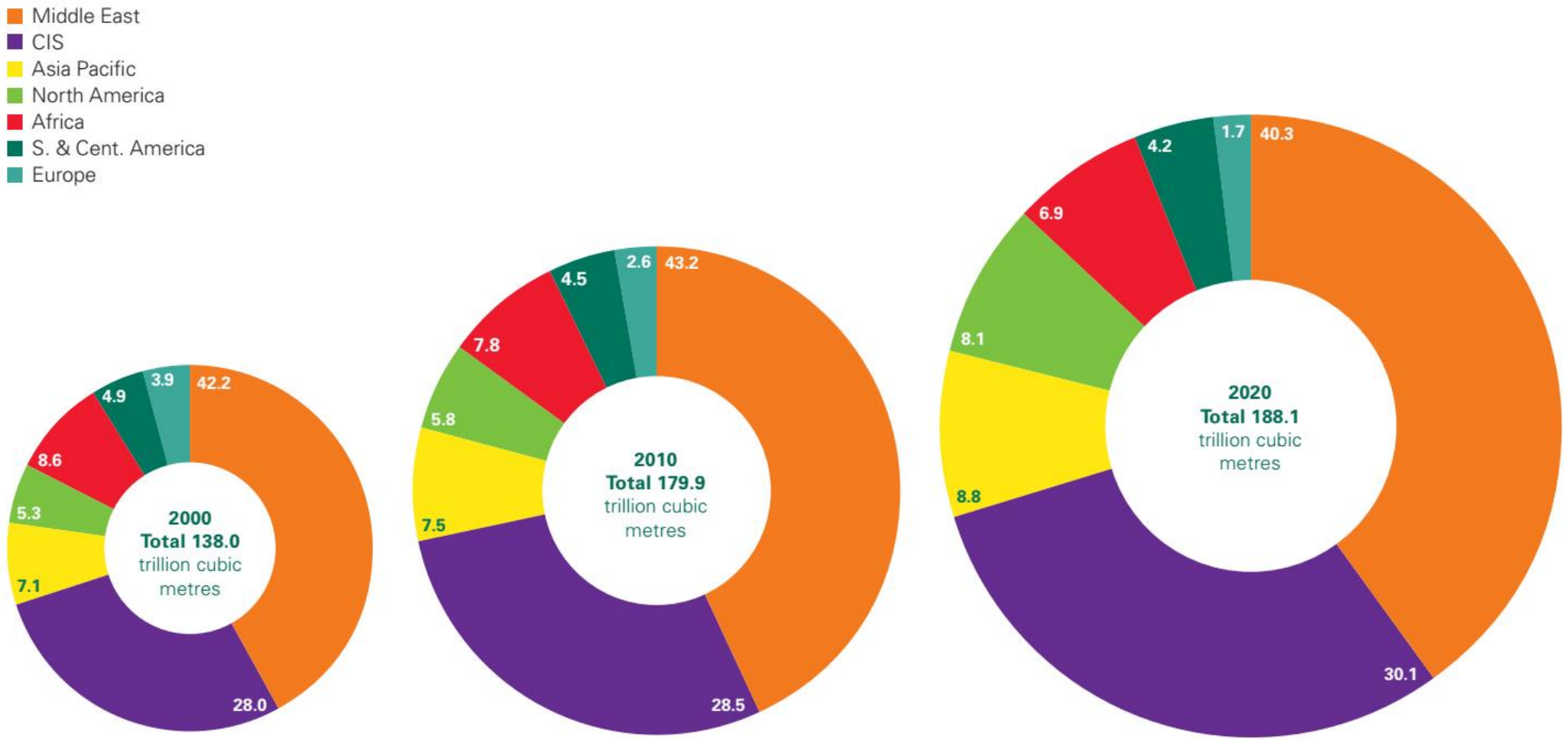
Kearney Introduction to Natural Gas 2014

Volumetric energy density of chemical fuels (MJ/liter)



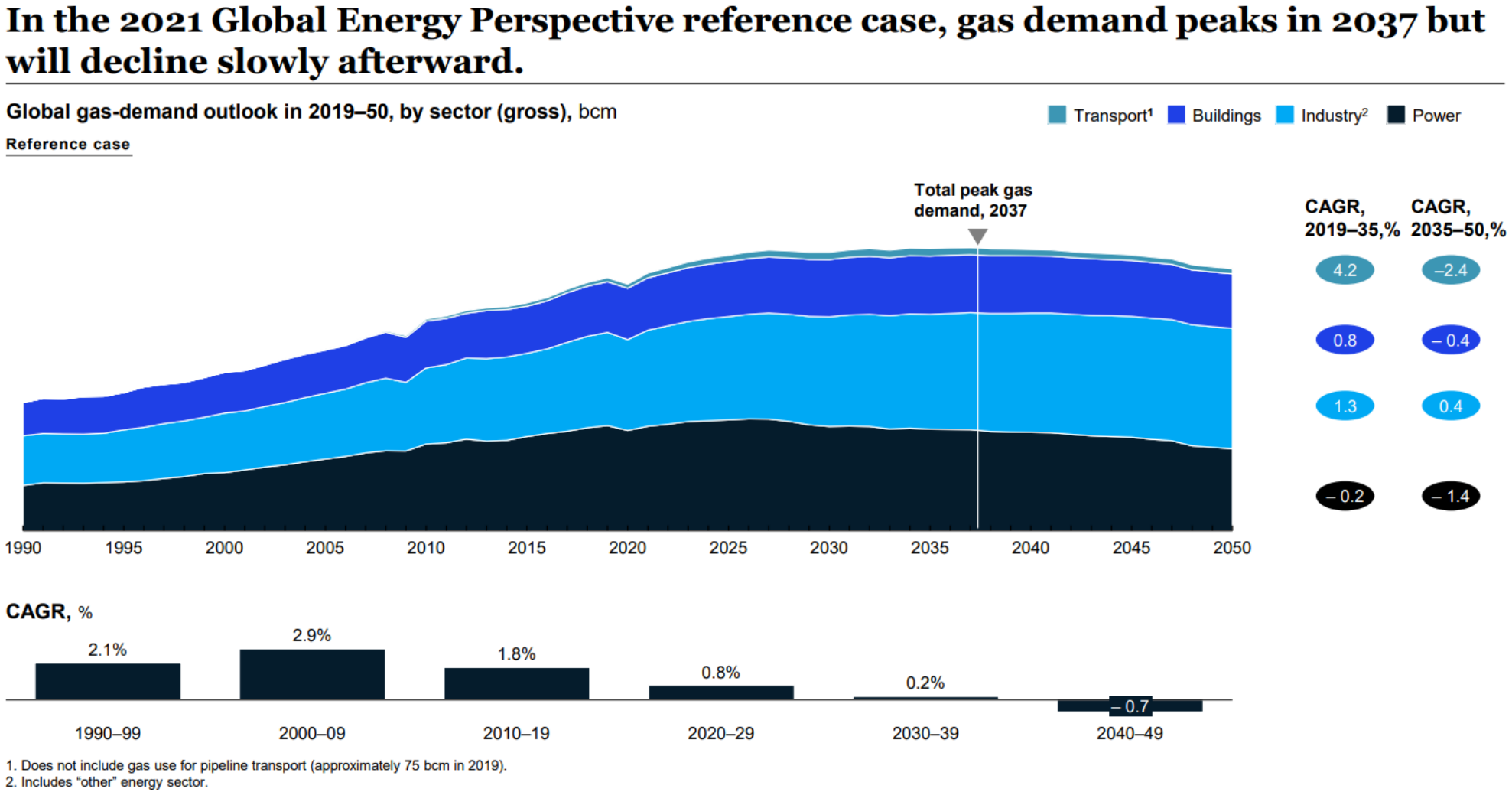
Kearney Introduction to Natural Gas 2014

Distribution of Proved Reserves



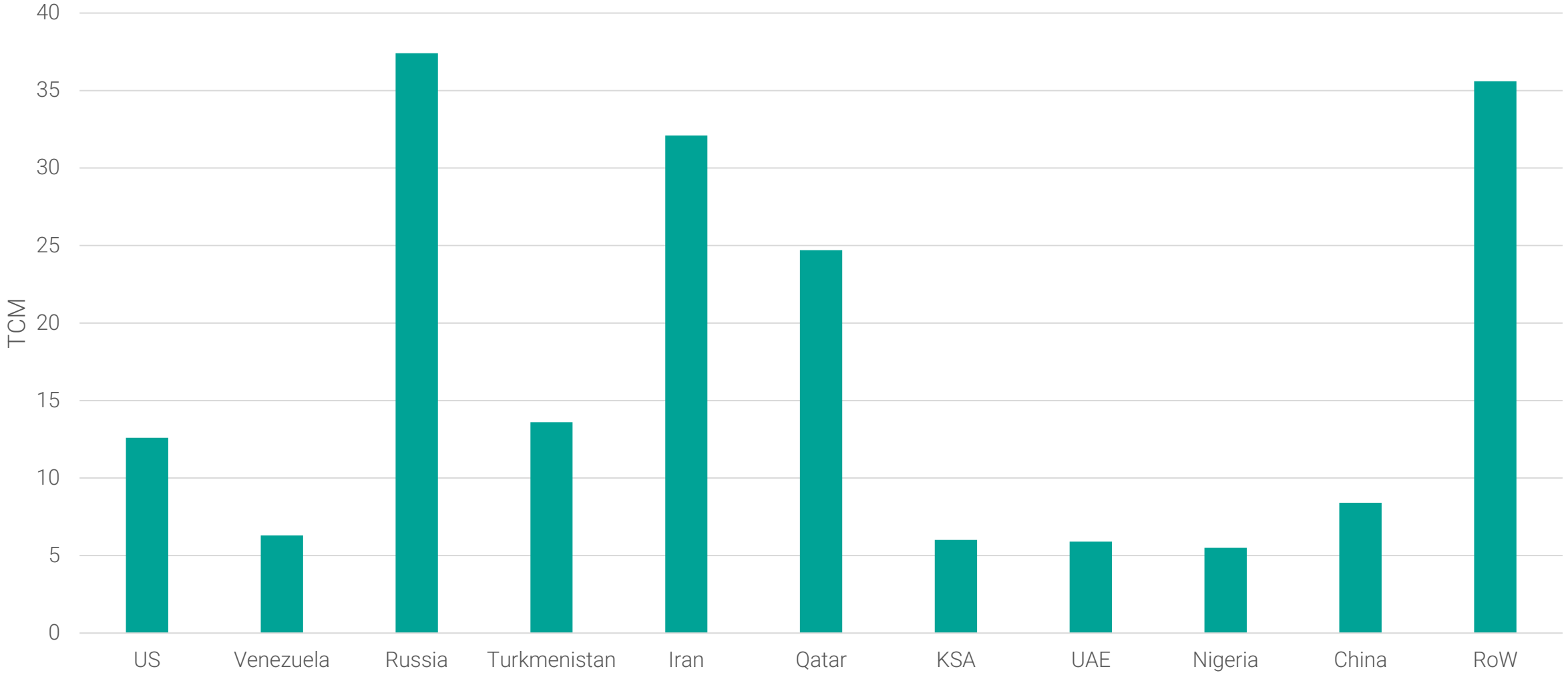
BP Statistical Review of World Energy 2021

Global Gas-demand Outlook by Sector



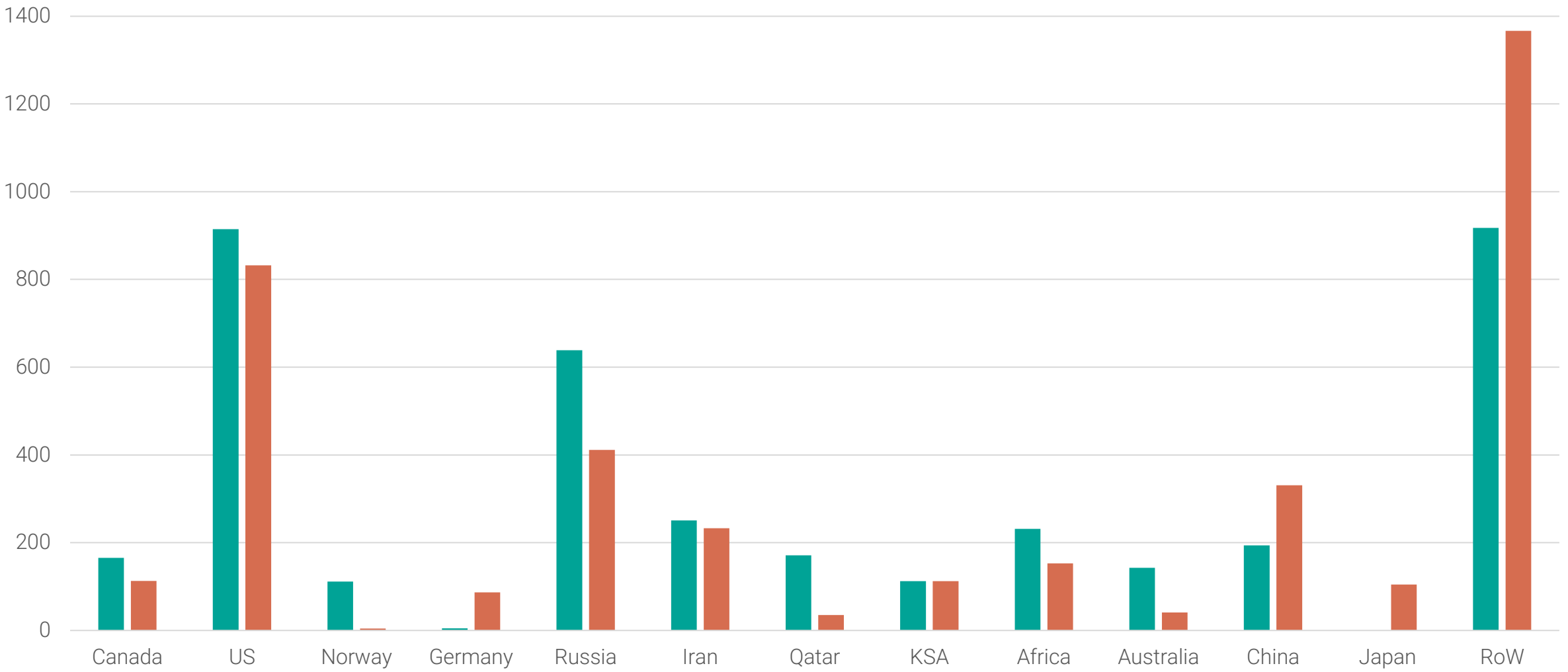
McKinsey Gas Outlook to 2050 2021

Top Countries by Reserves



BP Statistical Review of World Energy 2021

Top Countries by Production and Consumption (BCM)



BP Statistical Review of World Energy 2021

Producers, Net Exporters and Net Importers of Natural Gas

Producers	bcm	% of world total
United States	949	23.6
Russian Federation	722	18.0
Islamic Rep. of Iran	235	5.9
People's Rep. of China	191	4.8
Canada	184	4.6
Qatar	167	4.2
Australia	148	3.7
Norway	116	2.9
Saudi Arabia	99	2.5
Algeria	92	2.3
Rest of the world	1 111	27.5
World	**4 014**	**100.0**

2020 provisional data

Net exporters	bcm
Russian Federation	230
Qatar	127
Norway	111
Australia	103
United States	77
Turkmenistan	56
Canada	47
Algeria	41
Nigeria	27
Malaysia	22
Others	176
Total	**1 017**

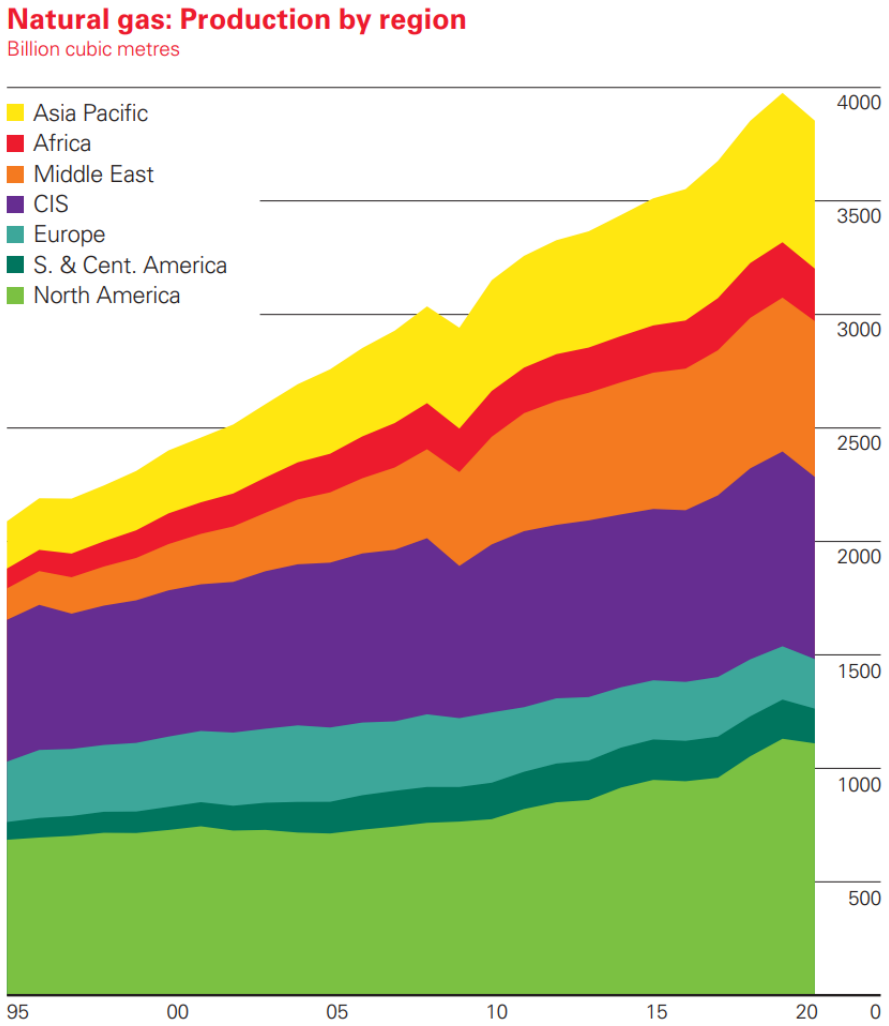
2020 provisional data

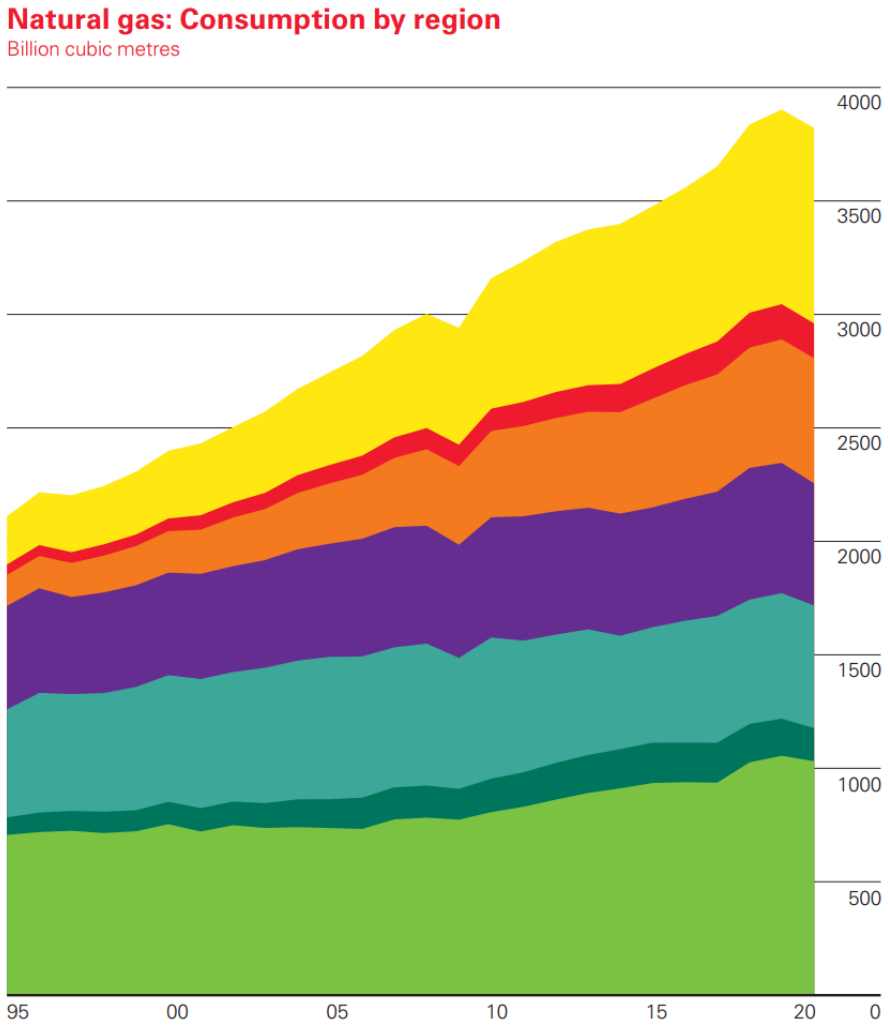
Net importers	bcm
People's Rep. of China	125
Japan	105
Germany	83
Italy	66
Mexico	64
Korea	54
Turkey	47
France	37
United Kingdom	34
India	34
Others	324
Total	**973**

2020 provisional data

IEA Key World Energy Statistics 2021

The Geopolitics of Gas





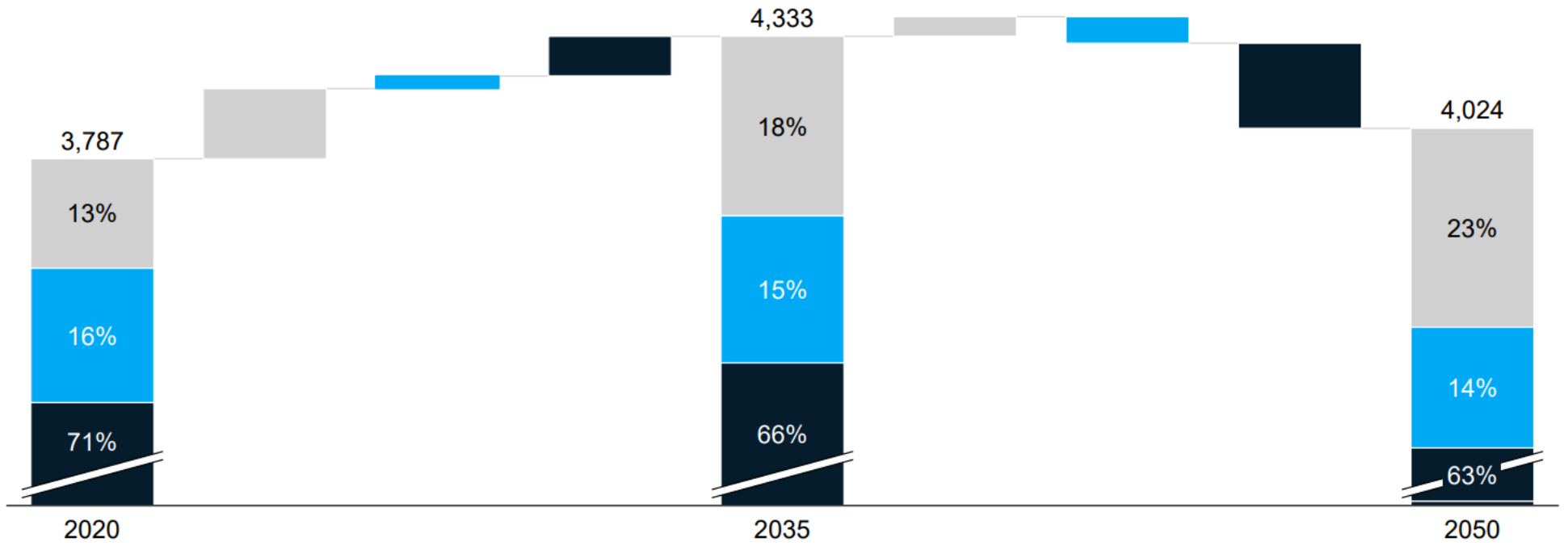
BP Statistical Review of World Energy 2021

Global Domestic Consumption (BCM)

The share of LNG in the global gas supply will increase consistently, as it meets demand growth and replaces declining pipeline and domestic gas.

Global domestic consumption (piped and LNG gas and import projections), bcm

Reference case



1. Including LNG flows within country for Indonesia and Malaysia.

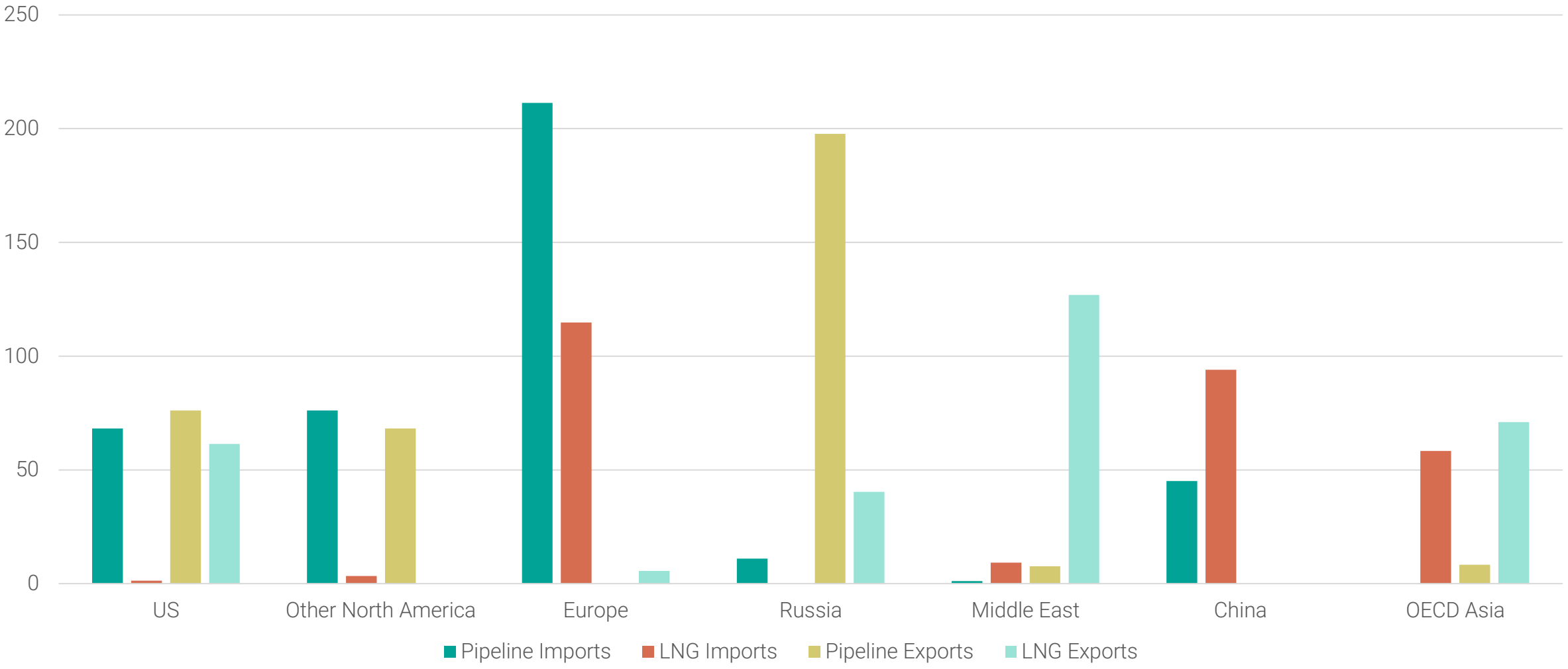
McKinsey Gas Outlook to 2050 2021

Natural Gas Inter-regional Trade (BCM)

Inter-regional Trade	Inter-regional Pipeline Trade	LNG Trade
940.1	452.2	487.9

BP Statistical Review of World Energy 2021

Natural Gas Major Inter-regional Trade Movements (BCM)



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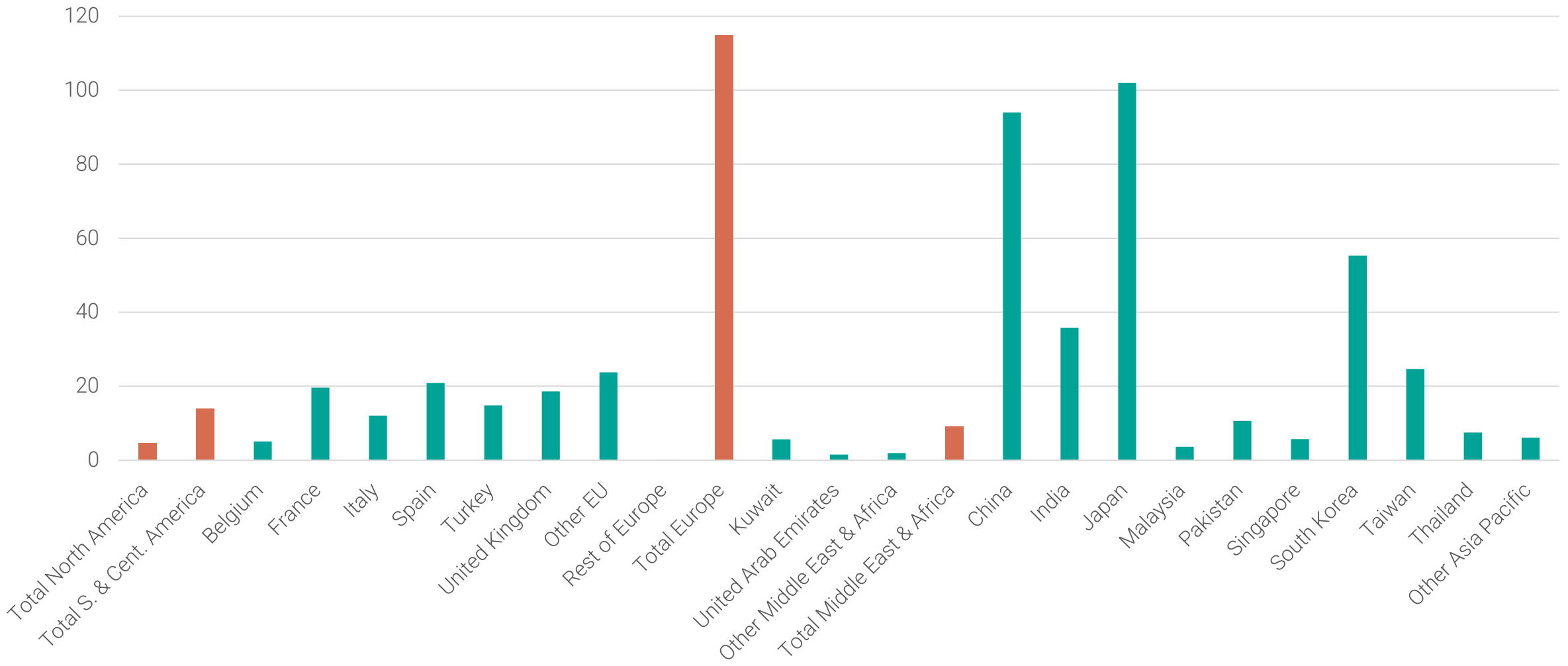
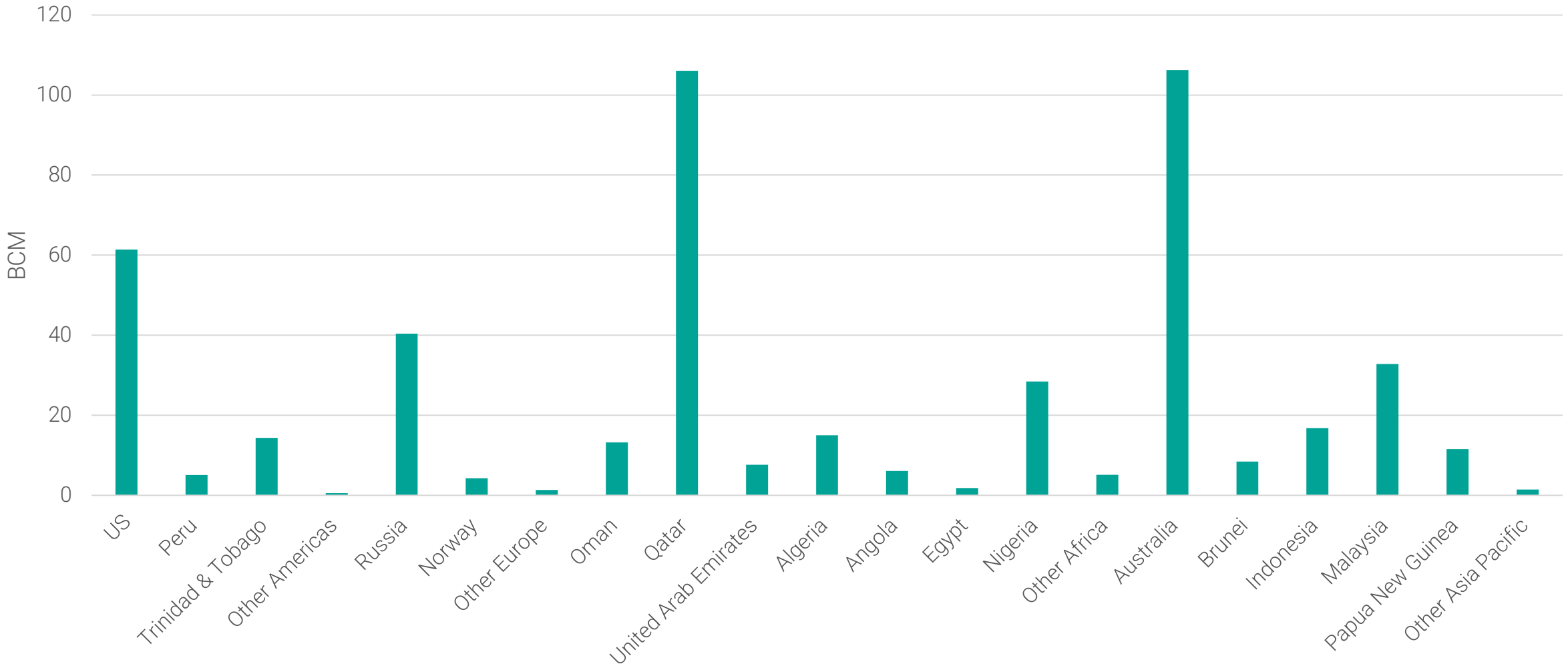
Key LNG Importers (BCM)



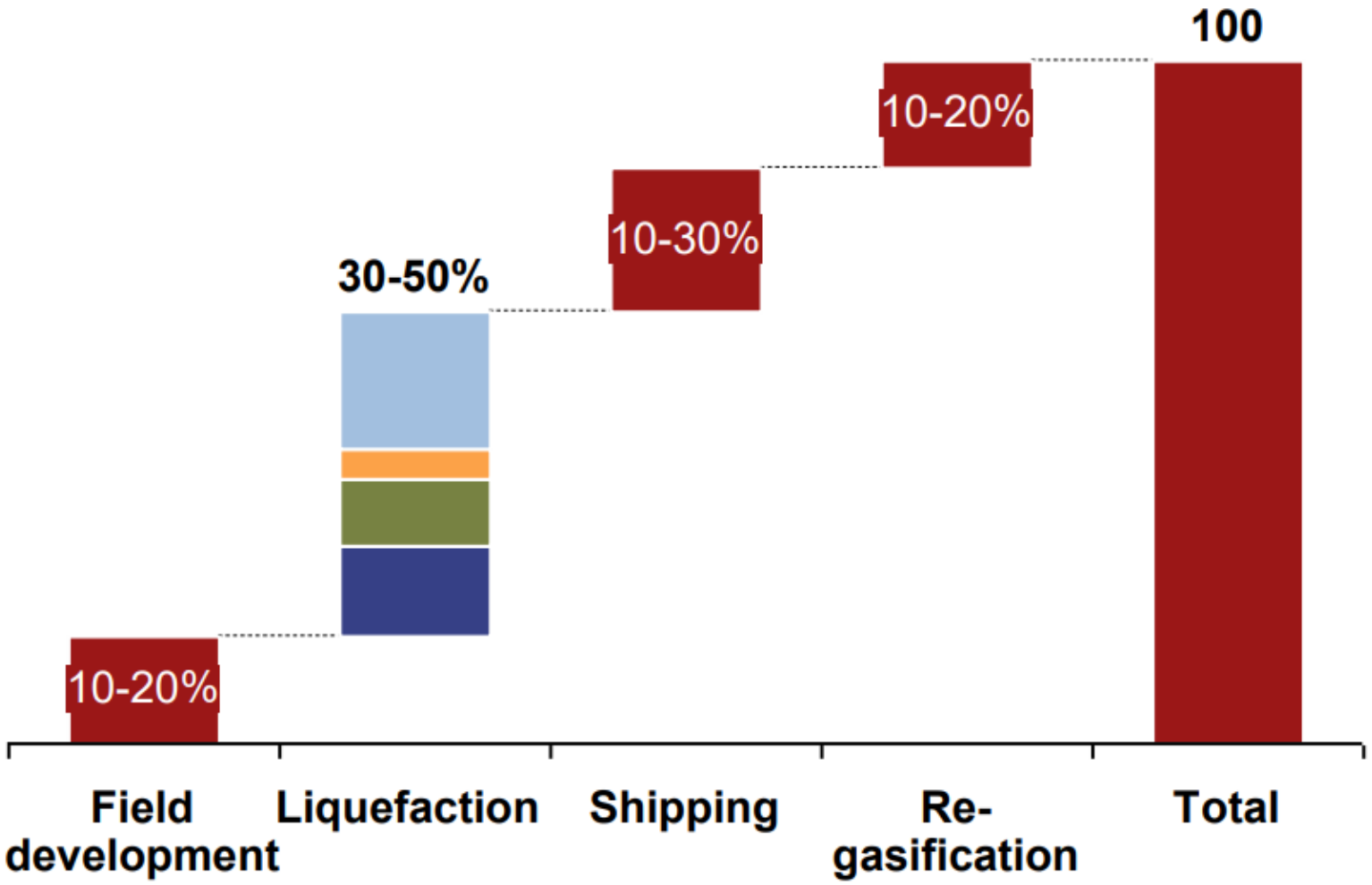
BP Statistical Review of World Energy 2021

Key LNG Exporters



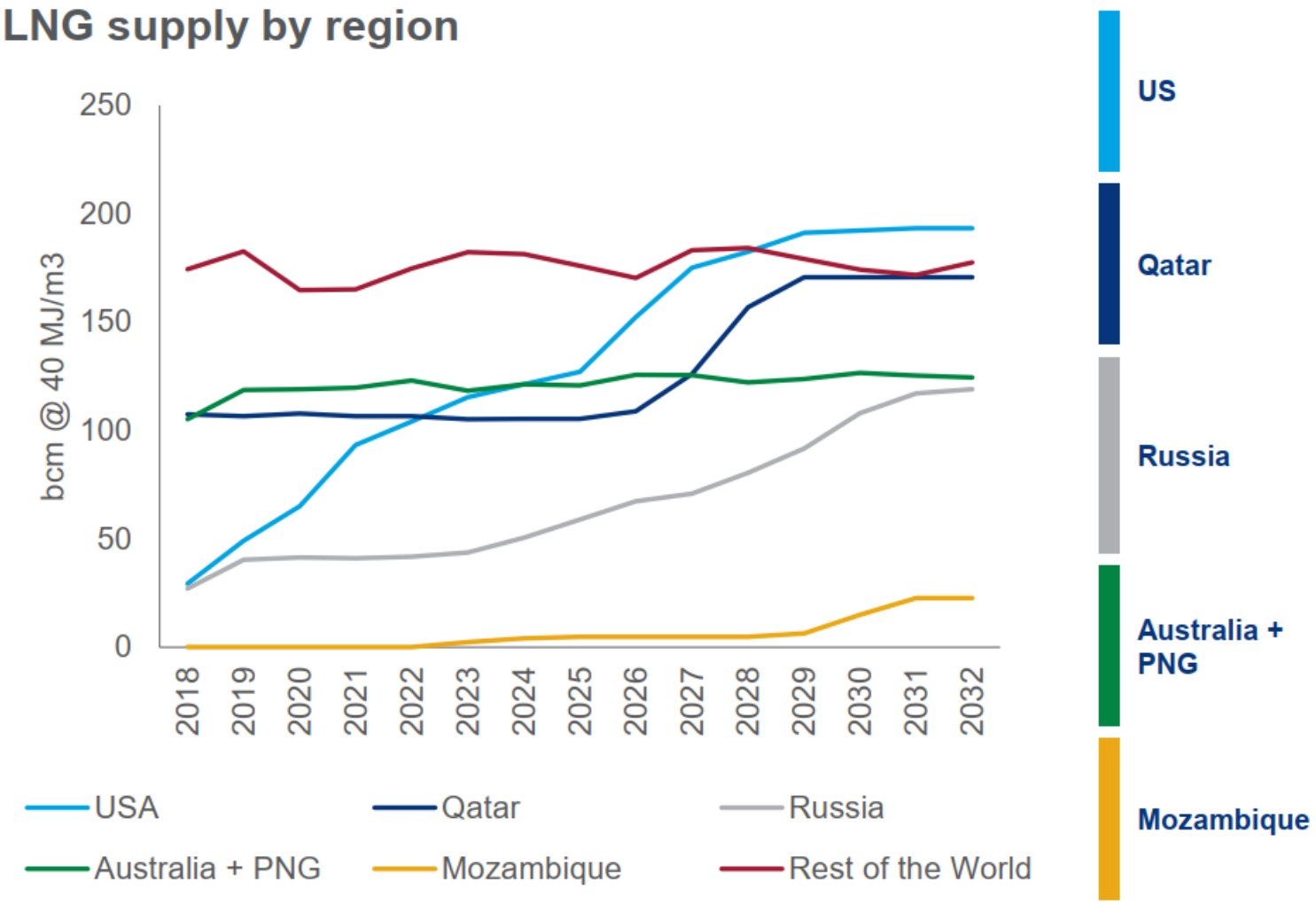
BP Statistical Review of World Energy 2021

Typical Cost Breakdown Of LNG Value Chain



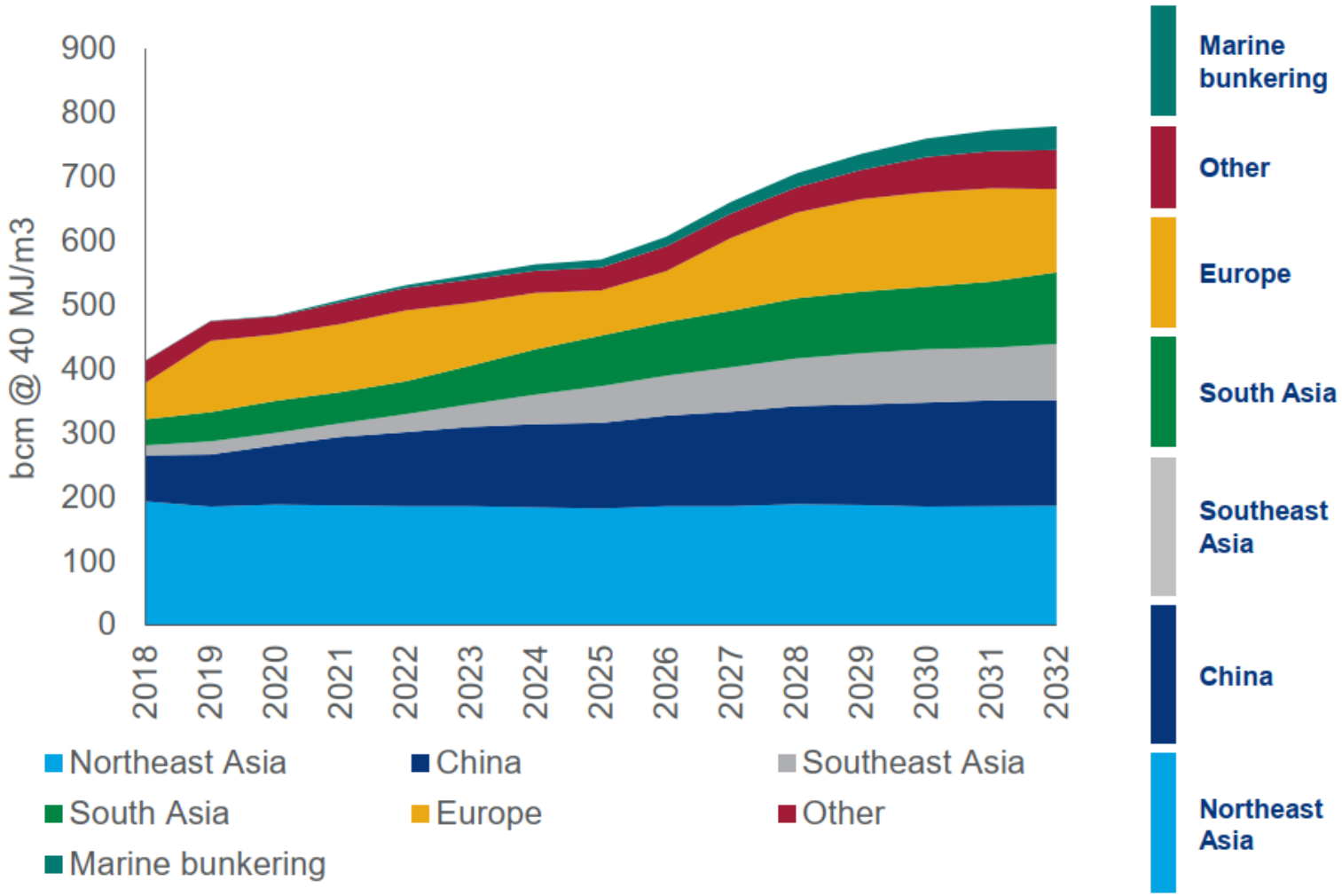
Kearney Introduction to Natural Gas 2014

LNG Supply by Region



Wood Mackenzie Global Gas investment horizon outlook to 2032 November 2021

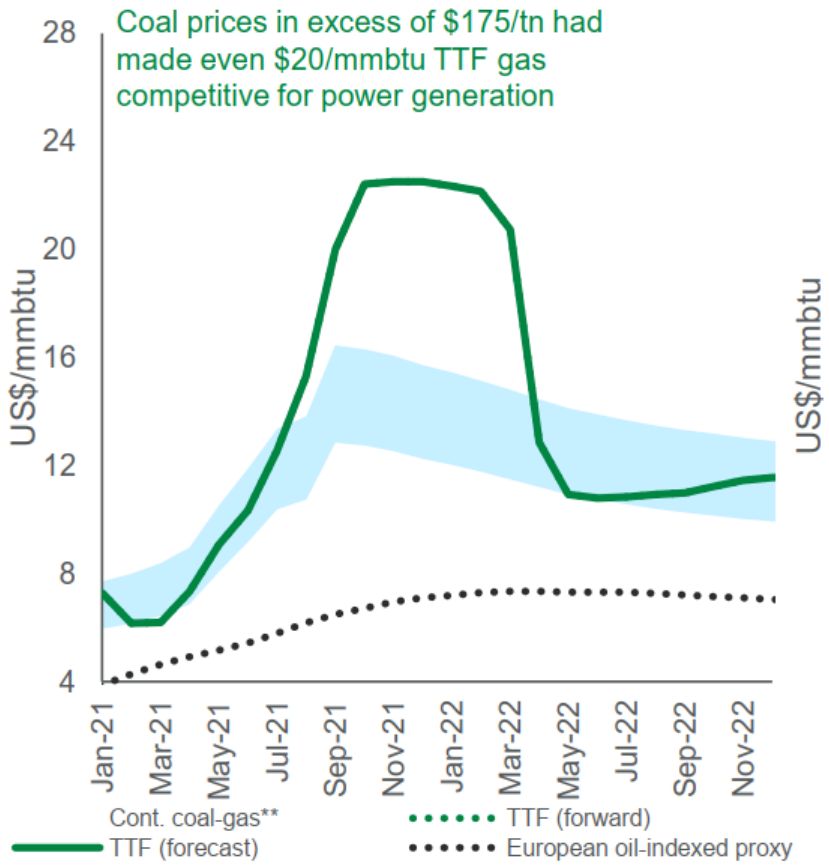
Global LNG Demand



Wood Mackenzie Global Gas investment horizon outlook to 2032 November 2021

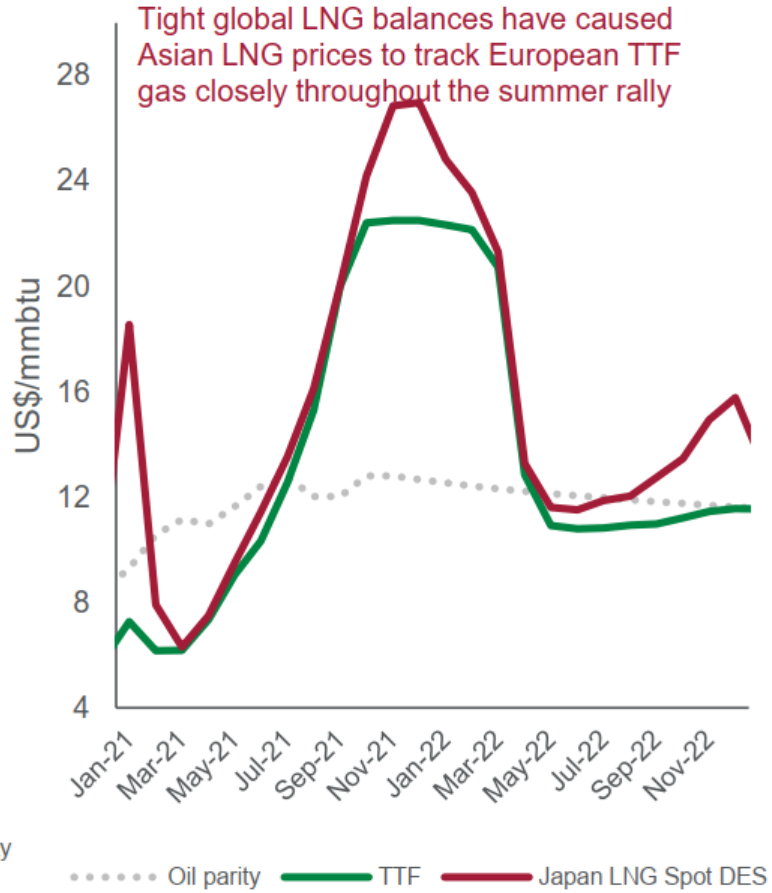
Domino Effect: High Coal Prices, Tight LNG Markets, Lift Fuel-oil Cracks

1. Tight coal and gas market

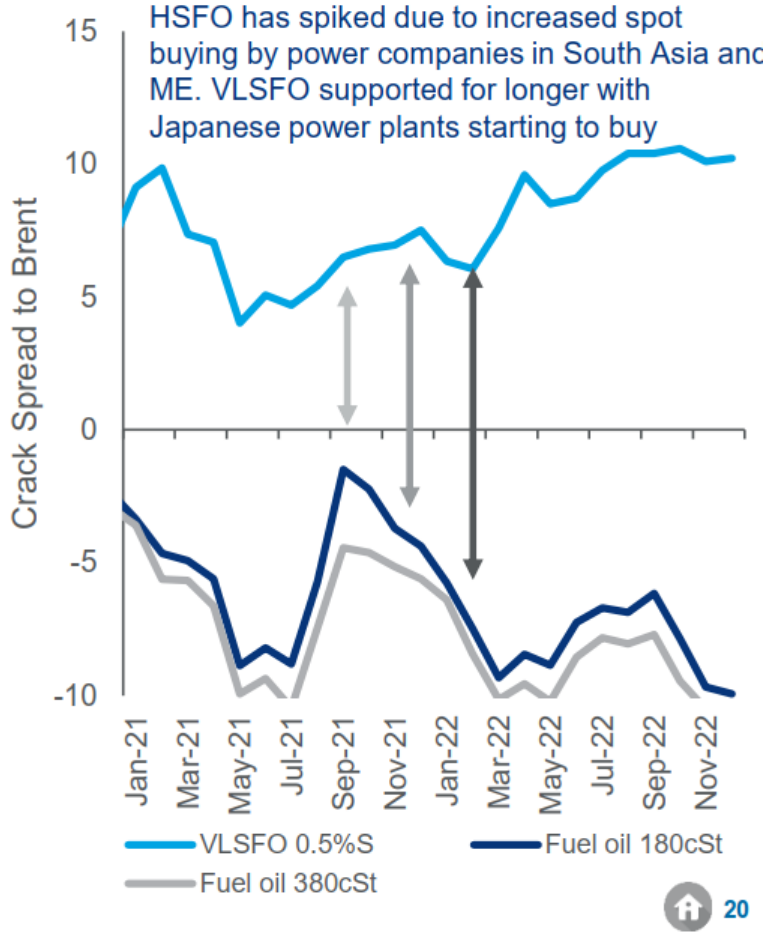


Source: Wood Mackenzie, the Argus Media group, GIE (AGSI)

2. Competition for LNG



3. Pressure on Fuel Oil cracks



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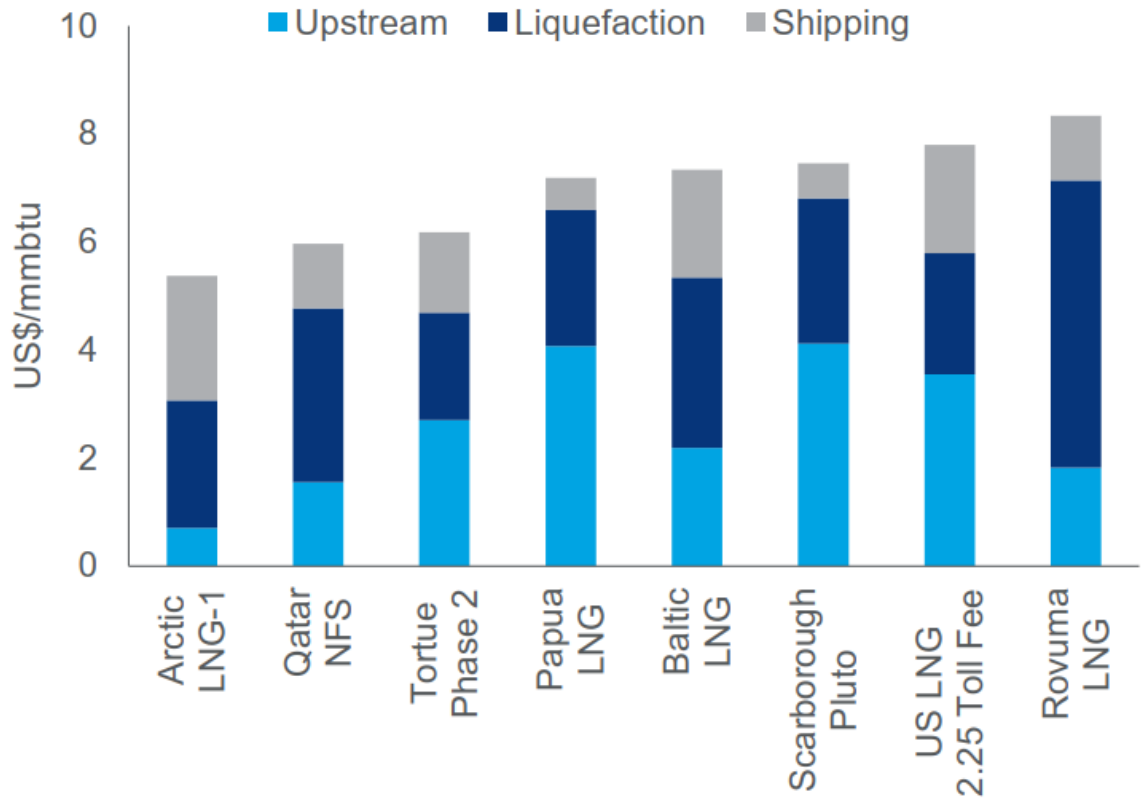
Wood Mackenzie Global Gas investment horizon outlook to 2032 November 2021

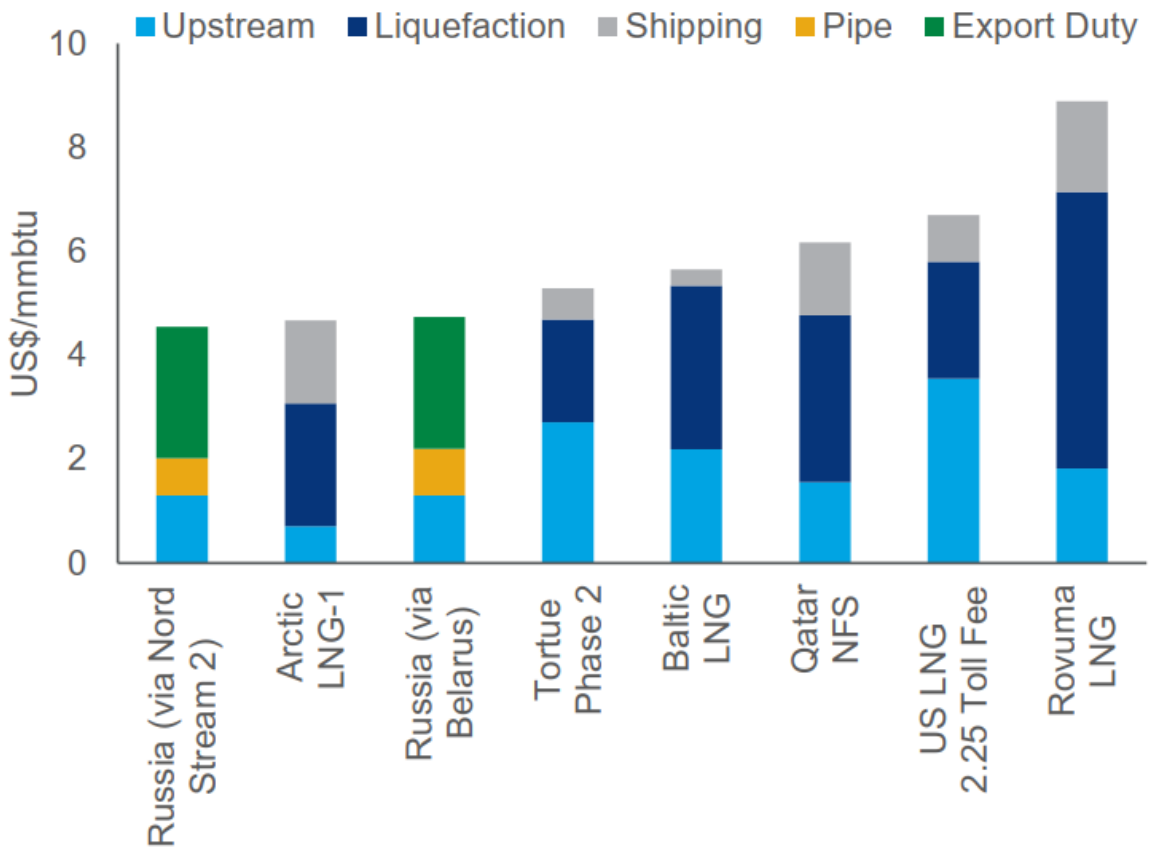
The Breakeven Prices of Gas Projects

LNG breakeven cost stack DES Northern Asia



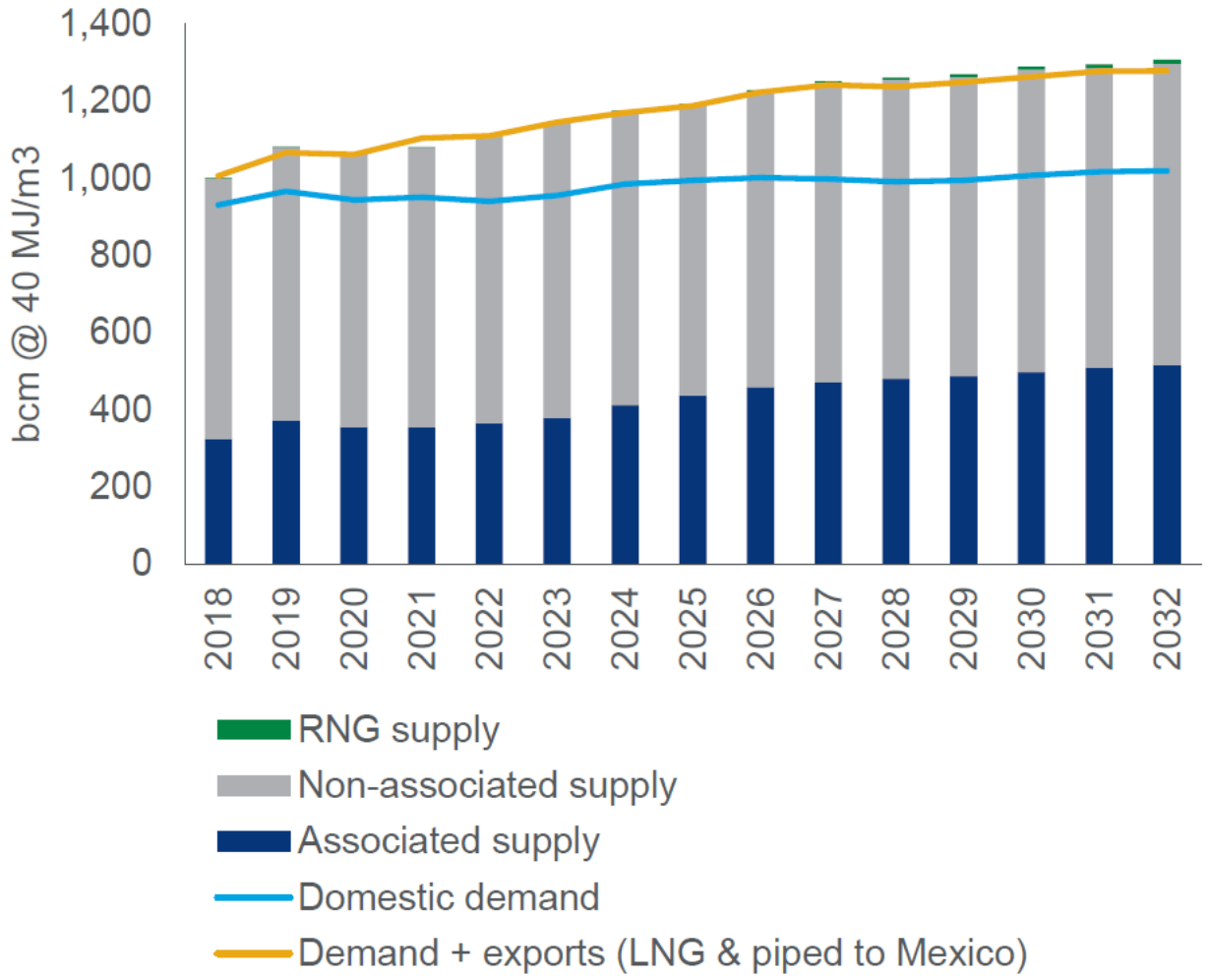
Source: Wood Mackenzie LNG Tool Q4 2021

LNG and pipe breakeven cost stack DES NW Europe



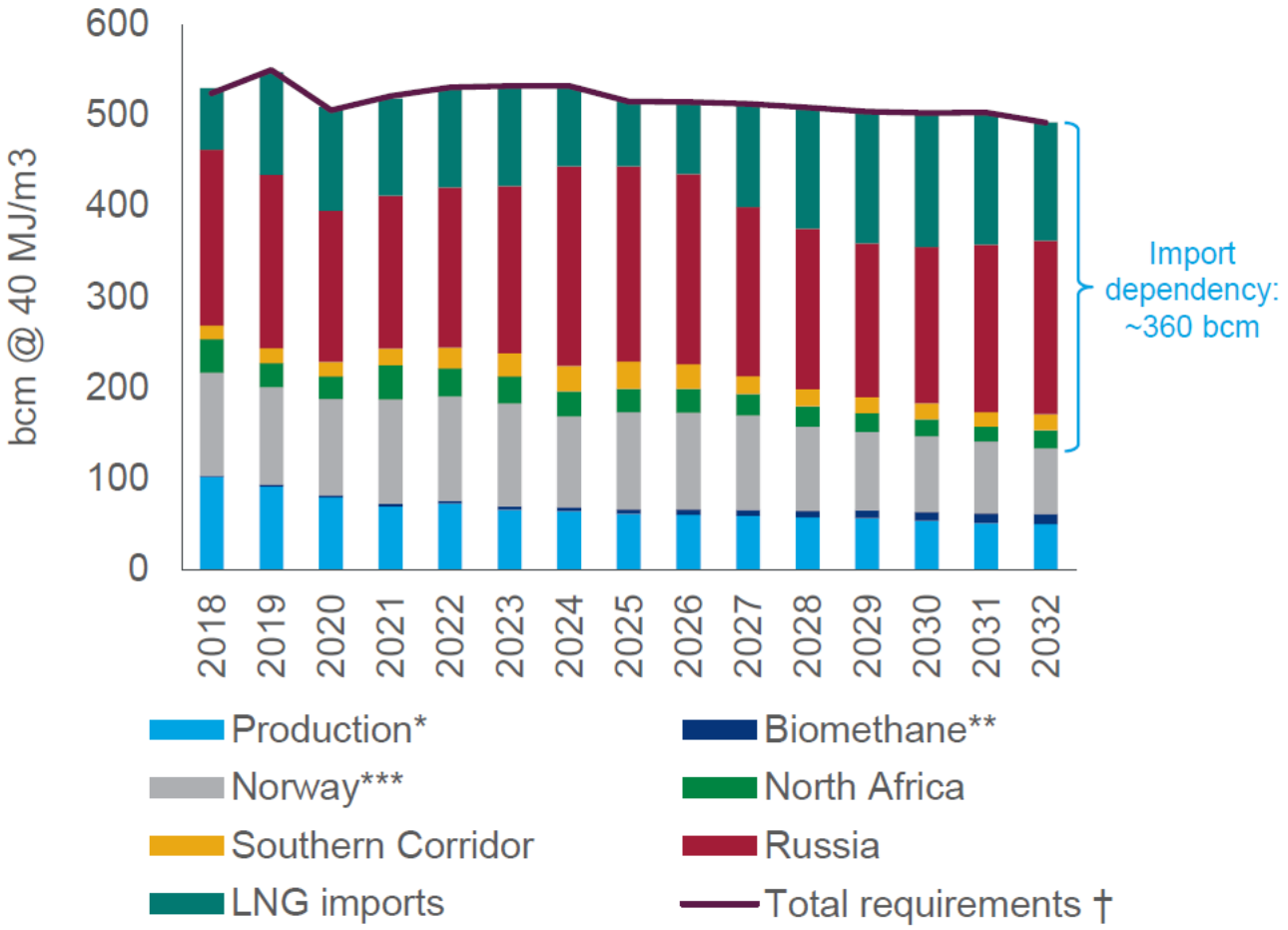
Wood Mackenzie Global Gas investment horizon outlook to 2032 November 2021

North America Gas Balance



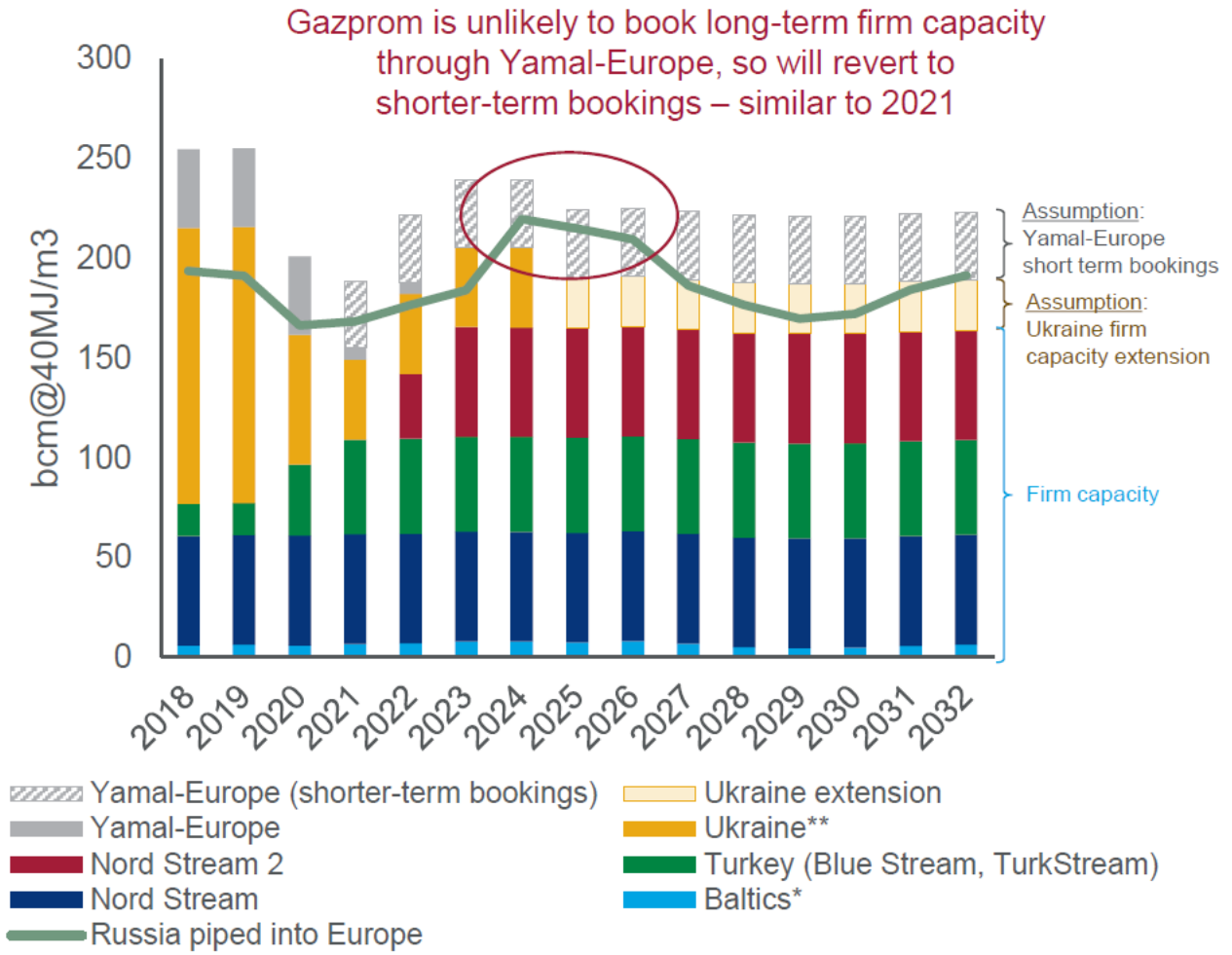
Wood Mackenzie Global Gas investment horizon outlook to 2032 November 2021

Europe Gas Balance



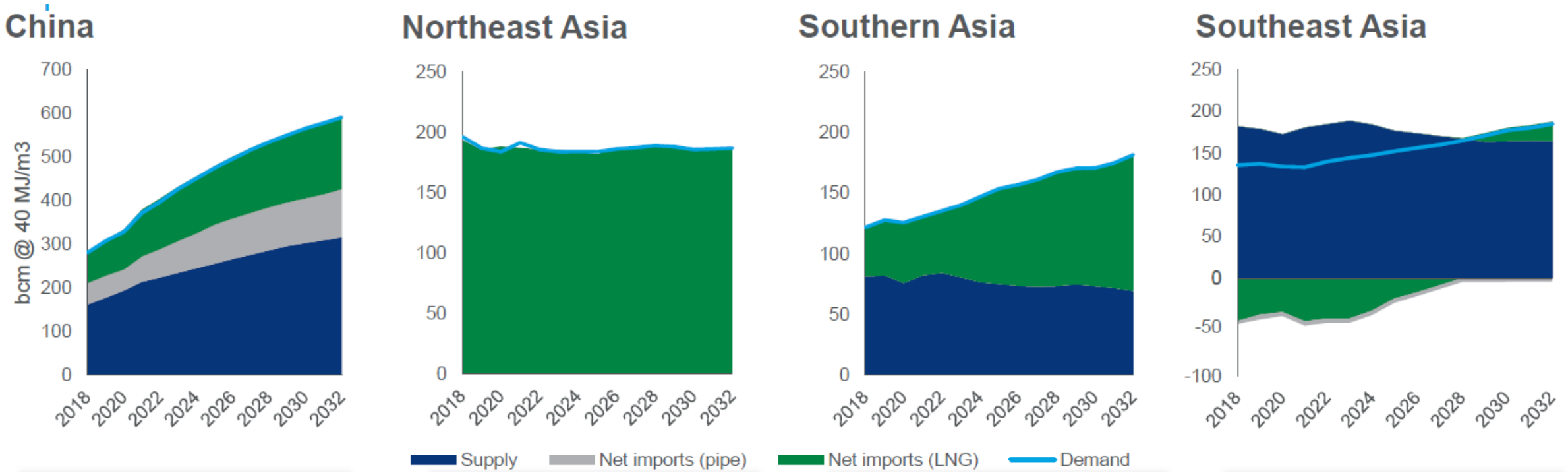
Wood Mackenzie Global Gas investment horizon outlook to 2032 November 2021

Russia Piped Capacity and Flows to Europe



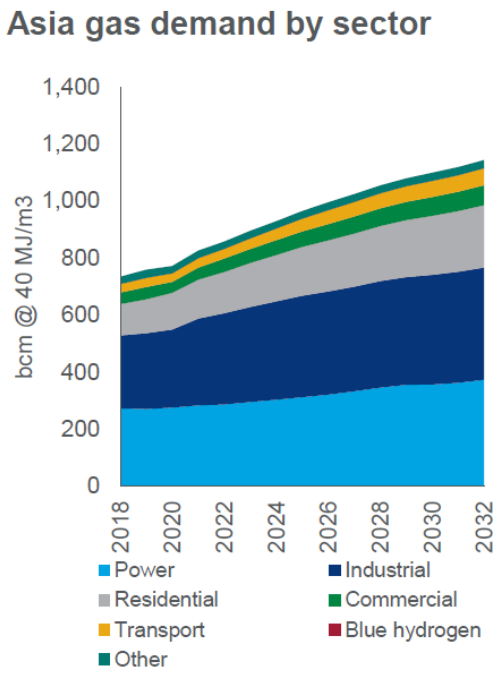
Wood Mackenzie Global Gas investment horizon outlook to 2032 November 2021

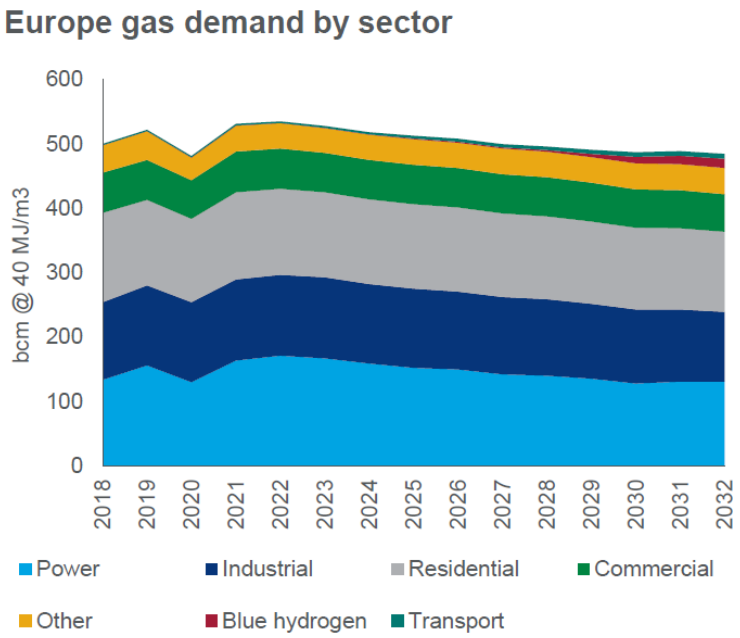
Asia Gas Balance

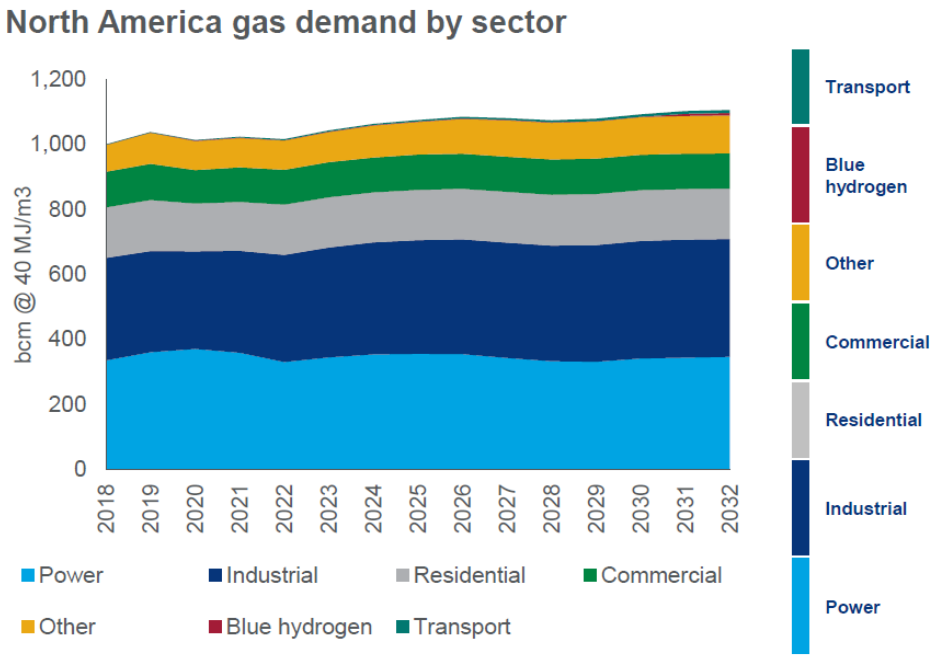


Wood Mackenzie Global Gas investment horizon outlook to 2032 November 2021

Regional Gas Demand by Sector

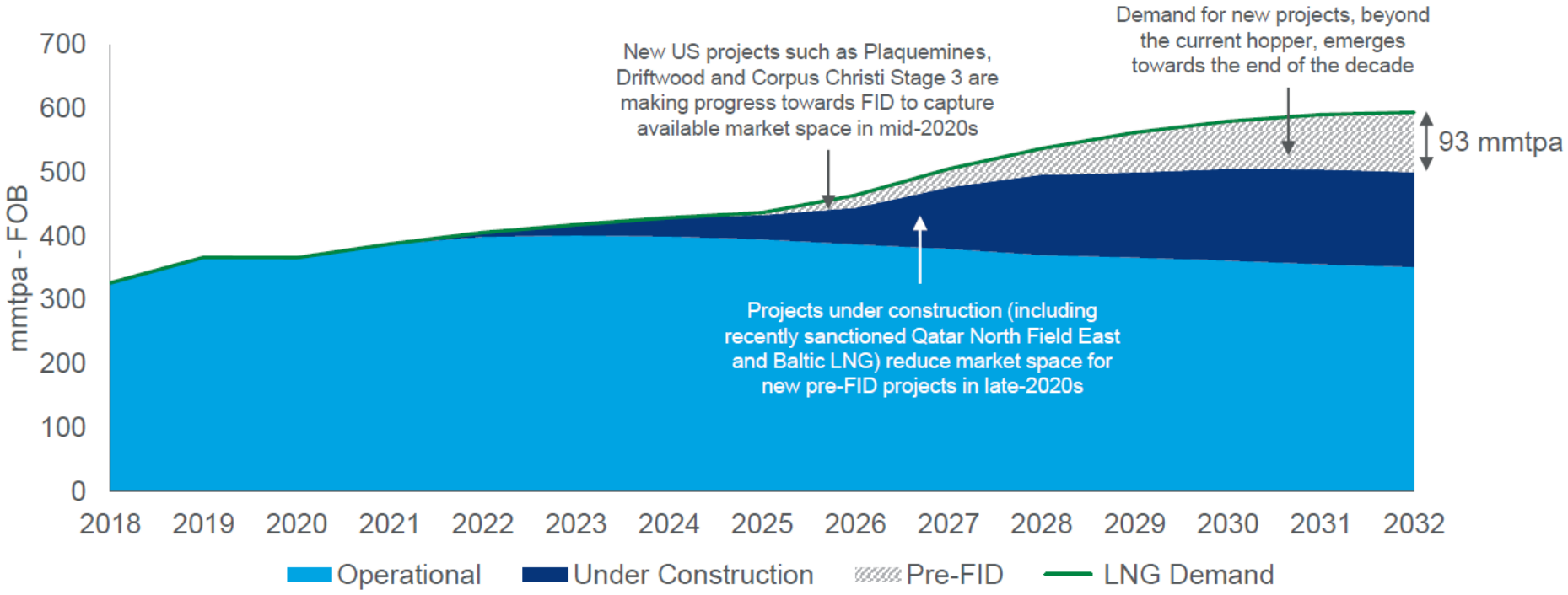






Wood Mackenzie Global Gas investment horizon outlook to 2032 November 2021

LNG Supply and Demand by Project Development Status



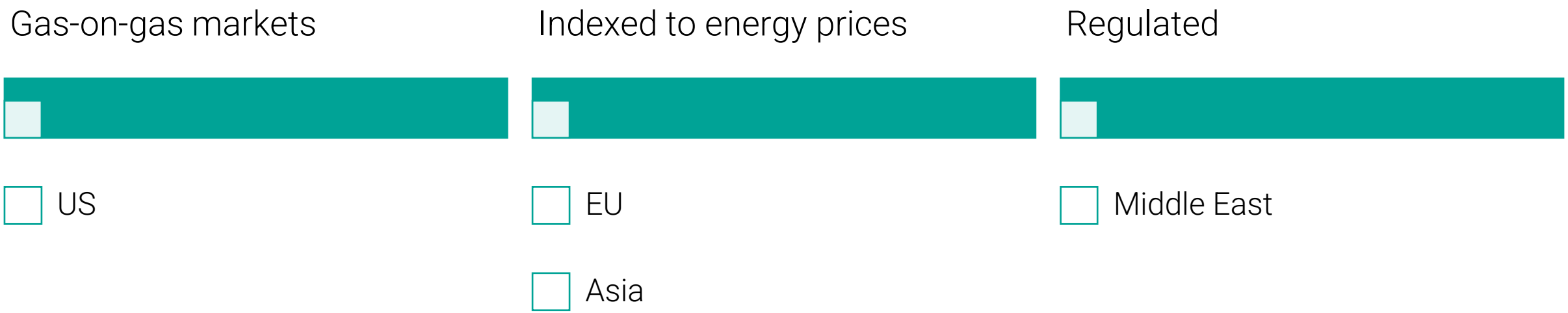
Wood Mackenzie Global Gas investment horizon outlook to 2032 November 2021

Gas and LNG Investment Requirements to 2032

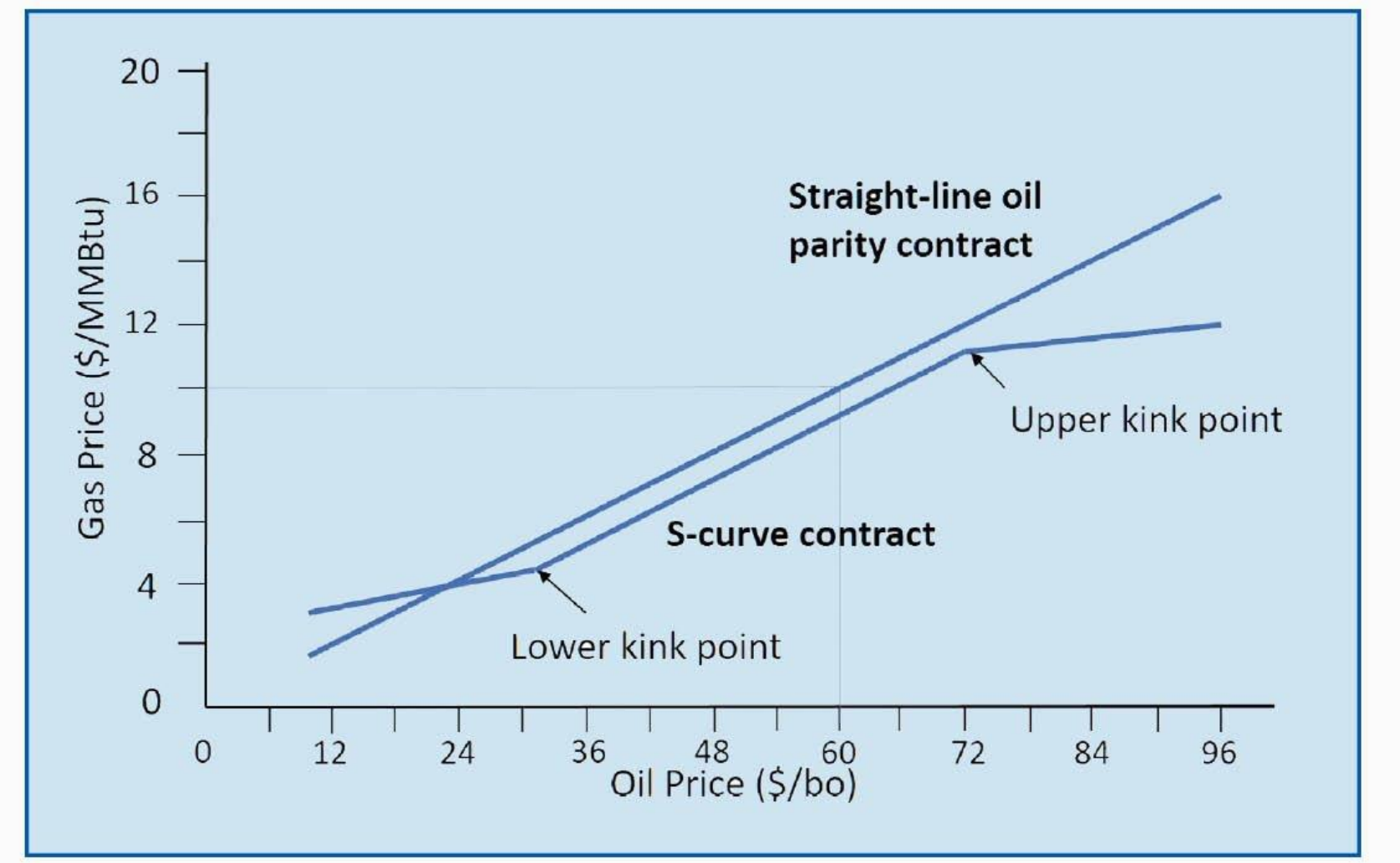
	Upstream	Liquefaction	Shipping	New pipeline developments*	Regas	Value of uncontracted LNG demand
	US$ billion capex	US$ billion capex	US$ billion capex	Bcm/yr capacity	US$ billion capex	US$ billion
Global	**1,510**	**175**	**120**	**490**	**48**	**620**
Asia	150		120	90	38	490
Europe	60			16	4	130
North America	630**	50		315	0.5	
Middle East	210	30			0.5	
Russia and the Caspian	170	25			0	
RoW	290	70		70	5	

Wood Mackenzie Global Gas investment horizon outlook to 2032 November 2021

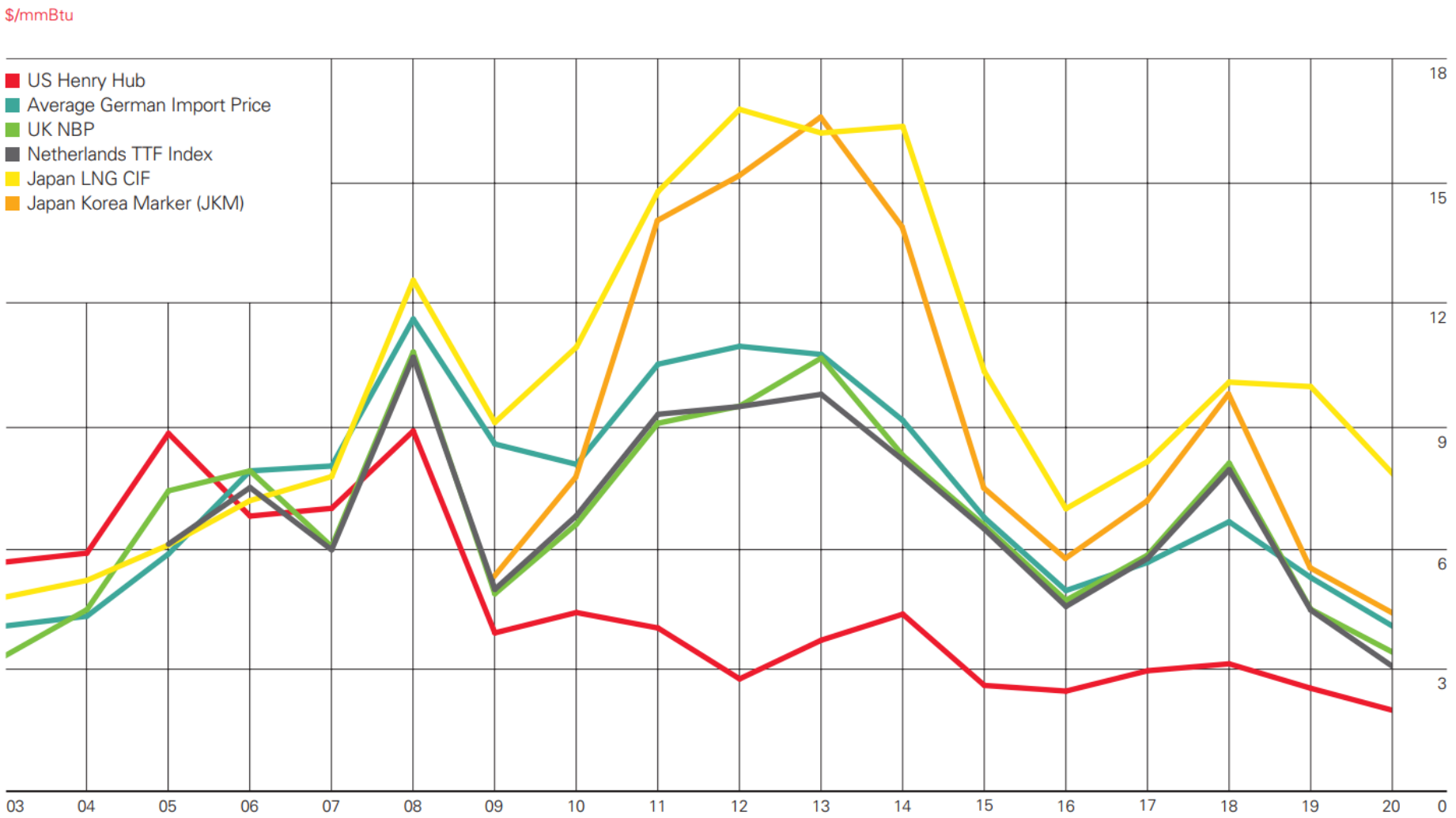
Global Gas Markets



Oil Parity

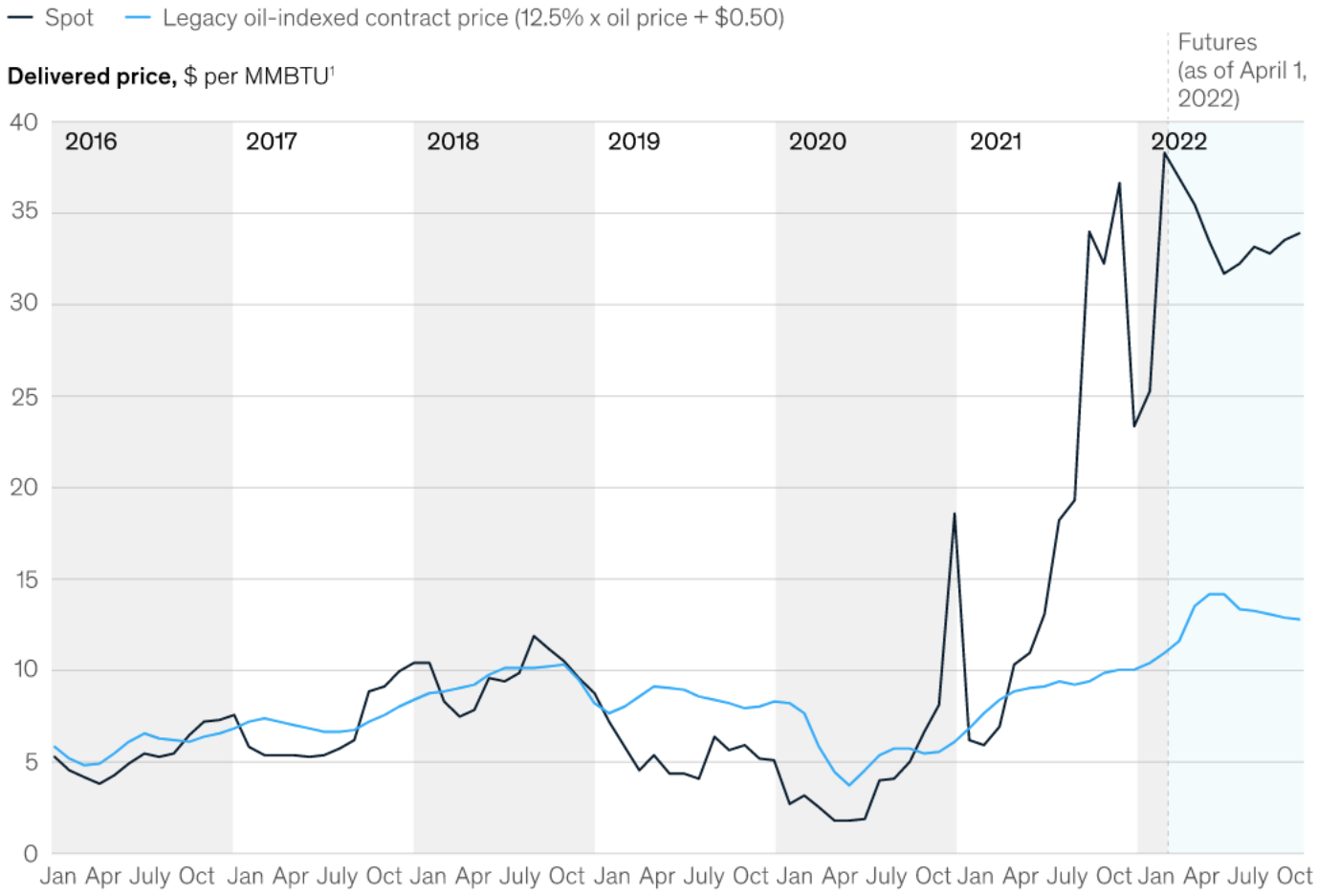

Straight-line oil parity contract
Upper kink point
S-curve contract
Lower kink point
Gas Price ($/MMBtu)
Oil Price ($/bo)
0
4
8
12
16
20
0
12
24
36
48
60
72
84
96

Gas Prices



BP Statistical Review of World Energy 2021

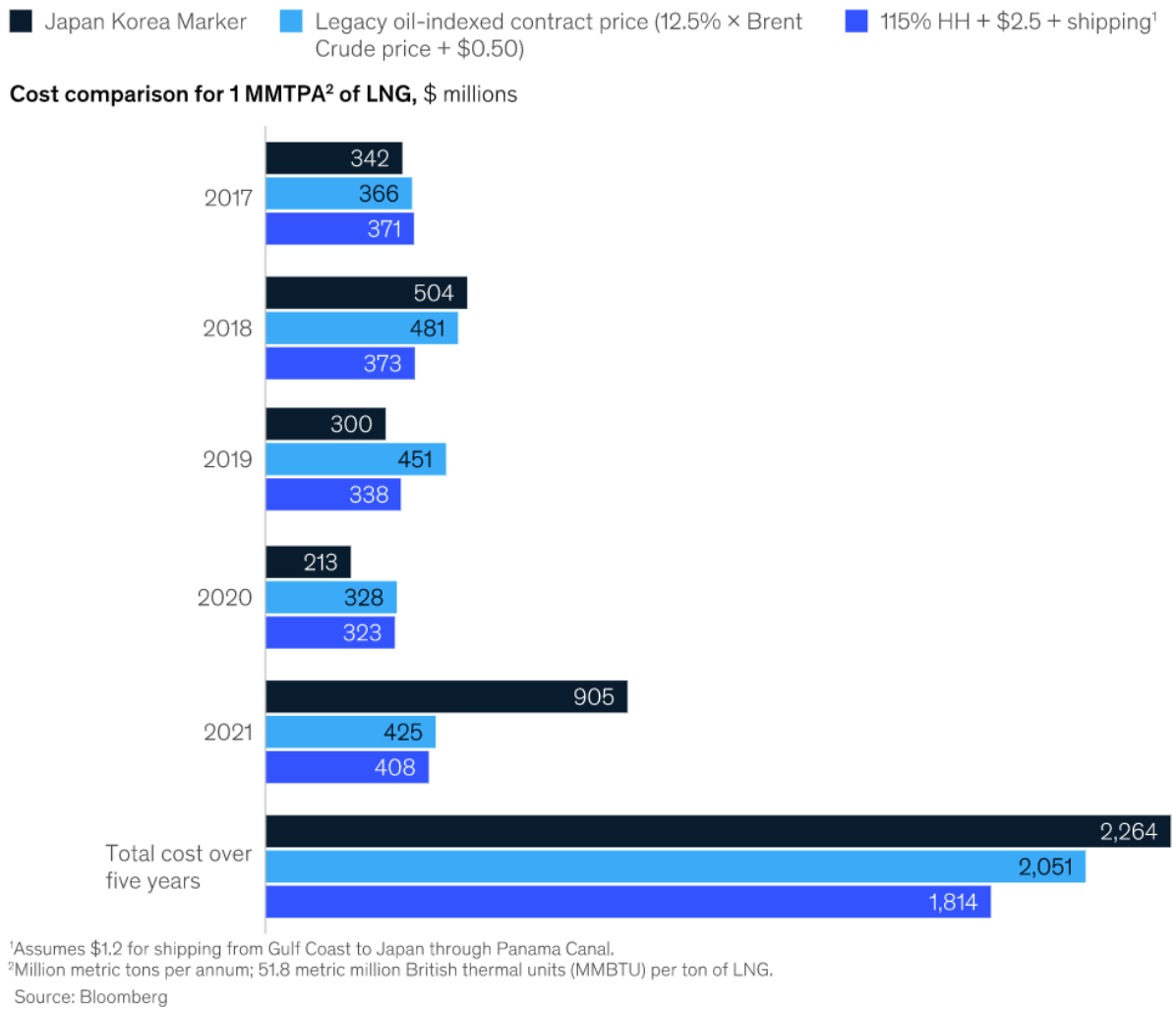
LNG Prices in Asia



[1]Metric million British thermal units.
Source: Bloomberg

McKinsey Reflecting on 2021 global LNG and European pipeline flows 2021

LNG Cost Comparisons



McKinsey Reflecting on 2021 global LNG and European pipeline flows 2021

Price Economics Logic ($/MMBTU)

	Residual cash costs[2]		Cash cost		Full cost	
Henry Hub (price setter)	Base		Base		Base	Abundant supply drives gas towards coal competition pricing
+ Liquefi-cation cost	0.4–0.5	Tolling ToP fixed fee	+0.8	LNG cash cost in short-term oversupplied market (opex)	+2.2–2.7	LNG full costs in a balanced market (opex and capex)
Shipping cost	+0.5	Bunker fuel/ boil off only	+1.7	Short-term charter rates	+1.8–2.2	Full cost shipping (opex and capex) to Tokyo Bay
Delivered LNG to Asia	Base +0.9-1.0	Near-term cash costs	Base +2.5	Short-term cash costs	Base + 4–5	Full cost

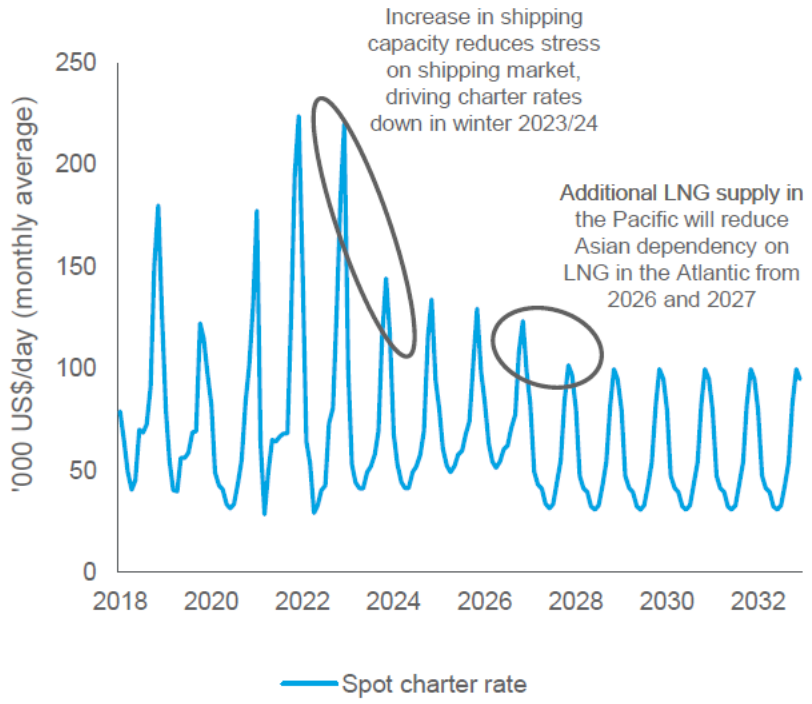
McKinsey

LNG Price Asia vs TTF

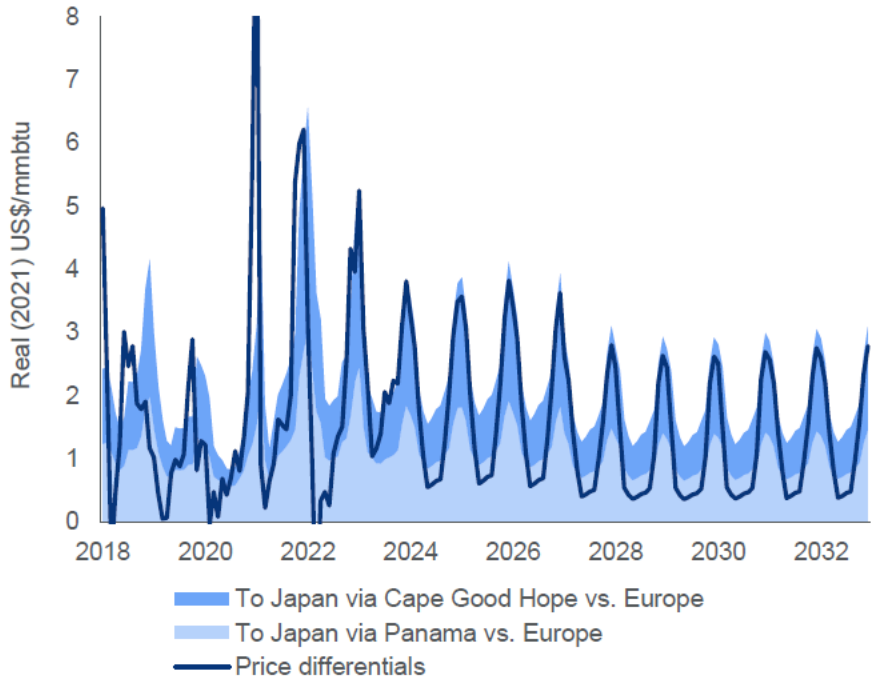
Japan LNG Spot DES (Asia) – price differentals vs TTF will soften from 2024 as increasing shipping capacity drives down spot charter rates

However, price differentails will remain relatively high as the “marginal cargo” will need to go through the Cape of Good Hope as requirements of US LNG to Asia remains sustained

LNG shipping spot charter rates



Price differentials (Japan spot DES – TTF) vs shipping differentials (from the US)



Wood Mackenzie Global Gas investment horizon outlook to 2032 November 2021

Players

To provide a framework for understanding types and categories of oil and energy companies

BP Business Model

BP

Key Players Classification by IEA

NOC

INOC

Majors

Independents

OFS Co.

Pure Downstream Co.

Trading Co.

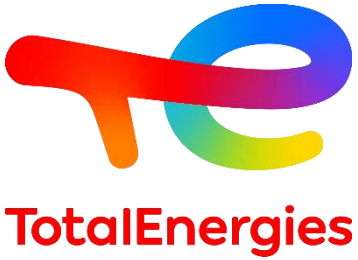
IEA

National Oil Companies

International National Oil Companies

Majors

ExxonMobil



Independents

Oilfield Services Companies

Pure Downstream Companies

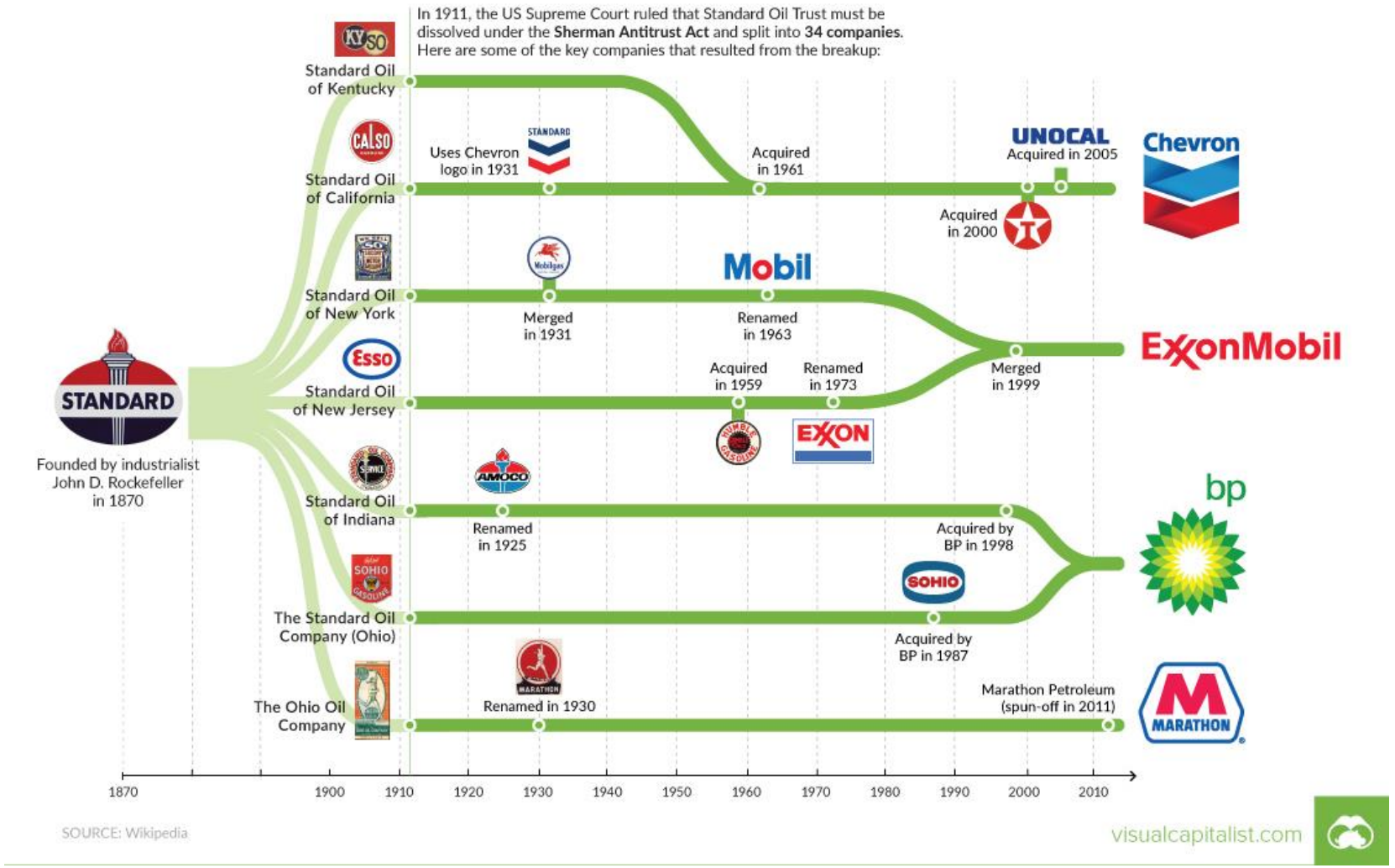
Trading Companies

The Old and New Seven Sisters

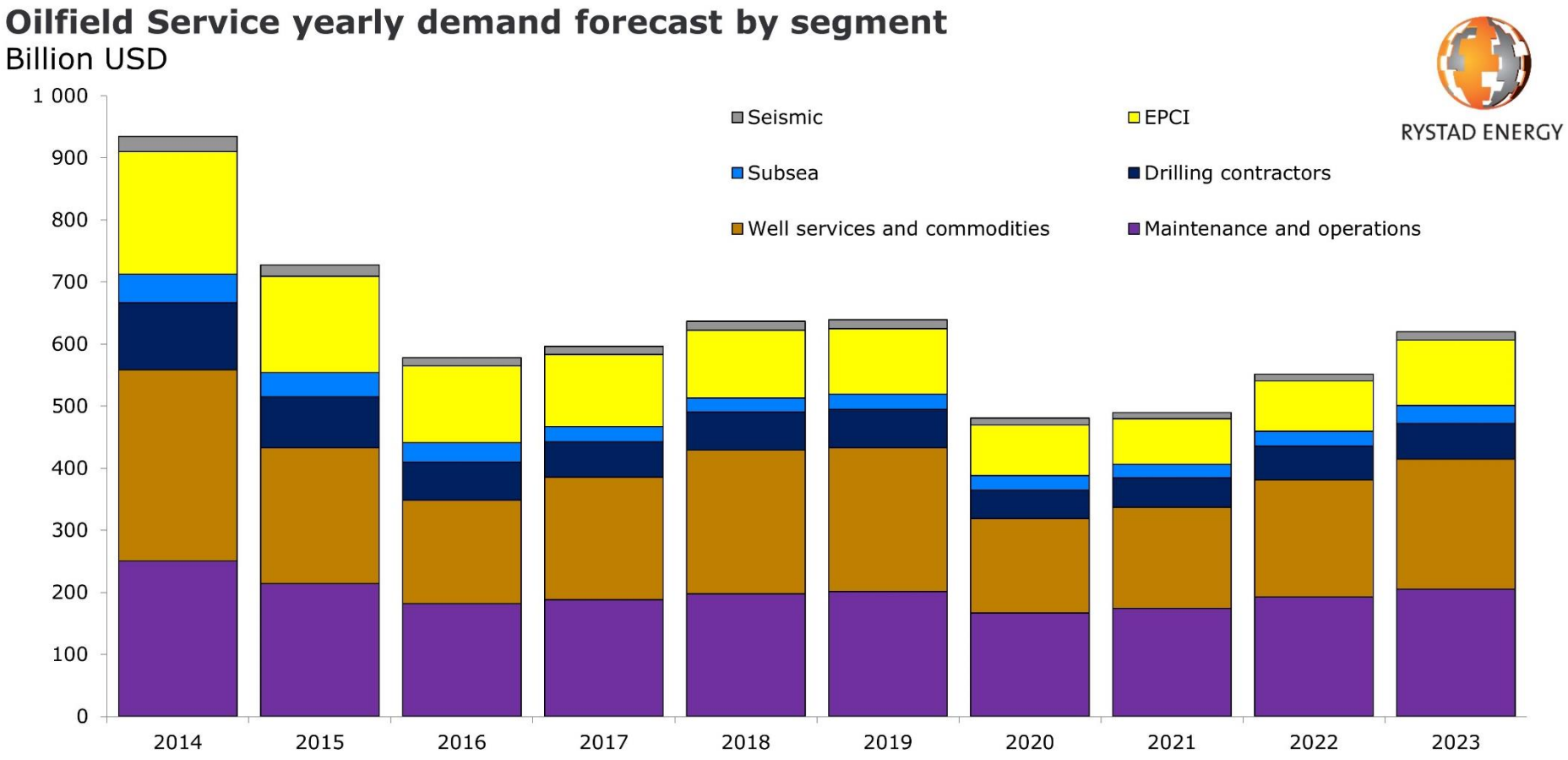
- The Old Seven Sisters

- The New Seven Sisters?!

The Evolution of Standard Oil

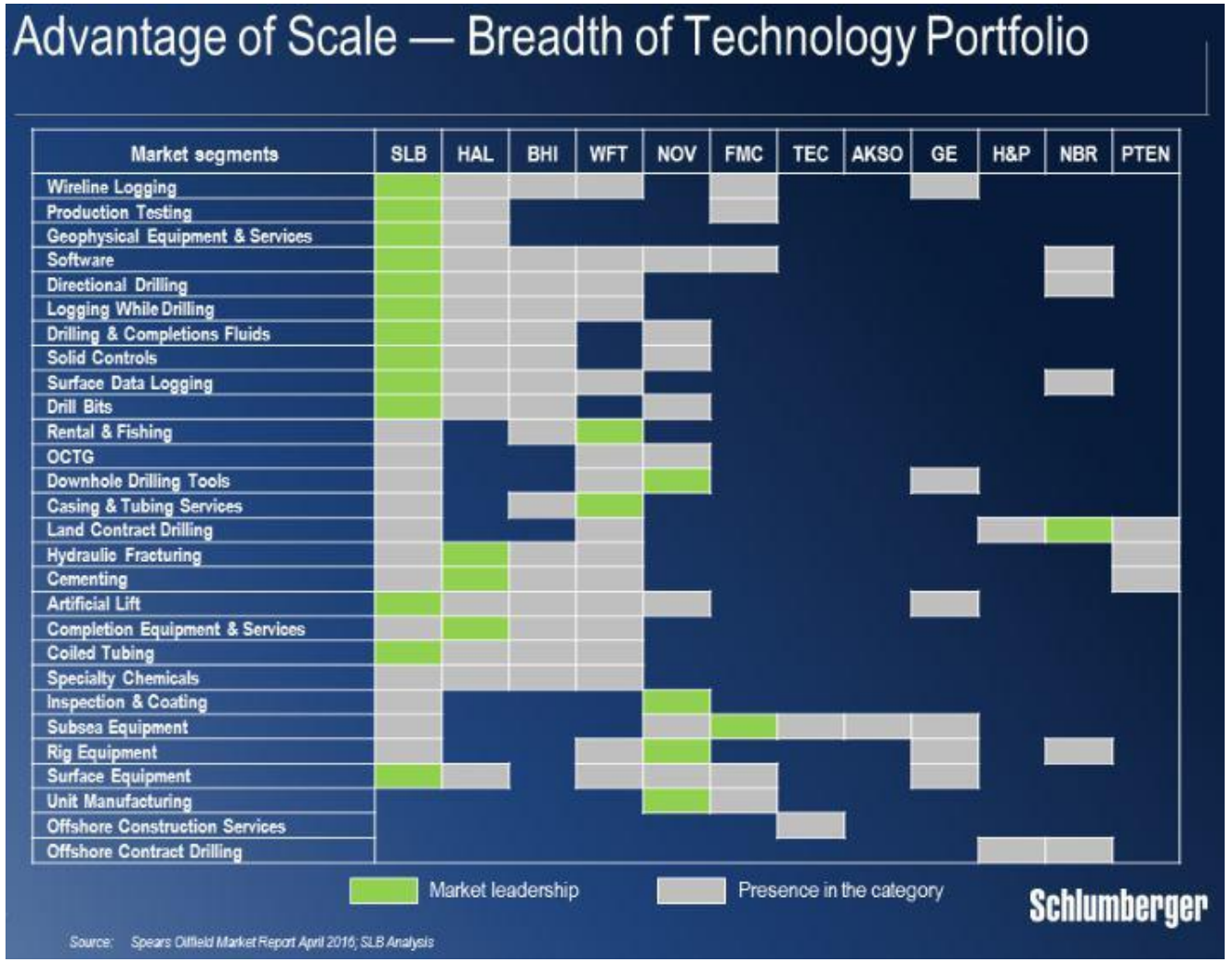


Global Oilfield Services Market



Rystad Energy

The Portfolio of Oilfield Services Companies



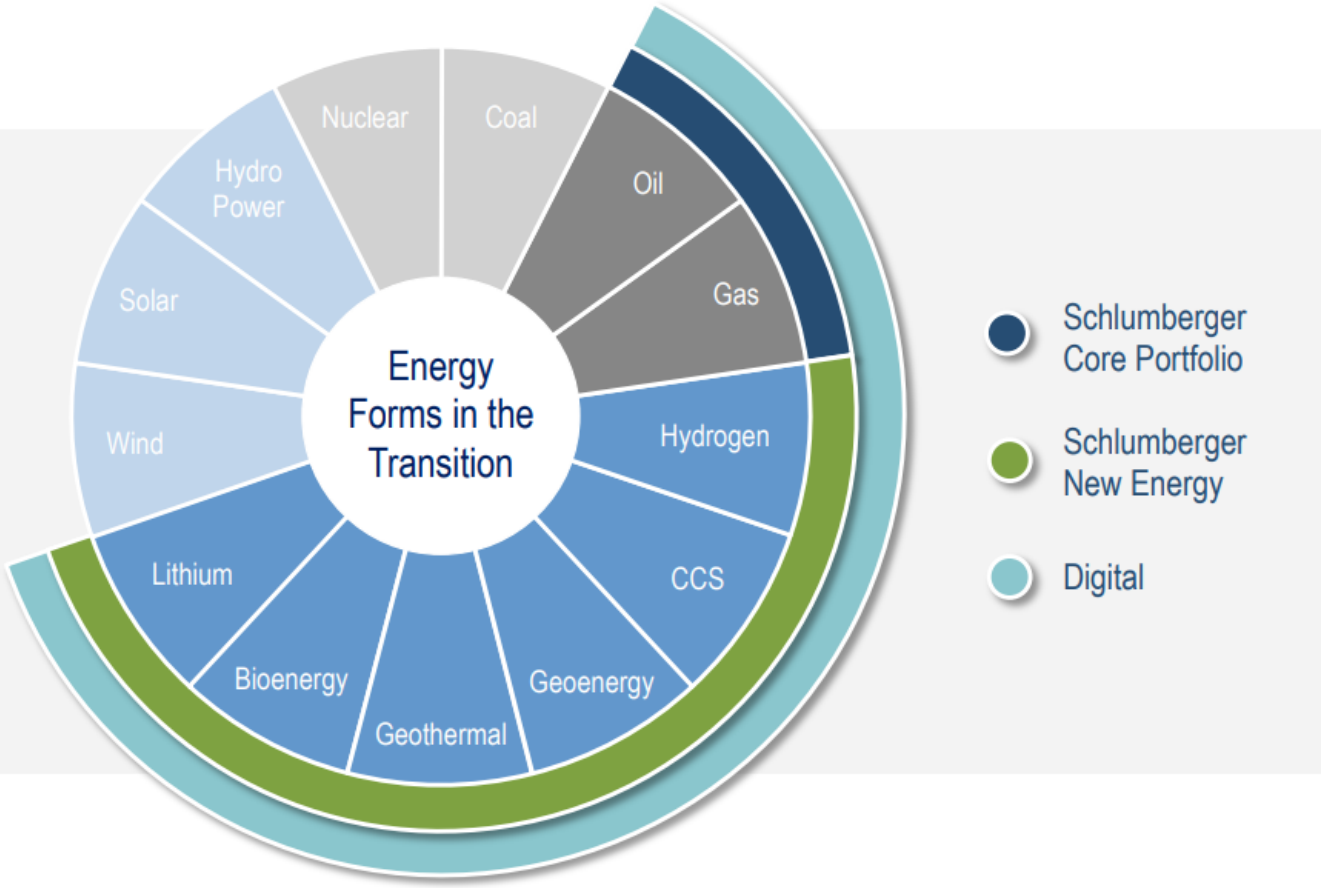
Schlumberger

Long-term Growth in Schlumberger New Energy

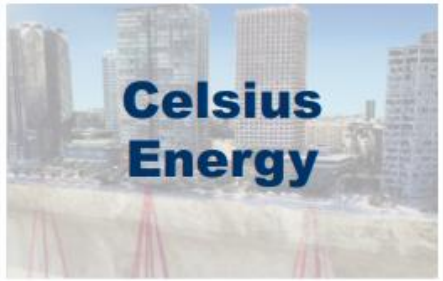
Diversified
Exposure to multiple adjacent, high-growth sectors

Technology Driven
Leveraging our strengths, combining our global footprint and technology industrialization capabilities

Preferred Partner
Accessing markets with unique partnerships, a strong reputation, and recognized track record as industry leader



Schlumberger New Energy Sectors

HYDROGEN	CARBON	GEO-ENERGY	GEOTHERMAL	LITHIUM / BATTERIES
				
Commercializing reversible solid oxide electrolyzer technology to produce clean hydrogen	Providing carbon capture and storage solutions to partners with concentrated emission streams	Using geo-energy sources to provide digitally controlled heating and cooling	Leveraging our subsurface and drilling expertise to develop geothermal power projects	Creating a pipeline of ventures such as developing advanced lithium extraction process technology

Rigs Market

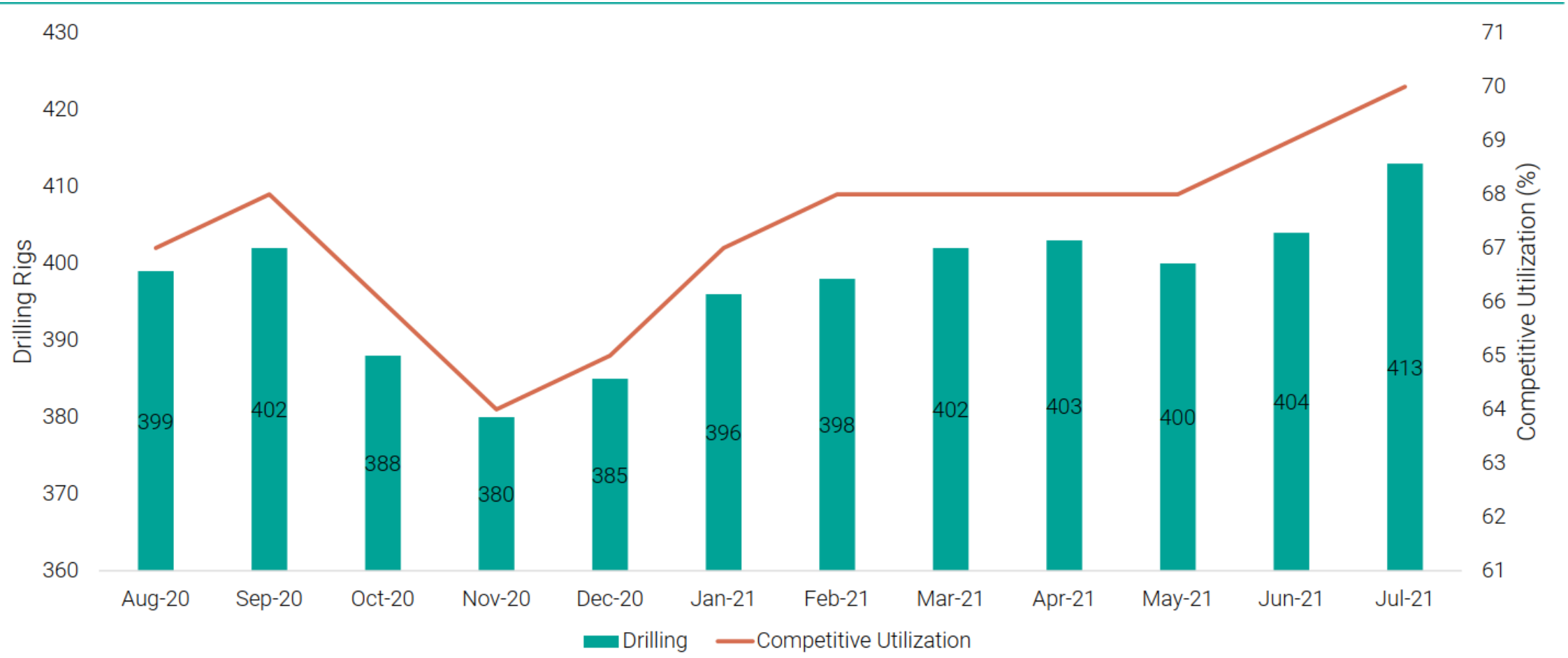
Land

- Drilling
- Workover

Offshore

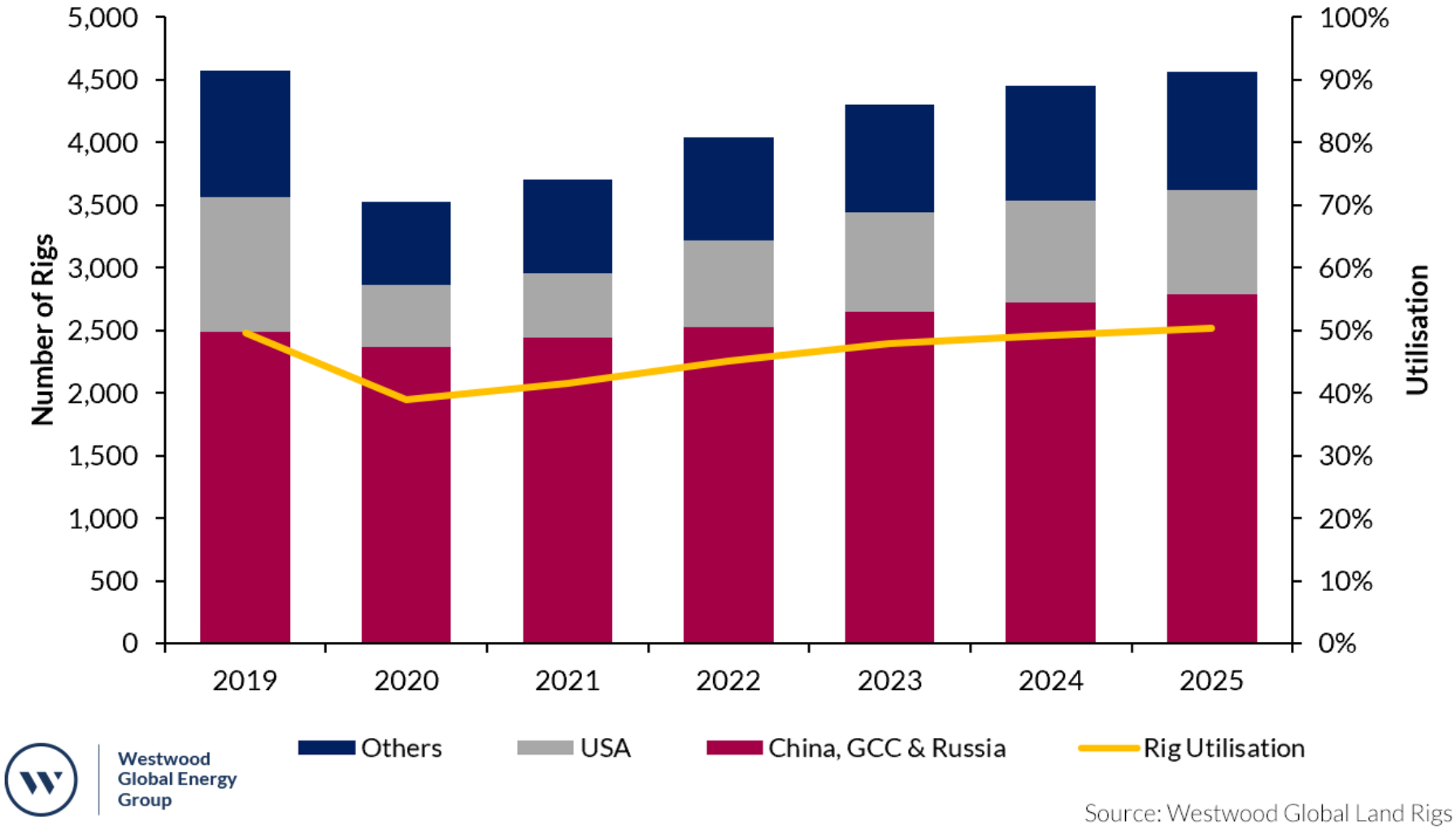
- Jackup
- Semisubmersible
- Drillship

Offshore Rig Market



Source: Bassoe Analytics

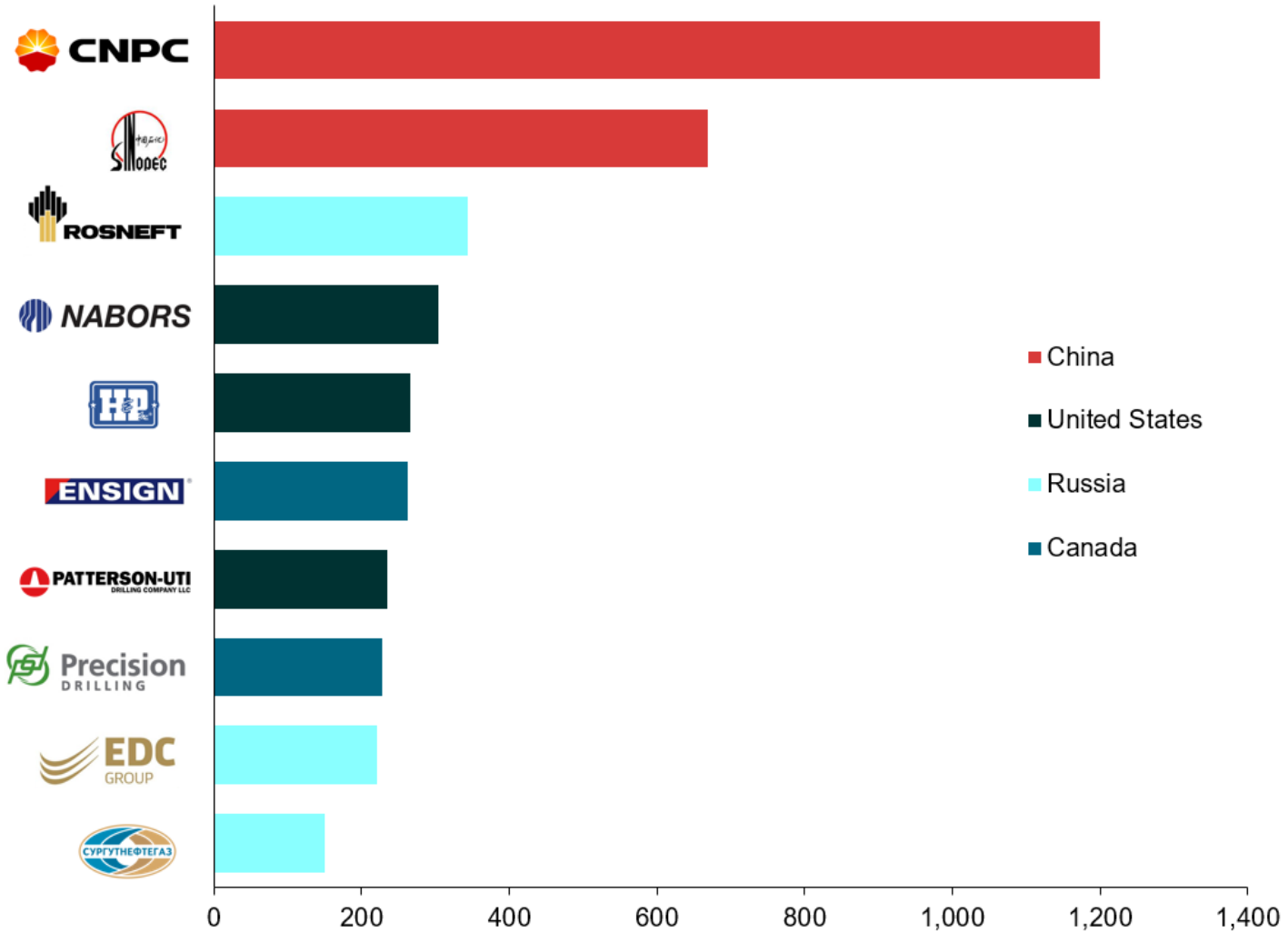
Average Number of Rigs Operational and Global Rig Utilization



Westwood Global Energy Group

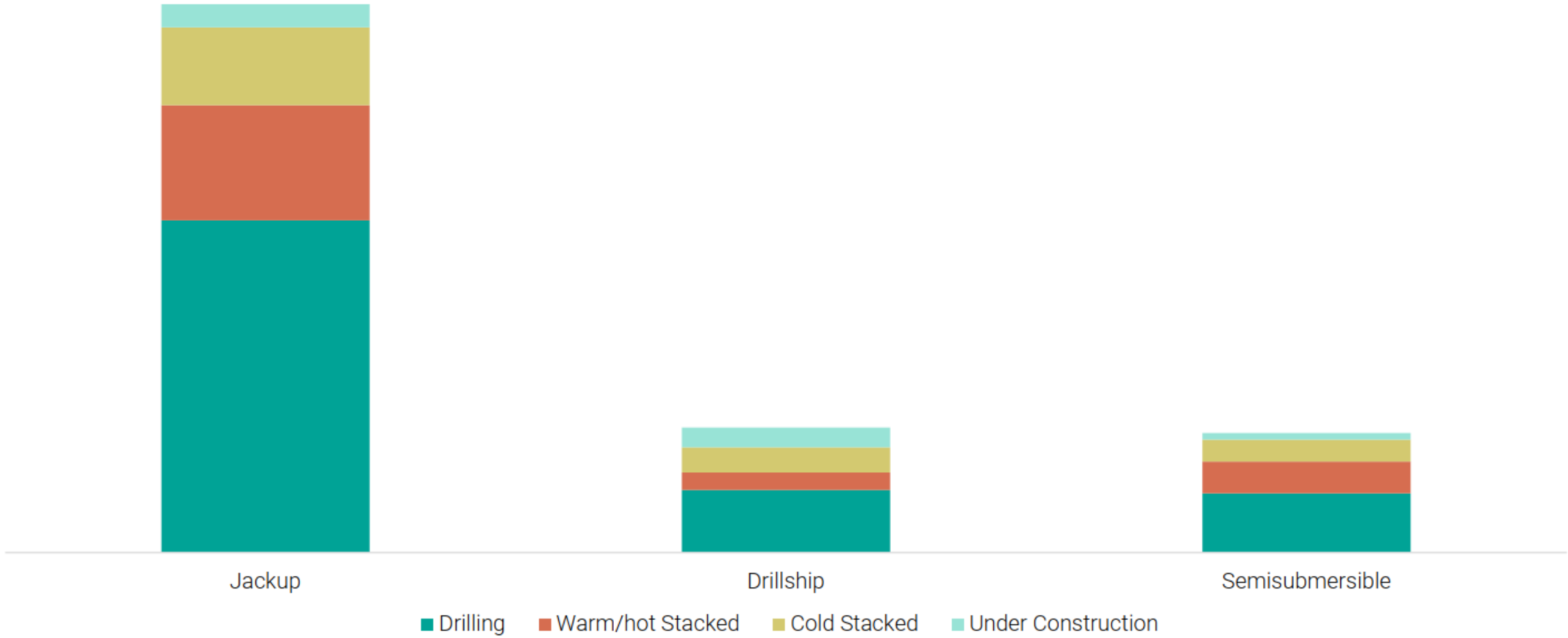
Source: Westwood Global Land Rigs

Top 10 Land Drilling Contractors



Rystad Energy

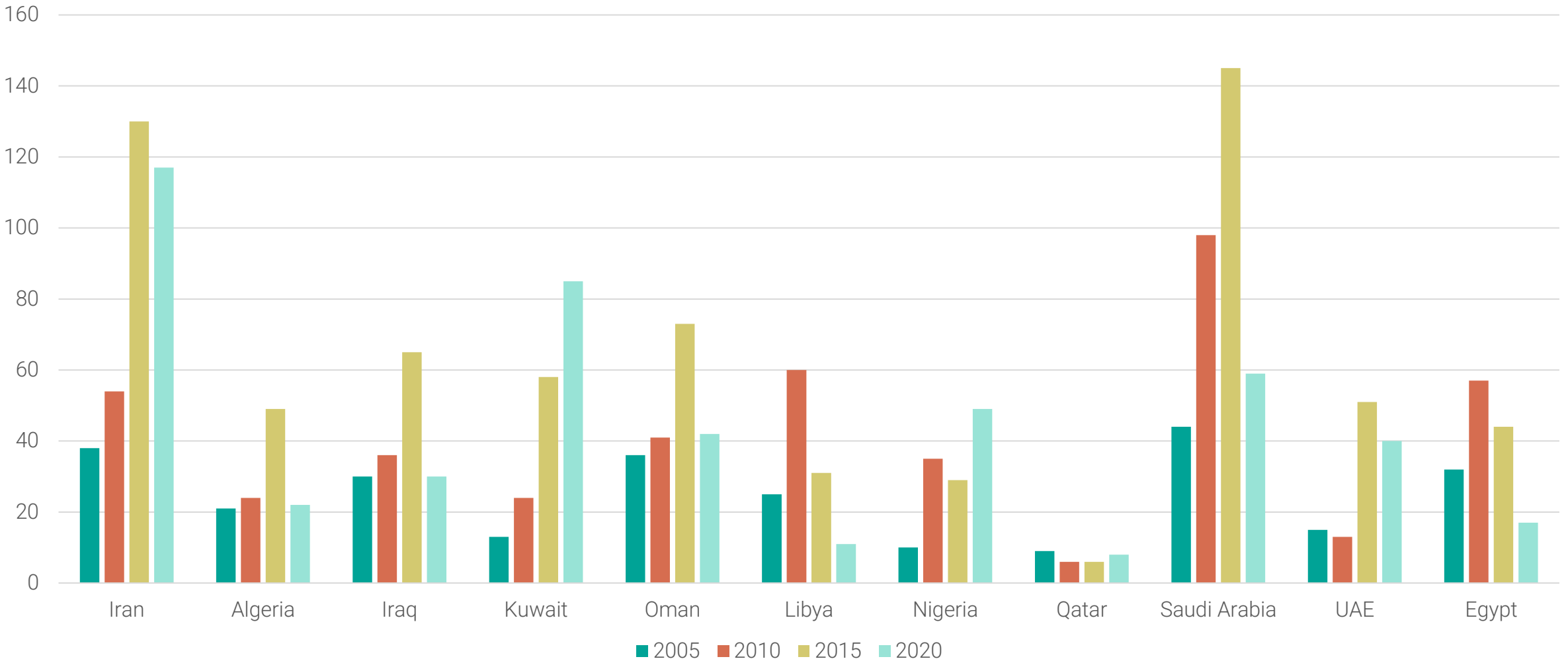
Rigs Status by Type



Source: Bassoe Analytics

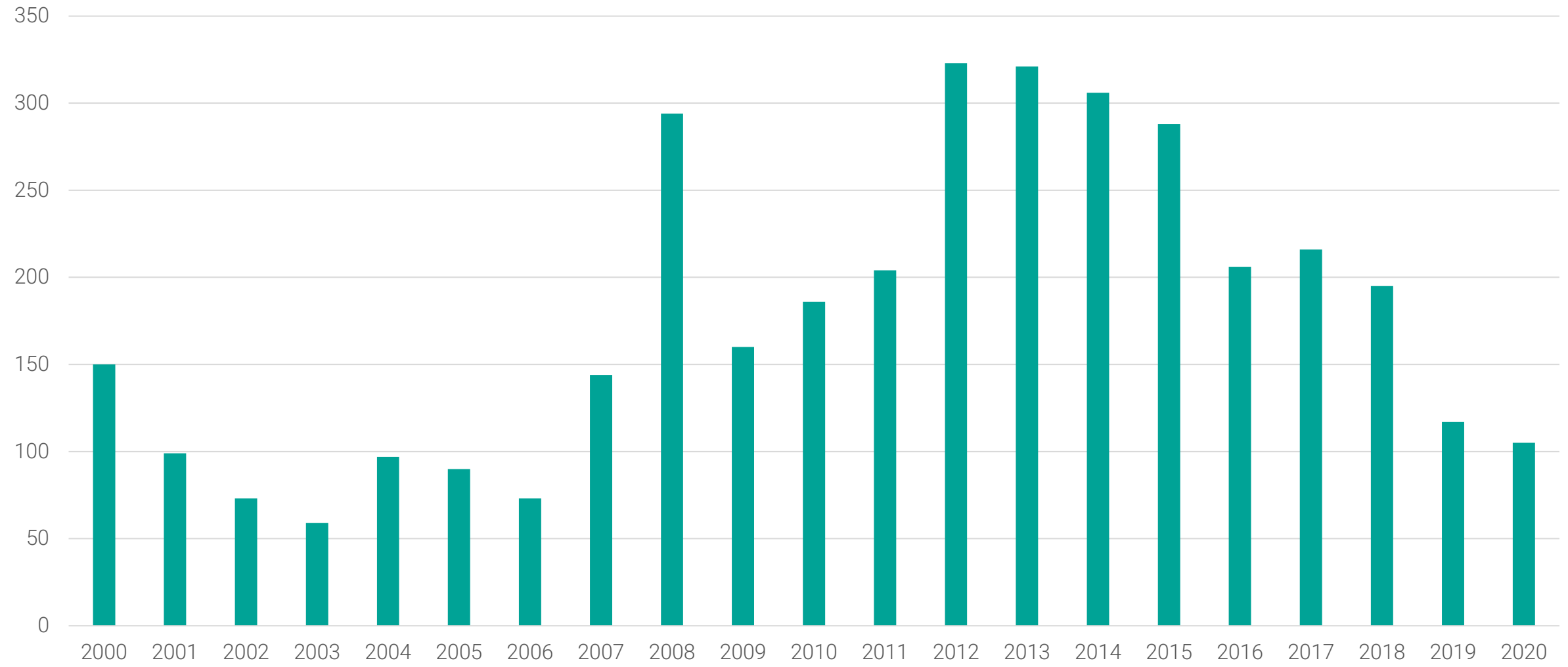
PetroView

Active Rigs in MENA



OPEC

Completed Wells in Iran

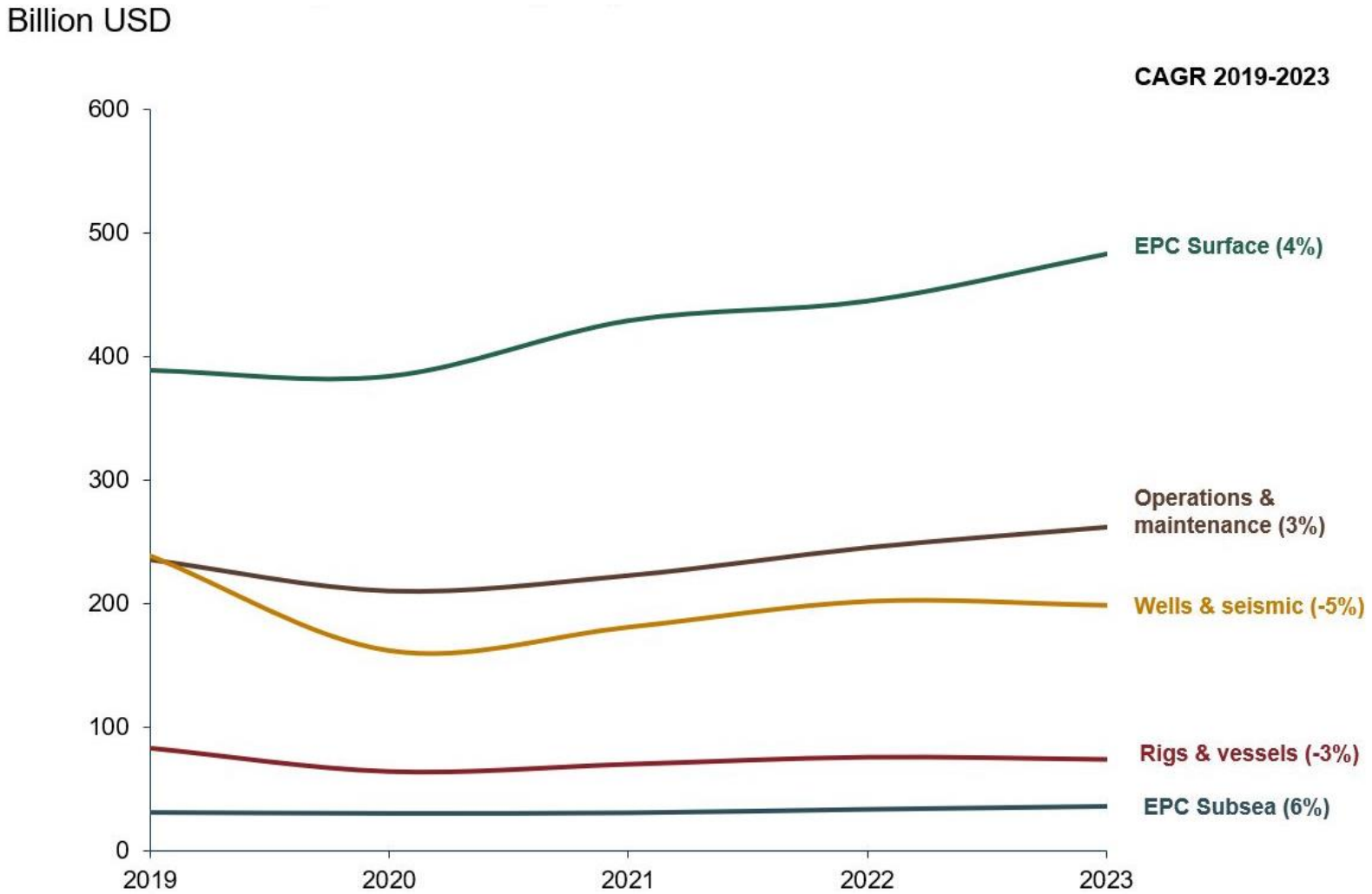


OPEC

Ranking of 11 OFS Segments Based on Resilience to Energy Transition

Rystad Energy

Services Purchase by Segment



Rystad Energy

Middle East Update

To provide an update of recent evolutions in selected Middle East countries

Saudi Arabia General Information (2020)

Population (million inhabitants)	35.01
GDP per capita ($)	19,996
GDP at market prices (million $)	700,118
Proven crude oil reserves (million barrels)	261,600
Proven natural gas reserves (billion cu. m.)	8,438
Crude oil production * (1,000 b/d)	9,213.2
Marketed production of natural gas (million cu. m.)	119,000.0
Refinery capacity (1,000 b/cd)	2,927.0

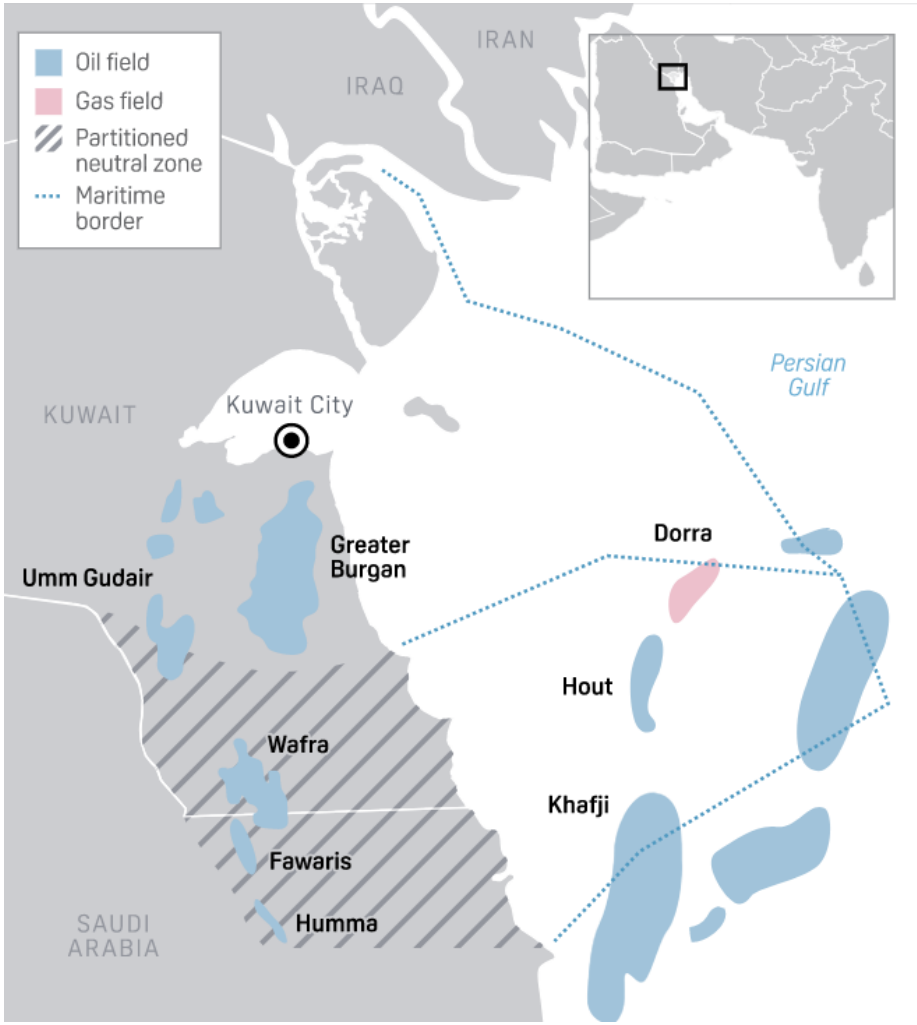
OPEC

Key Issues

- World's largest oil exporter and OPEC's most influential member
- Oil production comes mostly from onshore fields and is dominated by the Ghawar field – the world's largest
- National oil company Saudi Aramco is responsible for nearly all oil and gas production
- Chevron holds a unique position as operator of the oil fields in the onshore portion of the Neutral Zone
- Saudi exports 7-8 million barrels per day with the remainder going to local refineries and power stations
- During the hotter summer months, demand for power generation increases, which increases crude burn

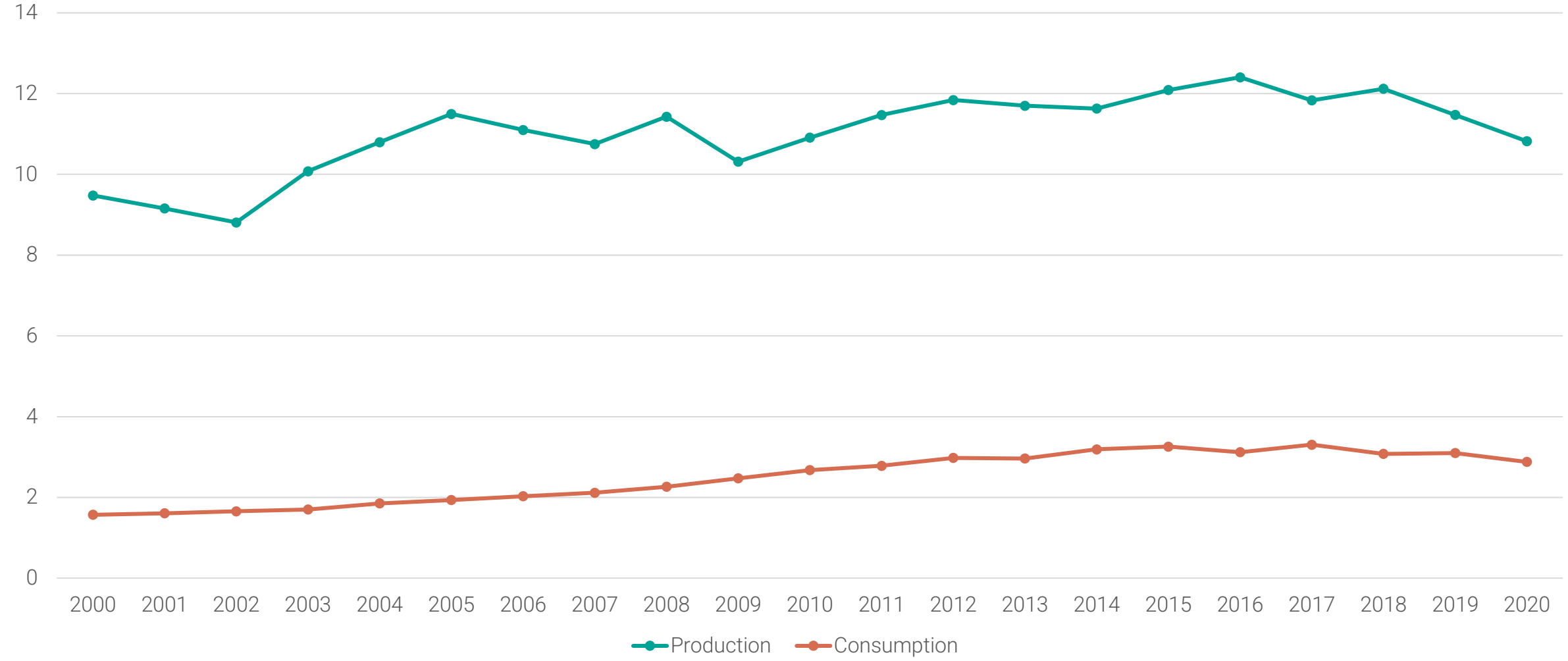
Wood Mackenzie **Saudi Arabia Upstream Summary 2018**

Neutral Zone



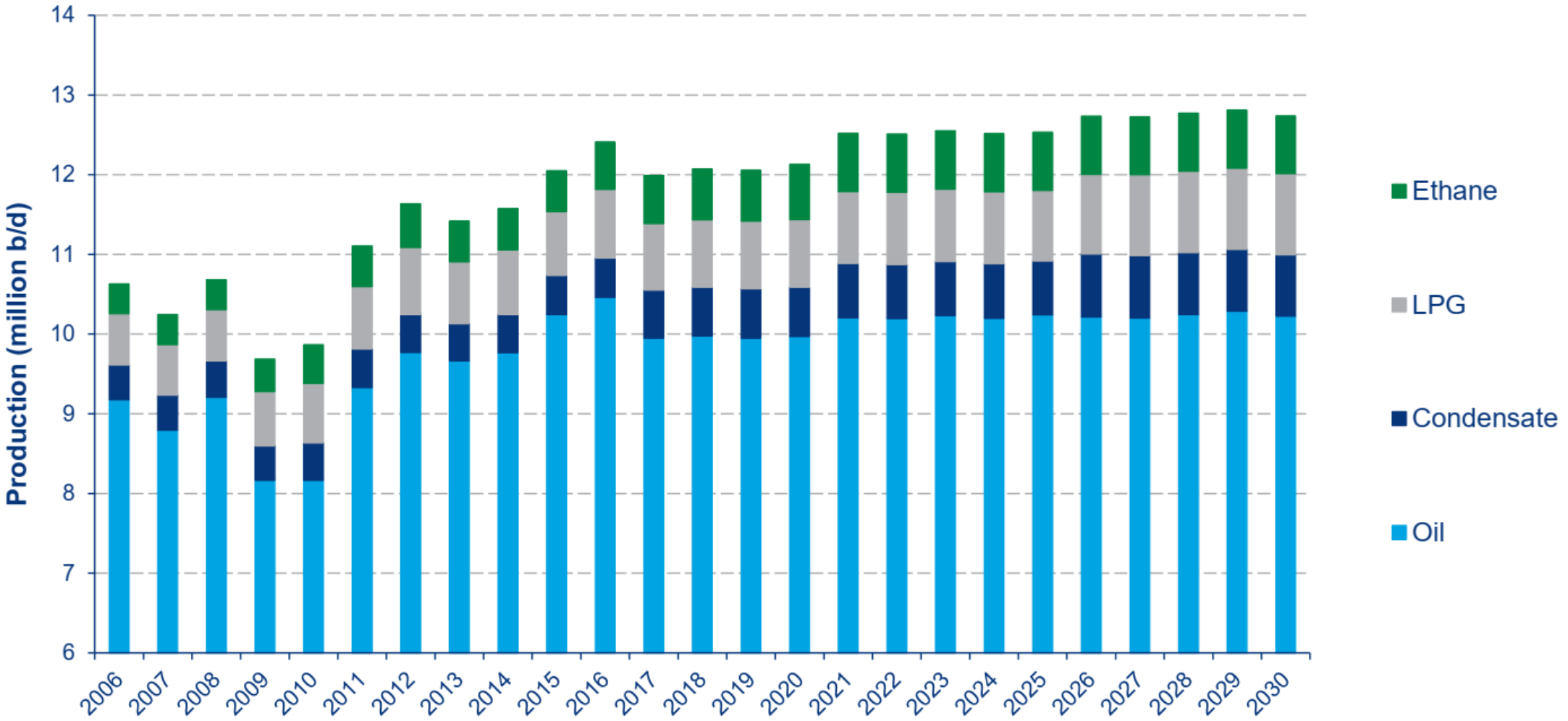
Platts

Petroleum and Other Liquids Production and Consumption (MBPD)



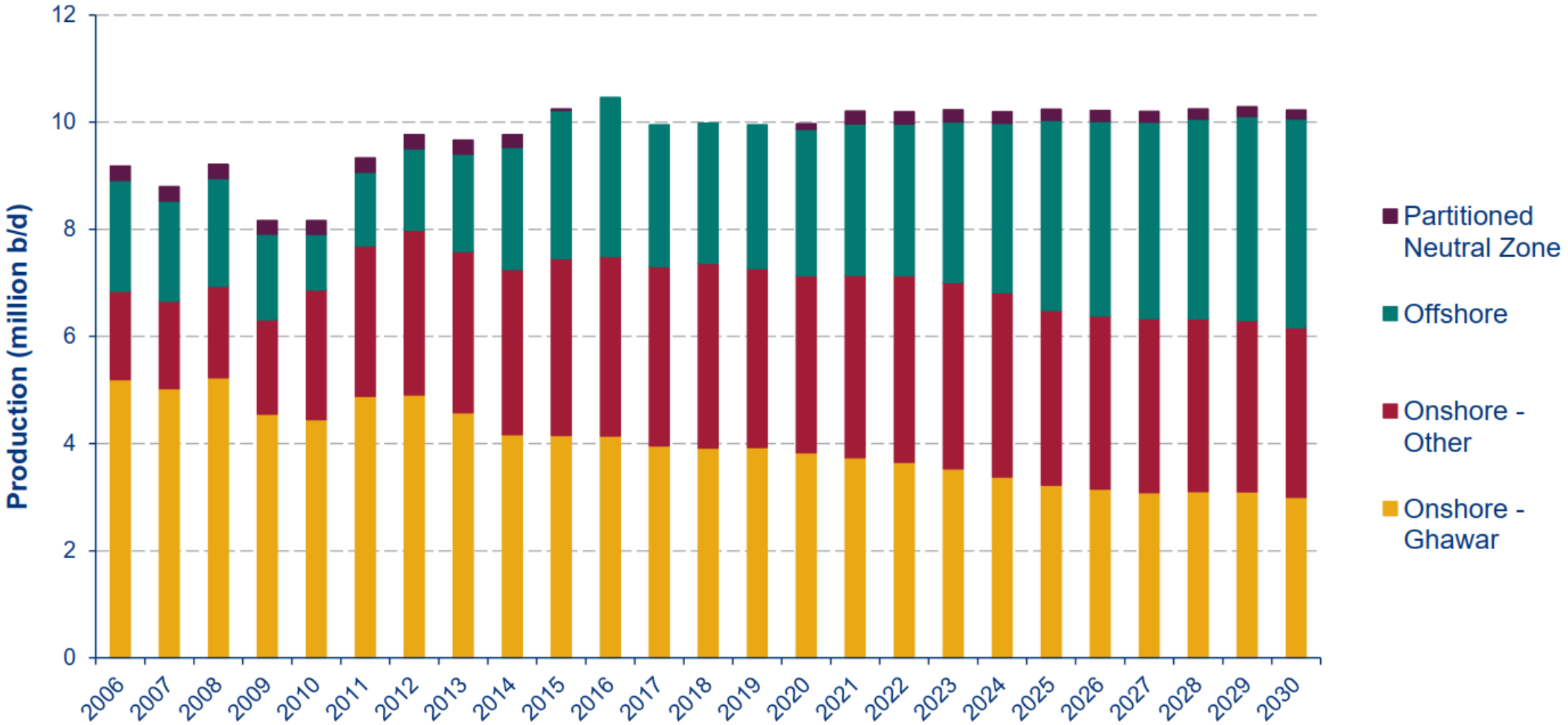
EIA

Liquids Production by Hydrocarbon Type (data: 2018)



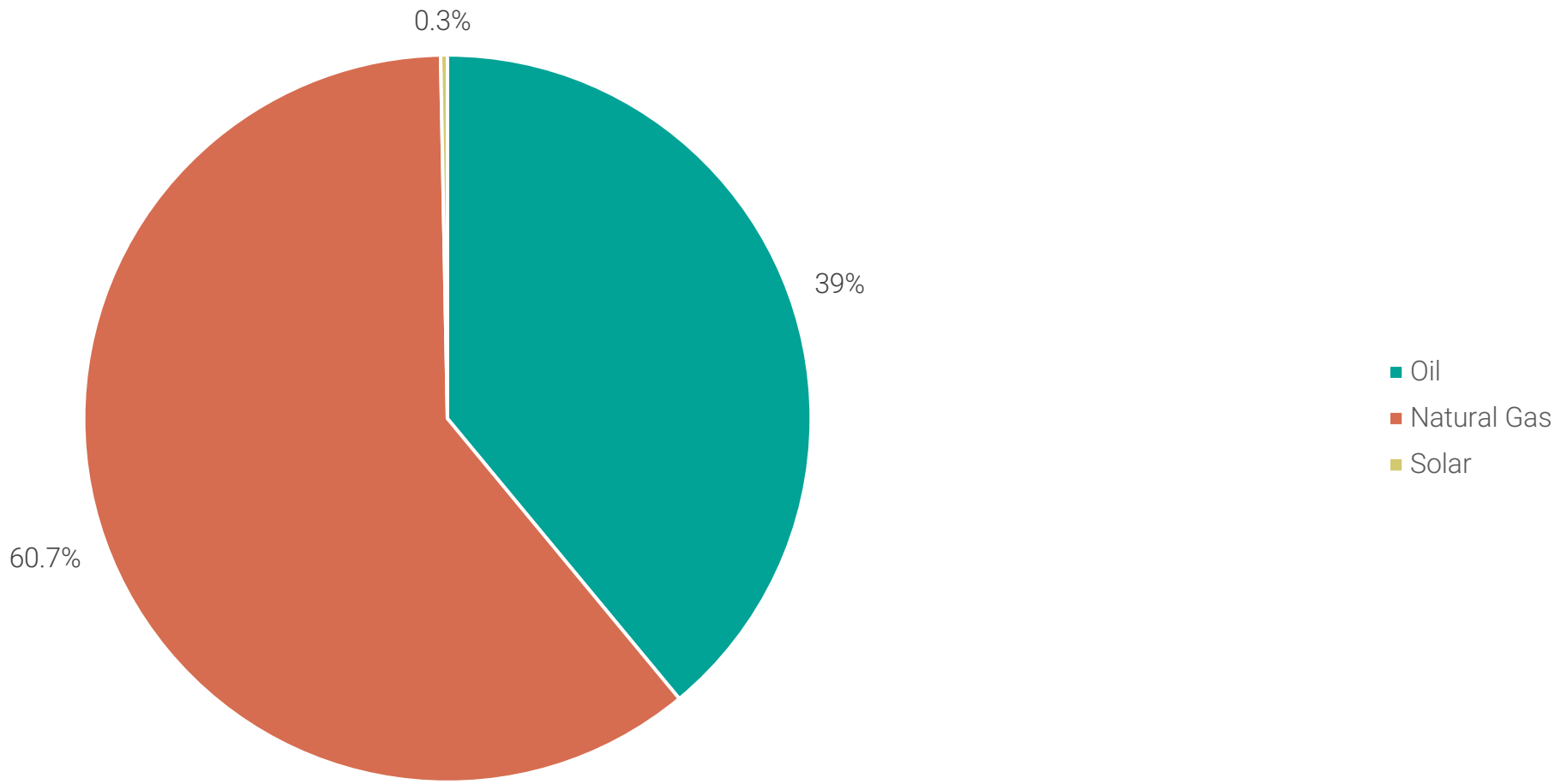
Wood Mackenzie **Saudi Arabia Upstream Summary 2018**

Oil production by Location (2018)



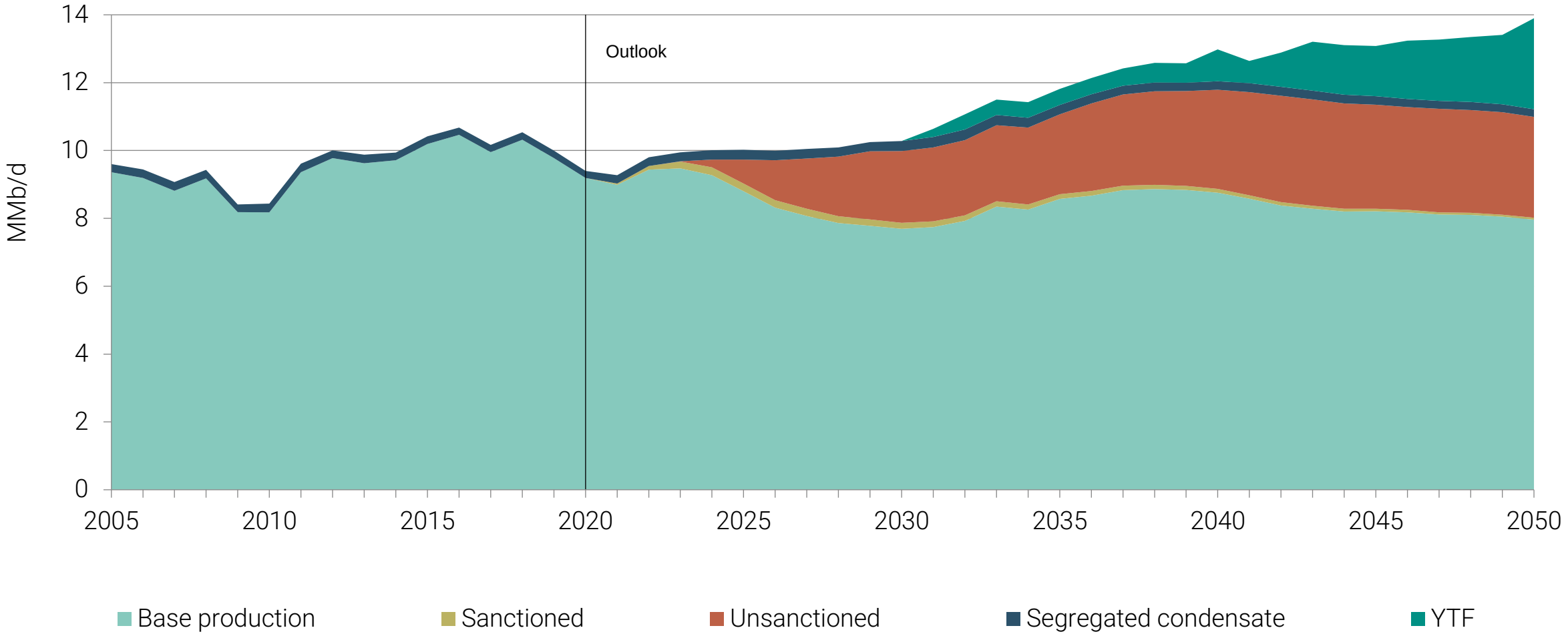
Wood Mackenzie **Saudi Arabia Upstream Summary 2018**

Electric Power Generation by Fuel



EIA

Crude and Condensate Production by Development



IHS Markit Asia Pacific and Middle East crude and condensate production outlook 2021

Aramco's Consolidated Statement of Income

	Note	SAR Year ended December 31 2020	SAR Year ended December 31 2019	USD* Year ended December 31 2020	USD* Year ended December 31 2019
Revenue	25	**768,109**	1,105,696	**204,829**	294,852
Other income related to sales		**93,982**	131,089	**25,062**	34,957
Revenue and other income related to sales		**862,091**	1,236,785	**229,891**	329,809
Royalties and other taxes		**(89,964)**	(182,141)	**(23,991)**	(48,571)
Purchases	26	**(181,116)**	(225,170)	**(48,297)**	(60,045)
Producing and manufacturing		**(74,350)**	(58,249)	**(19,827)**	(15,533)
Selling, administrative and general		**(46,970)**	(36,647)	**(12,525)**	(9,773)
Exploration		**(7,293)**	(7,291)	**(1,945)**	(1,944)
Research and development		**(2,830)**	(2,150)	**(755)**	(573)
Depreciation and amortization	6,7	**(76,208)**	(50,266)	**(20,322)**	(13,404)
Operating costs		**(478,731)**	(561,914)	**(127,662)**	(149,843)
Operating income		**383,360**	674,871	**102,229**	179,966
Share of results of joint ventures and associates	8	**(3,554)**	(9,455)	**(948)**	(2,521)
Finance and other income	28	**3,182**	7,351	**849**	1,960
Finance costs	21	**(10,564)**	(6,026)	**(2,817)**	(1,607)
Income before income taxes and zakat		**372,424**	666,741	**99,313**	177,798
Income taxes and zakat	9	**(188,661)**	(336,048)	**(50,310)**	(89,613)
Net income		**183,763**	330,693	**49,003**	88,185
Net income (loss) attributable to					
Shareholders' equity		**184,926**	330,816	**49,313**	88,218
Non-controlling interests		**(1,163)**	(123)	**(310)**	(33)
		183,763	330,693	**49,003**	88,185
Earnings per share (basic and diluted)	37	**0.93**	1.65	**0.25**	0.44

* Supplementary information is converted at a fixed rate of U.S. dollar 1.00 = SAR 3.75 for convenience only.

Aramco's Reports

Aramco Operational Highlights

MSC
(mmbpd)

12.0

(2019: 12.0)

Hydrocarbon production
(mmboed)

12.4

(2019: 13.2)

Crude oil production[1]
(mmbpd)

9.2

(2019: 9.9)

Reliability[2]
(%)

99.9

(2019: 99.2)

Gross refining capacity
(mmbpd)

6.4

(2019: 6.4)

Net chemicals production capacity
(million tonnes per year)

53.1

(2019: 21.7)

Upstream carbon intensity
(kg of CO_2e/boe)

10.5

(2019: 10.4)

Flaring intensity[3]
(scf/boe)

5.95

(2019: 5.88)

Aramco's Reports

United Arab Emirates General Information (2020)

Population (million inhabitants)	9.28
GDP per capita ($)	38,661
GDP at market prices (million $)	358,869
Proven crude oil reserves (million barrels)	107,000
Proven natural gas reserves (billion cu. m.)	7,726
Crude oil production (1,000 b/d)	2,778.6
Marketed production of natural gas (million cu. m.)	55,064.5
Refinery capacity (1,000 b/cd)	1,272.0

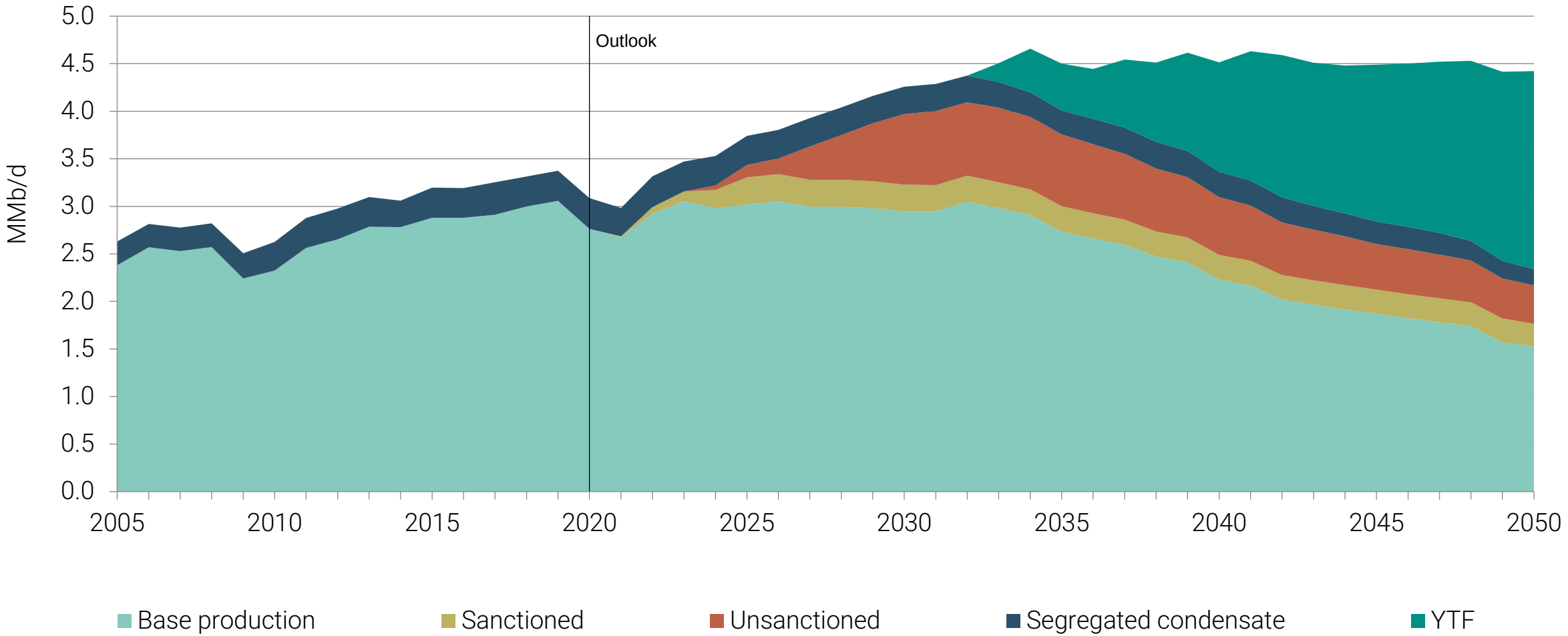
OPEC

Key Issues

- Most of the UAE's oil and gas production (>95%) is in Abu Dhabi
- Five fields (Asab, Bab, Bu Hasa, Umm Shaif and Zakum) account for more than 85% of the total oil production
- Pipeline gas imports from Qatar started in 2007. Dubai was the first emirate to begin LNG imports in 2010, followed by Abu Dhabi in 2016
- The volumes of sales gas available for the domestic market will be significantly lower, because of the continued reliance on gas re-injection for oil recovery
- Most contracts in the UAE are in the form of concession agreements and contractors are liable to pay royalty and income tax

Wood Mackenzie UAE Upstream Summary 2018

Crude and Condensate Production by Development



IHS Markit Asia Pacific and Middle East crude and condensate production outlook 2021

Iraq General Information (2020)

Population (million inhabitants)	40.15
GDP per capita ($)	4,160
GDP at market prices (million $)	167,037
Proven crude oil reserves (million barrels)	145,019
Proven natural gas reserves (billion cu. m.)	3,714
Crude oil production (1,000 b/d)	3,996.6
Marketed production of natural gas (million cu. m.)	7,374.1
Refinery capacity (1,000 b/cd)	828.5

OPEC

Key Issues

- Iraq has enormous oil resources. The ministry of oil estimate is over 150 billion barrels, with over 10 billion barrels in Kurdistan
- Production has grown from 2.4 million b/d in 2010 to 5 million b/d capacity in 2019, with Kurdistan contributing around 10%
- It has 110 tcf of gas resources, mostly associated with oil production, but domestic demand is not being met
- Iraq has the potential to be a substantial contributor to OPEC supply for many decades
- Kurdistan opened to foreign investors through license awards in 2002 and 2004, but the main influx started in 2006 with the award of the first Production Sharing Contract (PSC) in the region

Wood Mackenzie Iraq Upstream Summary 2020

The Summary of Four Bid Rounds

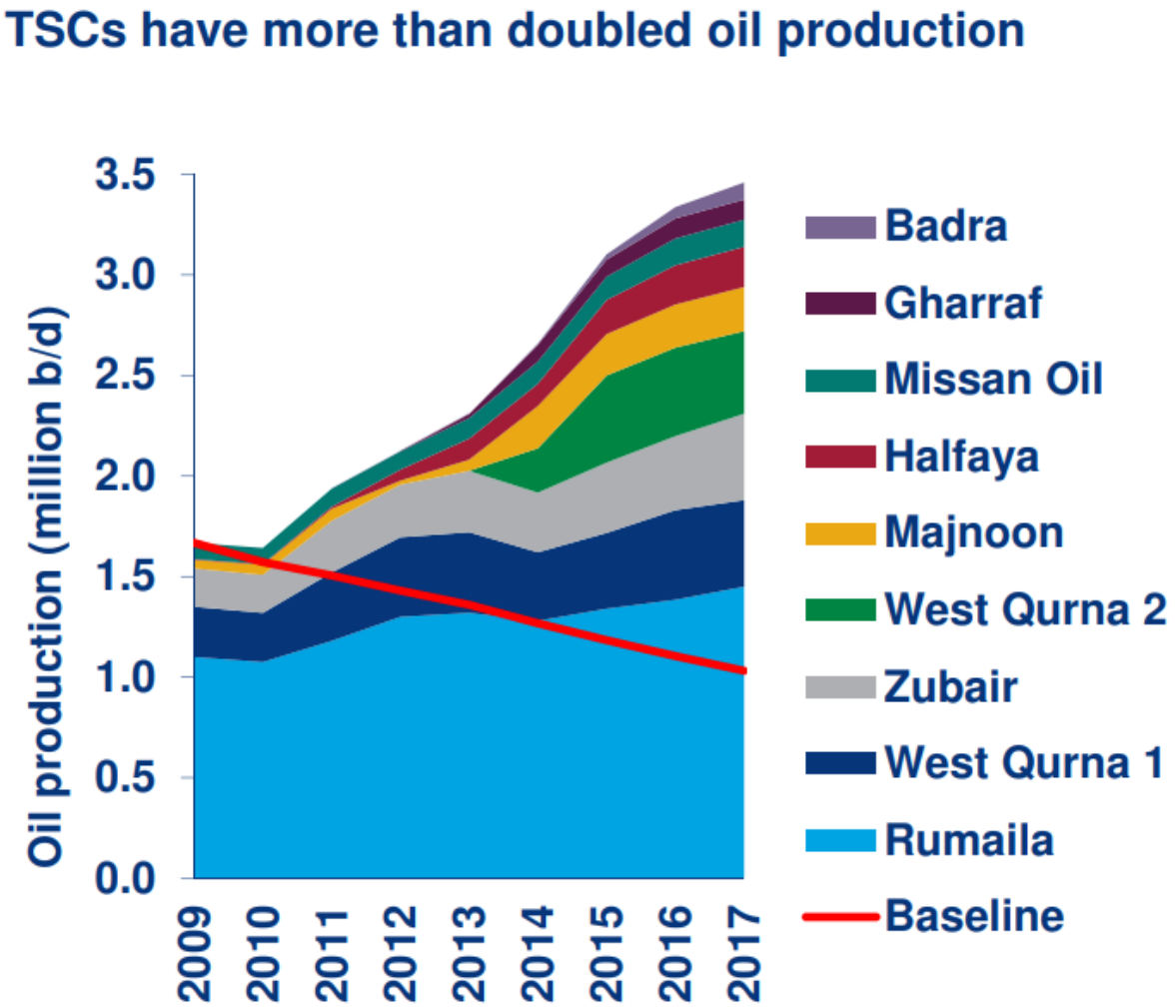
Bid round	Project or licensing block	Operator	Type	Production*			Max. fee**
				Initial Target	June 2012	Plateau target	
2008	Ahdab	Petrochina	Oil	25	129	140	6.00
One (2009)	Rumaila	BP	Oil	1 173	1 279	2 850	2.00
	West Qurna (I)	ExxonMobil	Oil	268	417	2 825	1.90
	Zubair	Eni	Oil	201	225	1 200	2.00
	Missan Group	CNOOC	Oil	97	91	450	2.30
Two (2009)	West Qurna (II)	Lukoil	Oil	120	-	1 800	1.15
	Majnoon	Shell	Oil	175	21	1 800	1.39
	Halfaya	Petrochina	Oil	70	34	535	1.40
	Gharraf	Petronas	Oil	35	-	230	1.49
	Badra	GazpromNeft	Oil	15	-	170	5.50
	Qairayah	Sonangol	Heavy oil	30	2	120	5.00
	Najmah	Sonangol	Heavy oil	20	-	110	6.00
Three (2010)	Akkas	KOGAS	Gas	1.03	-	4.1	5.50
	Mansuriyah	TPAO	Gas	0.78	-	3.1	7.00
	Siba	Kuwait Energy	Gas	0.26	-	1.0	7.50
Four (2012)	Block 8	Pakistan Petroleum	Gas-prone	n/a	-	n/a	5.38
	Block 9	Kuwait Energy	Oil-prone	n/a	-	n/a	6.24
	Block 10	Lukoil	Oil-prone	n/a	-	n/a	5.99
	Block 12	Bashneft	Oil-prone	n/a	-	n/a	5.00

IEA Iraq Energy Outlook 2012

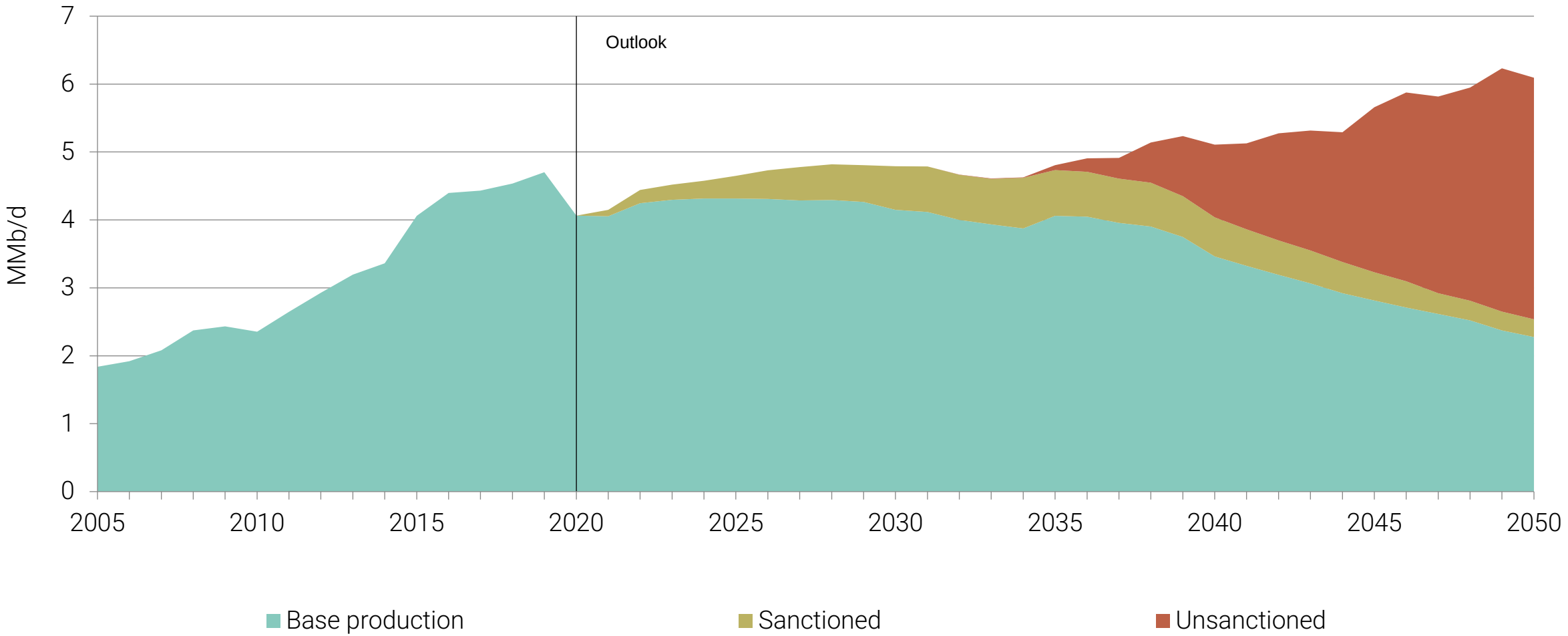
Renegotiated Contract Terms

Project	Revised Plateau Production Target ('000 b/d)	Licence extension (Years)	Revised state equity (%)	Comments
Halfaya	400	10	10	-
Rumaila	2,100	5	6	R-factor removed
West Qurna 1	1,600	Unconfirmed	9.6	-
West Qurna 2	1,200	5	No change	Amendment includes construction of pipeline from Tuba to Fao
Zubair	850	5	No change	R-factor removed

Technical Service Contracts Performance



Crude and Condensate Production by Development



IHS Markit Asia Pacific and Middle East crude and condensate production outlook 2021

Oman General Information (2020)

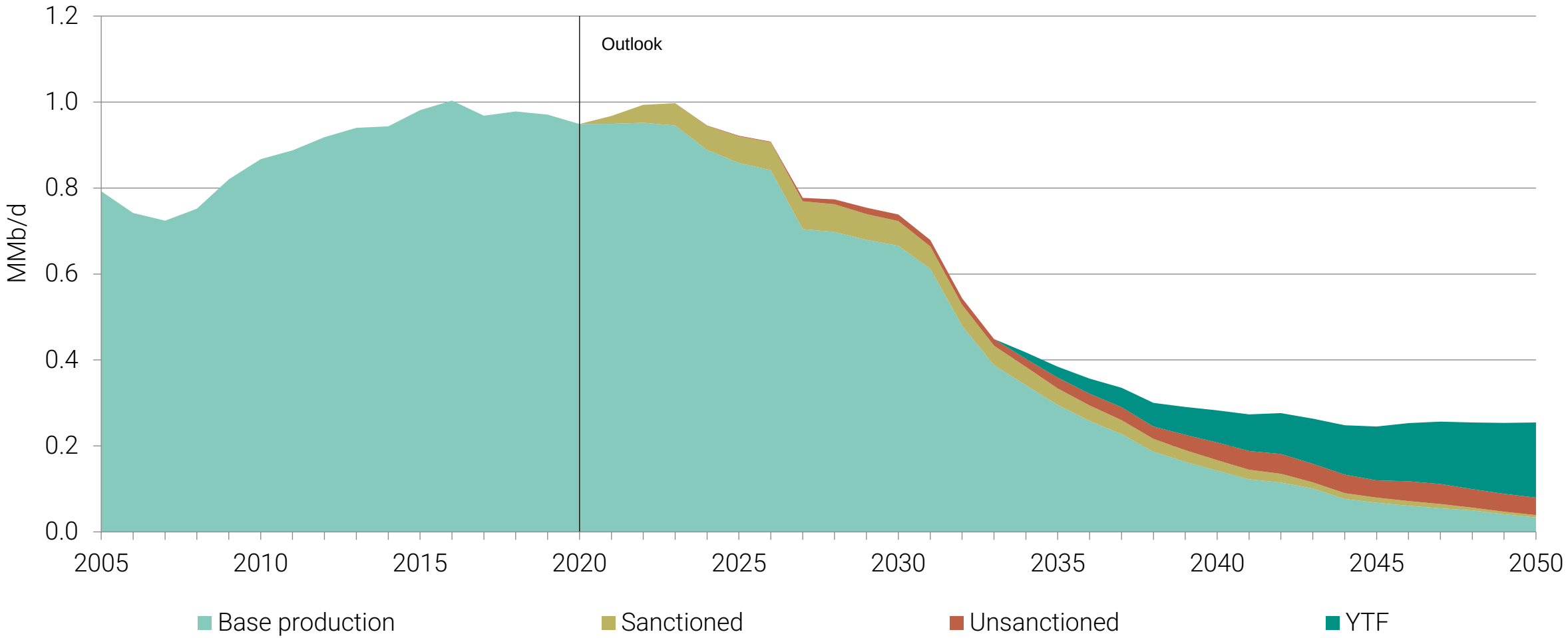
Population (million inhabitants)	5.1
GDP per capita ($)	14,255
GDP at market prices (million $)	76,330
Proven crude oil reserves (million barrels)	5,400
Proven natural gas reserves (billion cu. m.)	700
Crude oil production (1,000 b/d)	951
Marketed production of natural gas (million cu. m.)	36,900

OPEC

Key Issues

- Oman is the largest non-OPEC producer in the Middle East, dominated by state participated PDO
- Stable operating environment has drawn a multitude of international investors but considerable value remains locked up in PDO's Block 6, with less appetite and lower prospectivity in remaining acreage
- Challenging geology and requirement for EOR technology has resulted in relatively high cost developments
- Oman is a leading proponent of EOR developments in the Middle East, with steam flood, miscible gas and polymer injection projects common
- Oman offers Exploration and Production Sharing Agreements (EPSA) for new contracts. PDO Block 6 remains under concession terms

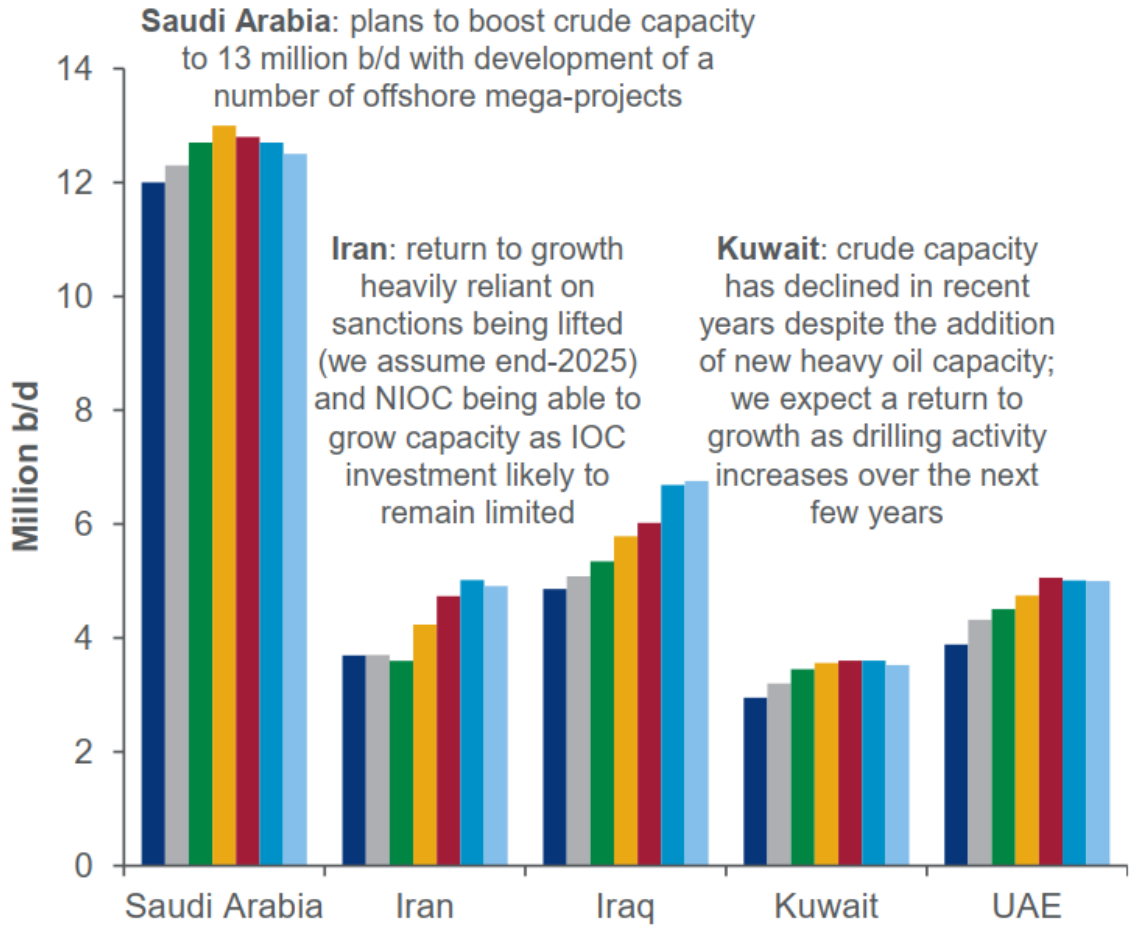
Crude and Condensate Production by Development



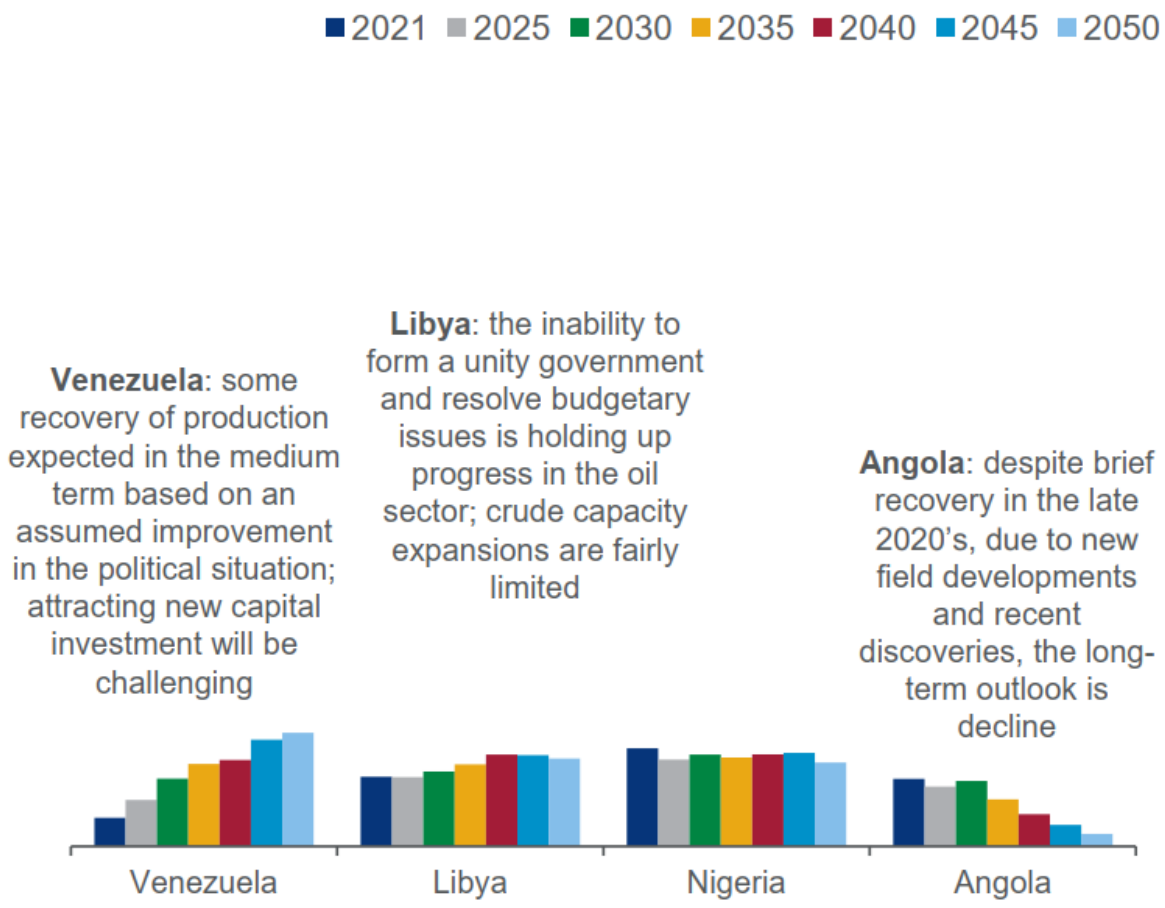
IHS Markit Asia Pacific and Middle East crude and condensate production outlook 2021

OPEC Crude Capacity

Middle East OPEC crude capacity

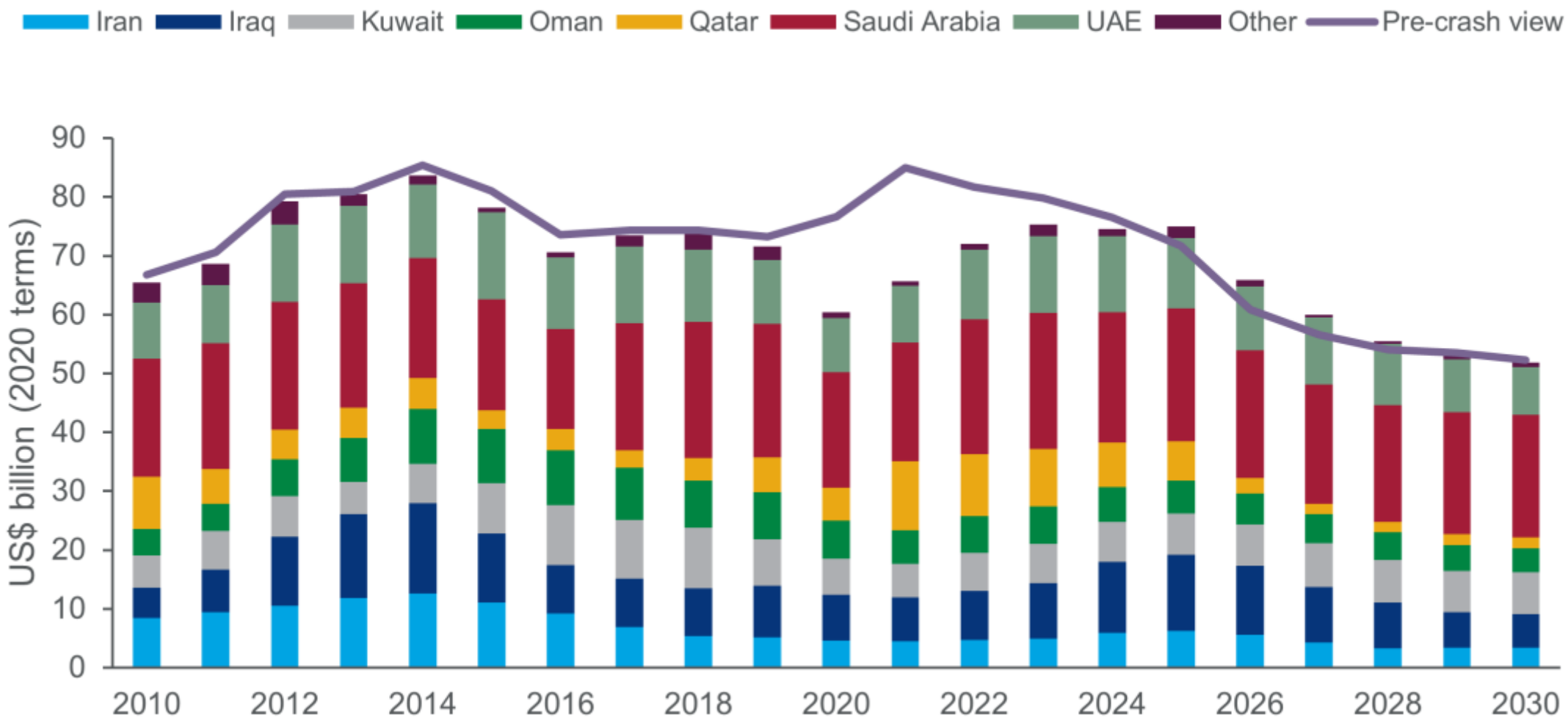


Other key OPEC crude capacity



Wood Mackenzie Macro Oils long-term 2021 outlook to 2050 November 2021

Middle East Upstream Investment



Wood Mackenzie MENA upstream in brief 2021

Oil in Iran

To present a briefing about Iran’s oil history and recent evolutions

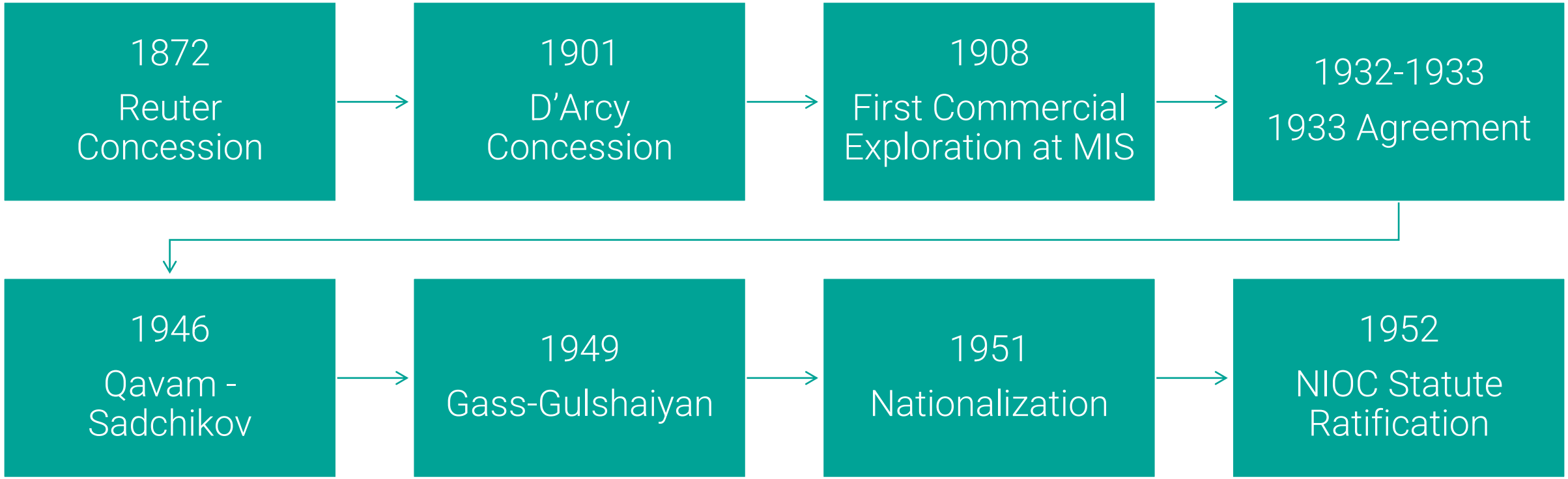
Periods of History

1872-1949
- Concession

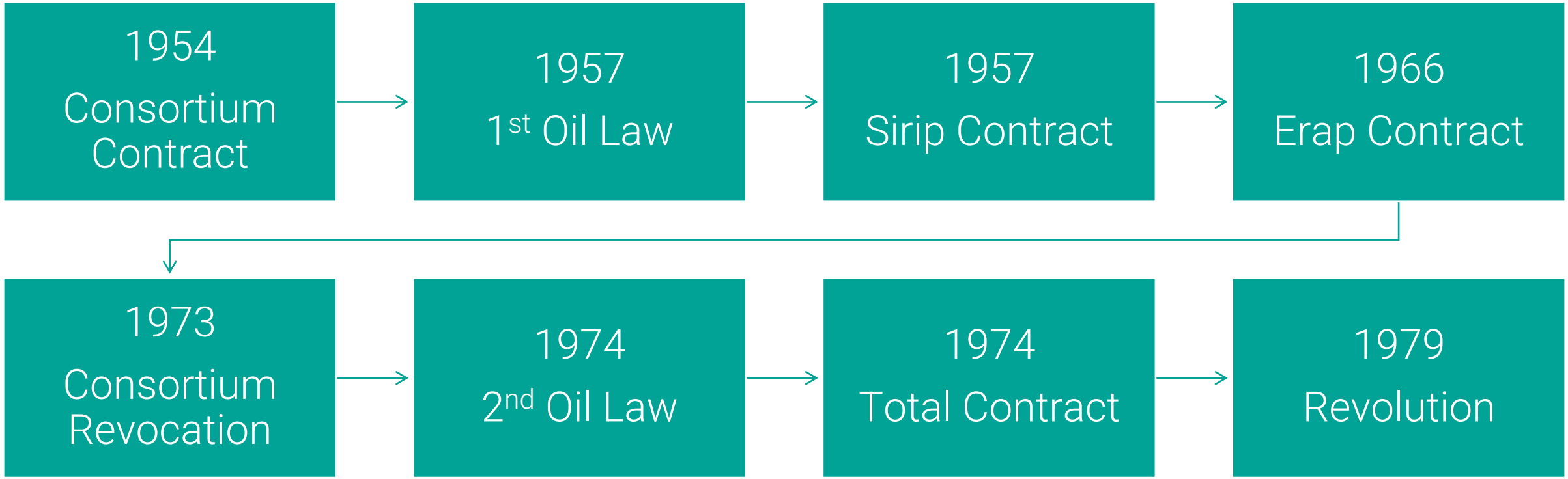
1954-1979
- Consortium

1979-Now
- Service

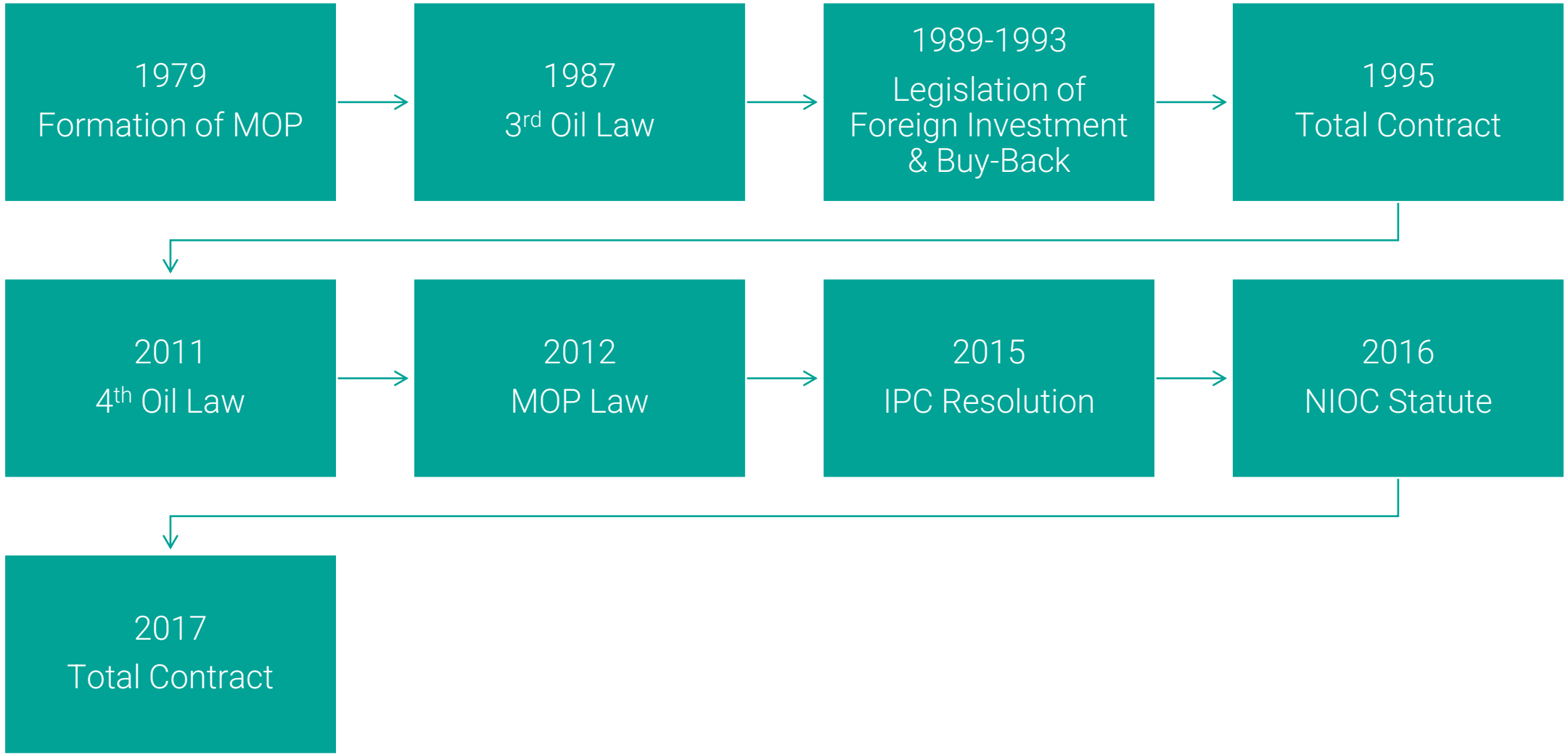
Concessions



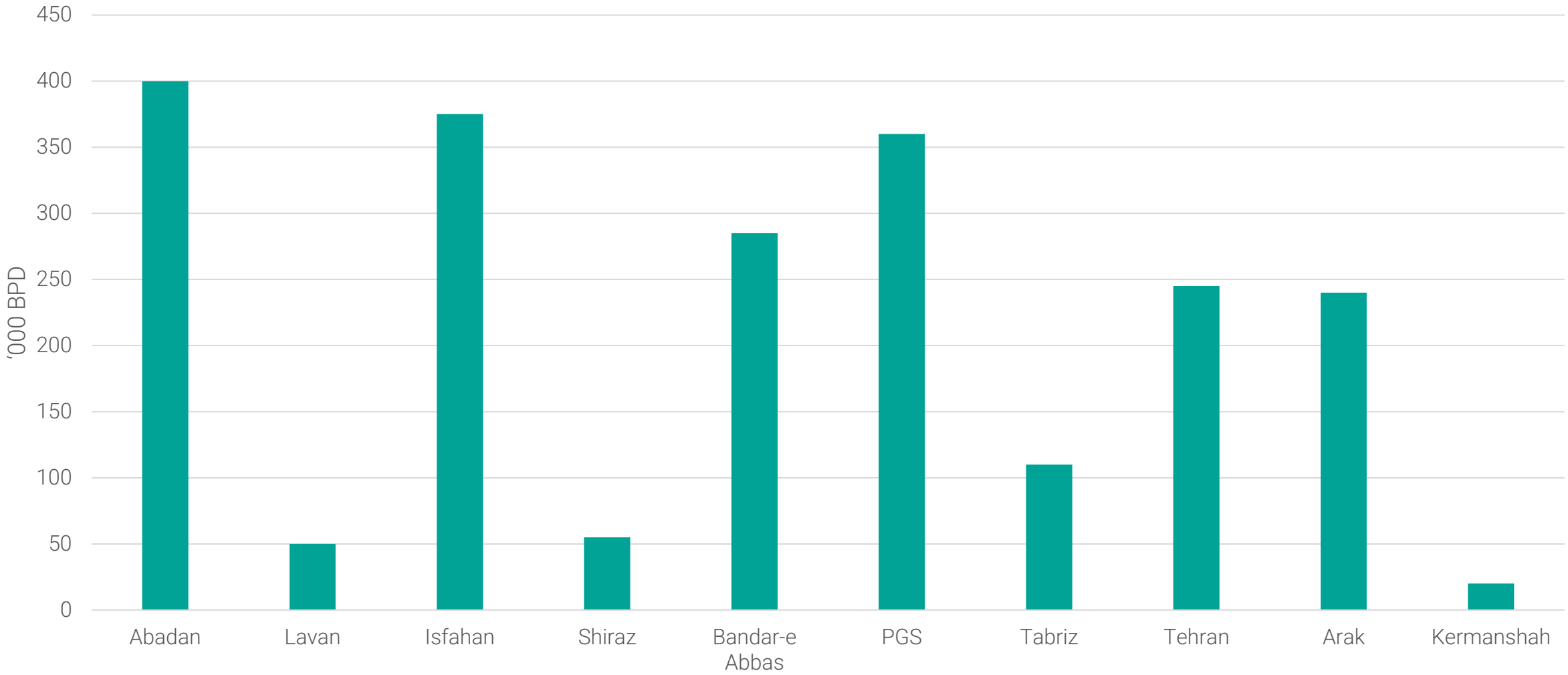
Consortium


1954
Consortium Contract
1957
1st Oil Law
1957
Sirip Contract
1966
Erap Contract
1973
Consortium Revocation
1974
2nd Oil Law
1974
Total Contract
1979
Revolution

Service Contracts



Iran Oil Refineries



Iran Petrochemical Plants (Examples)

Methanol	Urea	Olefin	BTX
Zagros	Pardis	Arya Sasol	Nouri
Fanavaran	Khorasan	Arak	Bu Ali

Post JCPOA E&P Players in Iran

European majors

Favoured by NIOC for their technology and know-how

TOTAL, Shell, eni, bp

European mid-caps

Specific expertise can be a plus for specific mid-size projects

OMV, CEPSA, PERENCO, DNO, PGNiG

Asians

Political relations and Iran's will to secure market share will help, but technical reputation can disserve some

CNPC, Sinopec, ONGC Videsh, PETRONAS, PTTEP, CNOOC, INPEX, JAPEX, PERTAMINA, KOGAS, MITSUI & CO.

Russians

Political relations and part of Moscow's strategy to increase its influence in MENA oil and gas

GAZPROM, LUKOIL, ROSNEFT, ZARUBEZHNEFT

Wood Mackenzie

Iranian E&Ps

Name	Major shareholder	Name	Major shareholder
Petro Pars	Government	PEDC	Private *
OIEC	Public	PGFK	Public
Dana Energy	Private	IOEC	Public
PEDCO	Government	Kayson	Private
MAPNA	Public	Iran Ofogh	Private
Khatam-ol-Anbia	Public	Pars Petro Zagros	Private
IDRO	Government	Global Petro Tech	Private *
Persia	Public	NDCO	Public
Ghadir	Public		

Classification of Iranian Energy Players

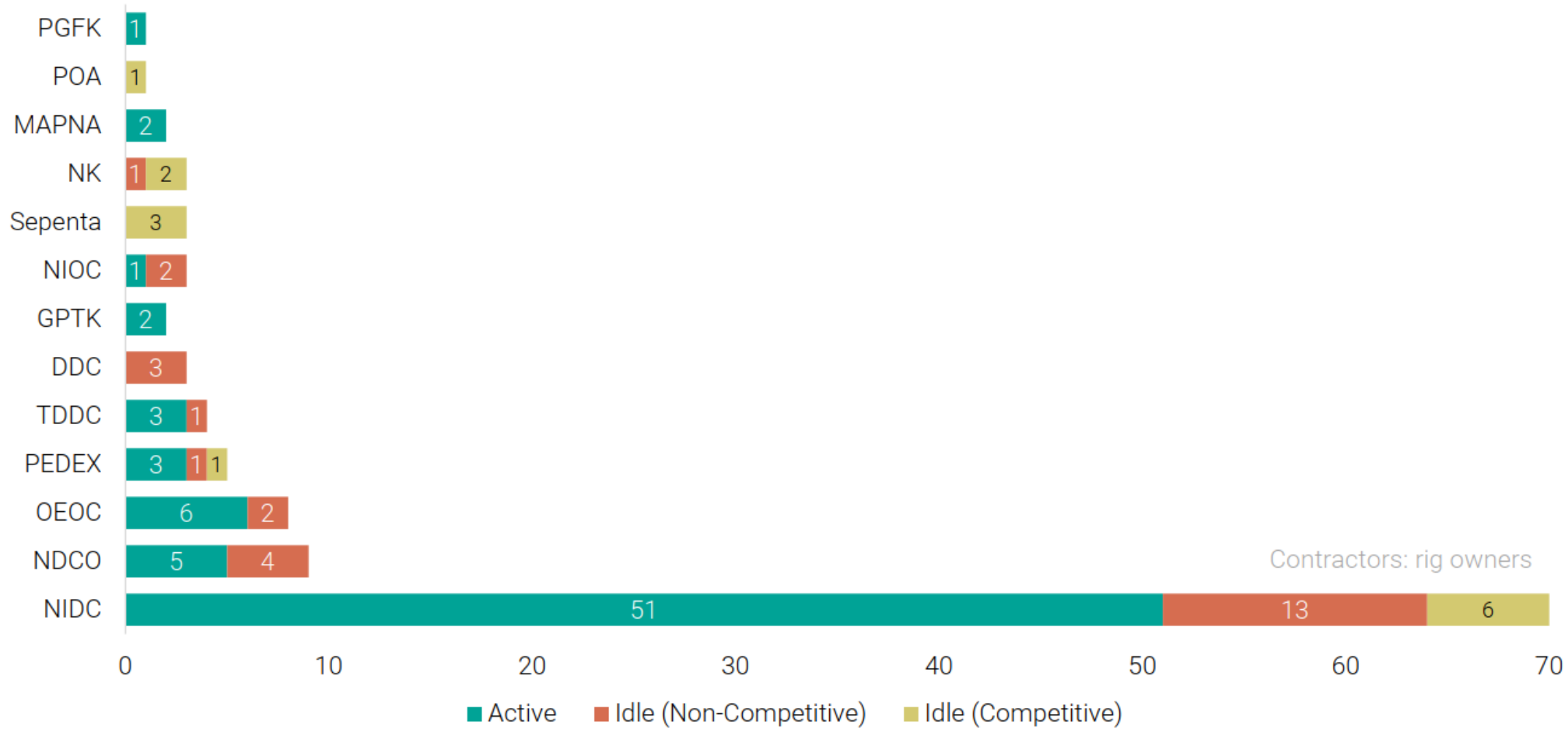
Investment

E&P	Chemicals	Refining	Power & Utilities
• NIOC • Dana Energy	• Arya Sasol • Jam	• Tehran • Abadan	• Mahtab Gostar • Mapna

Supply Chain

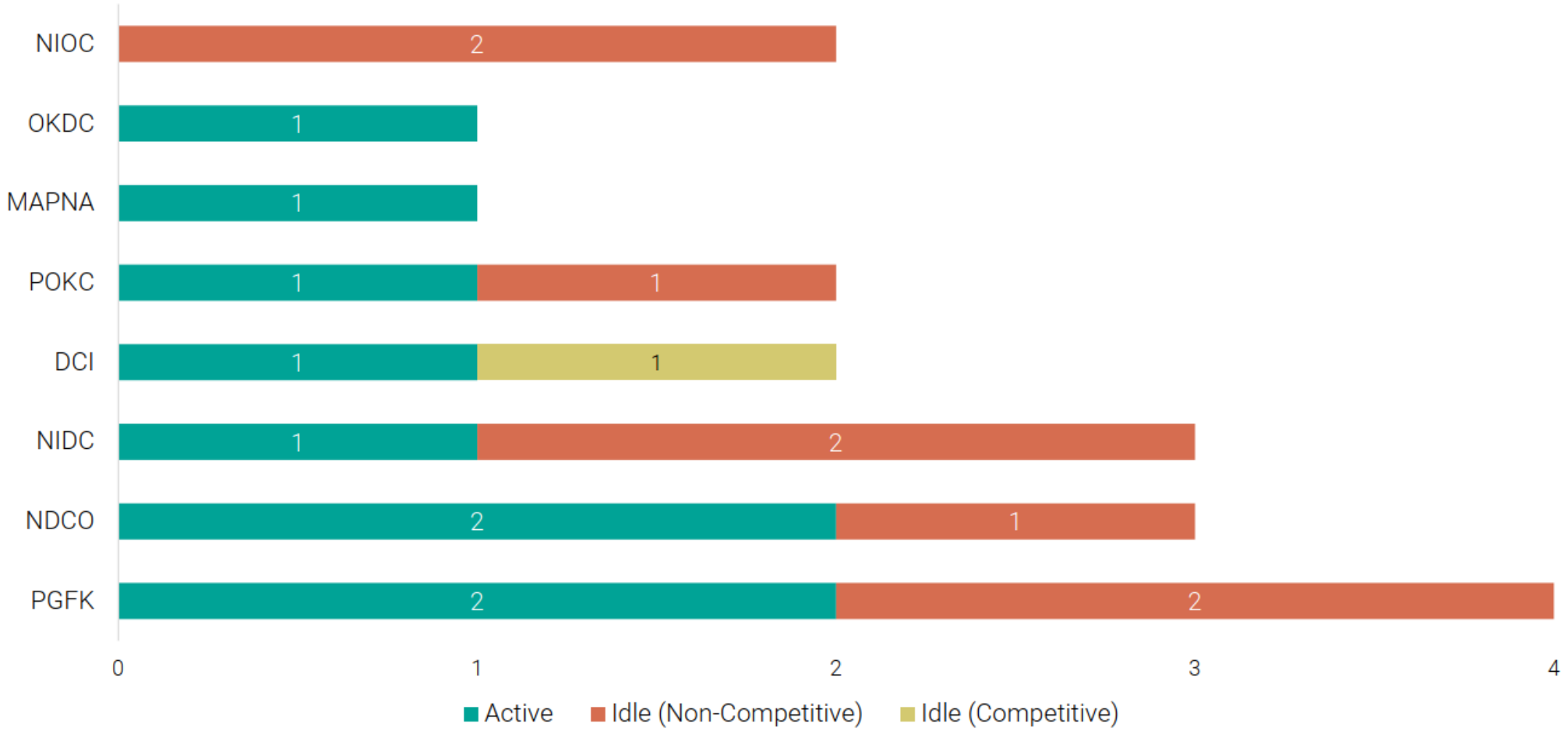
EPC	OFS	Manufacturing	Consultants
• Jahan Pars • Kayson	• NIDC • NDCO	• OTCC • LulehGostar	• Monenco • TEC

Iran Land Drilling Players (August 2021)



PetroView Iran Rig Report

Iran Offshore Drilling Players (August 2021)

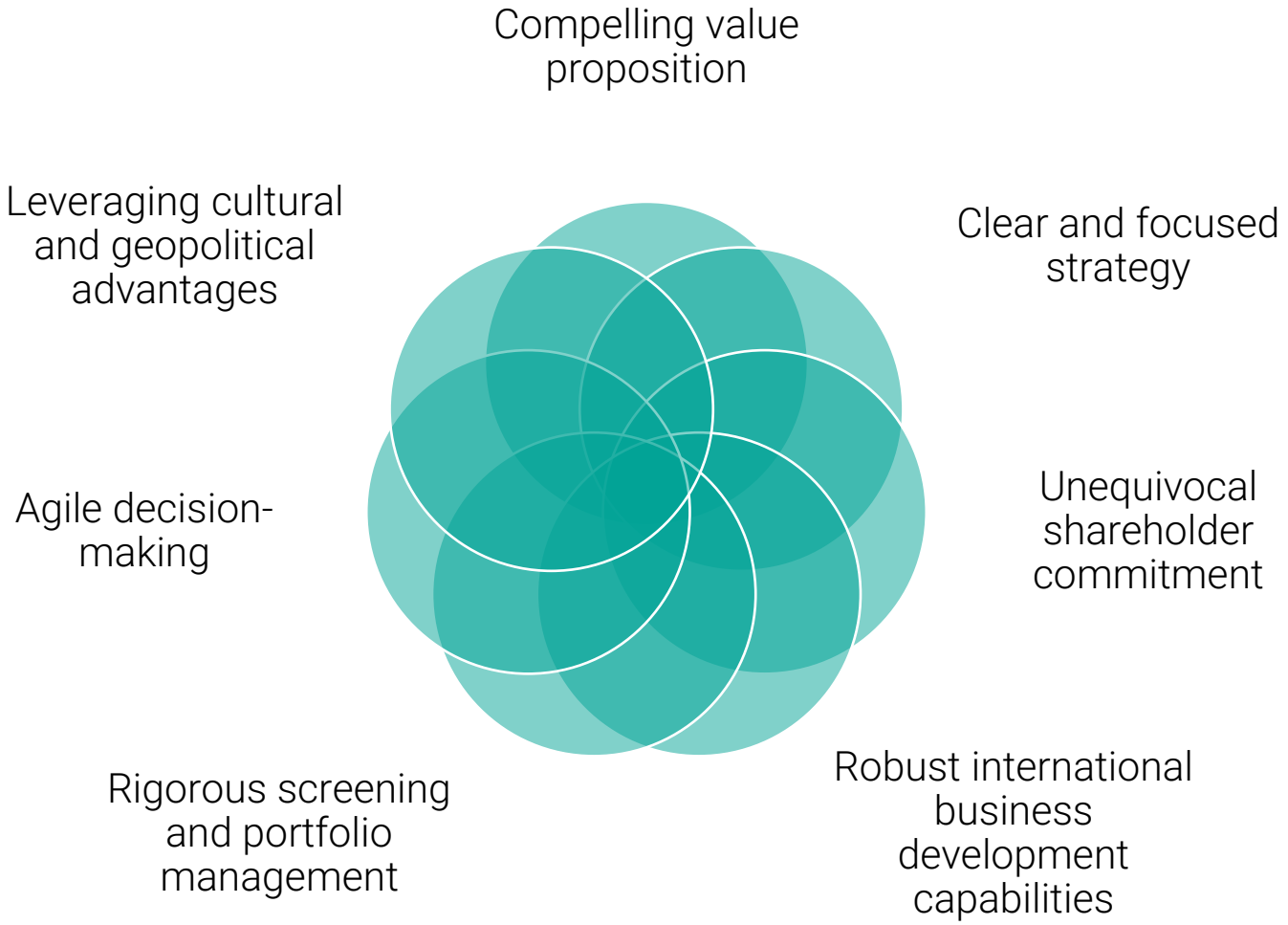


PetroView Iran Rig Report

Business Strategies

To provide examples of some emerging business strategies developed by oil and energy companies

Key Success Factors for Internationalization of NOCs



Main Decisions

Business model

- What do we want to be known for in the future?

Growth objectives & portfolio structure

- How big do we want to be?

Operatorship targets

- What is our target balance between operatorship and non-operatorship of portfolio assets?

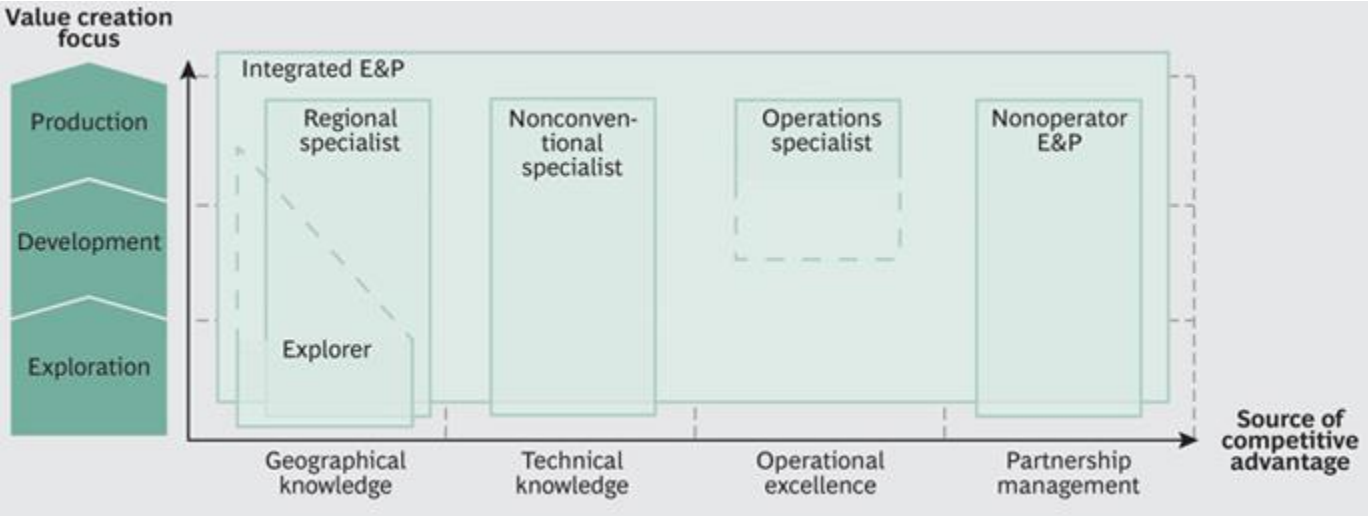
Risk appetite

- What is our appetite for risk?

Financing approach

- What financing approach is needed to support our growth strategy?

6 business models



6 E&P Business Models

Integrated E&P players (Anadarko, Premier Oil, & Apache):

- Balanced portfolio across technologies, geographies, and phases life cycle.

Explorers (Cairn Energy, Kosmos Energy, & Cove Energy)

- Concentrate on exploration of frontier areas and early monetization of discoveries.

Regional specialists (Pacific Rubiales Energy, Afren, & Pluspetrol):

- Specific countries with established presence & high degree of familiarity.

Nonconventional specialists (Chesapeake Energy, Canadian Oil Sands, & Husky Energy):

- Such as heavy oil, shale oil, and oil sands.

Operations specialists (including Perenco, Black Elk Energy, & Occidental Petroleum):

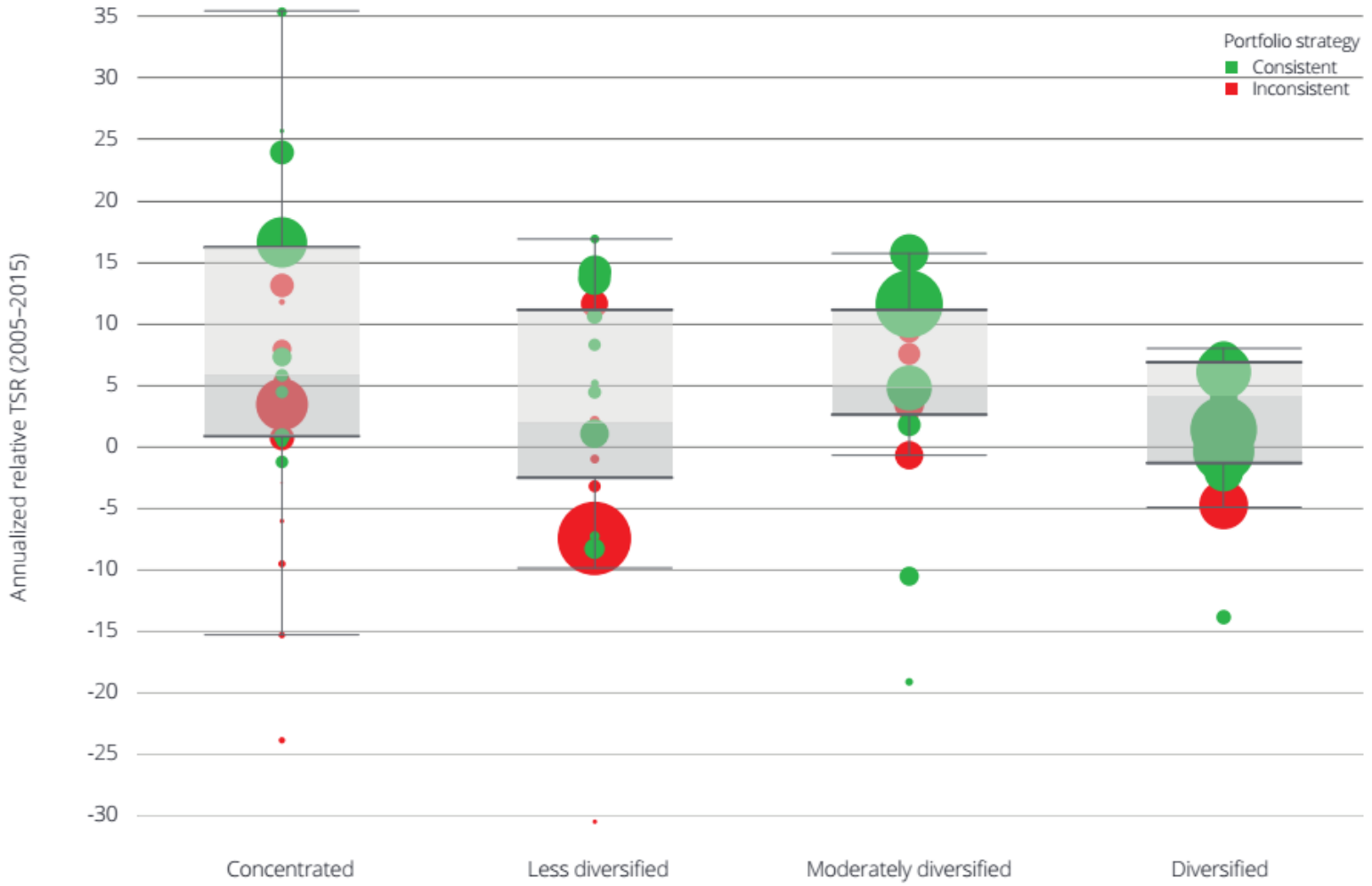
- Efficient extraction from existing fields.

Non-operator E&P players (Mitsui & Co. & Galp Energia)

- Use their relationships with NOC's and governments to gain access to high-quality assets & manage those assets but do not act as operators.

Deloitte Upstream Diversification Index

- Production Mix
- Region
- Resource
- Basin
- Investment Cycle



Deloitte

Oil and Gas Capability Areas

Capability Area	Description	Example
E&P value chain	Capabilities with respect to a particular part of the E&P value chain	**Occidental** Enhanced oil recovery
Core region	Capabilities with respect to operating in a particular geographic area	**Lundin** Norwegian North Sea
Play types	Capabilities regarding exploration in particular geological play types	**Tullow Oil** Rift basins, stratigraphic traps
Technology	Capabilities in application of a particular specific technology	**Statoil** Harsh environments
Operational	Capabilities to combine various technologies and operating practices	**EOG** U.S. shale plays
Product	Capabilities relating primarily to one particular product	**BG** Gas value chain
Partnerships	Capabilities in establishing and leveraging partnerships	**Wintershall** Gazprom partnership
Political situation	Capabilities to operate under particular political circumstances	**BP** Russia
Commercial situation	Capabilities to secure assets in particular commercial situations	**Apache** Bilateral negotiations

PWC

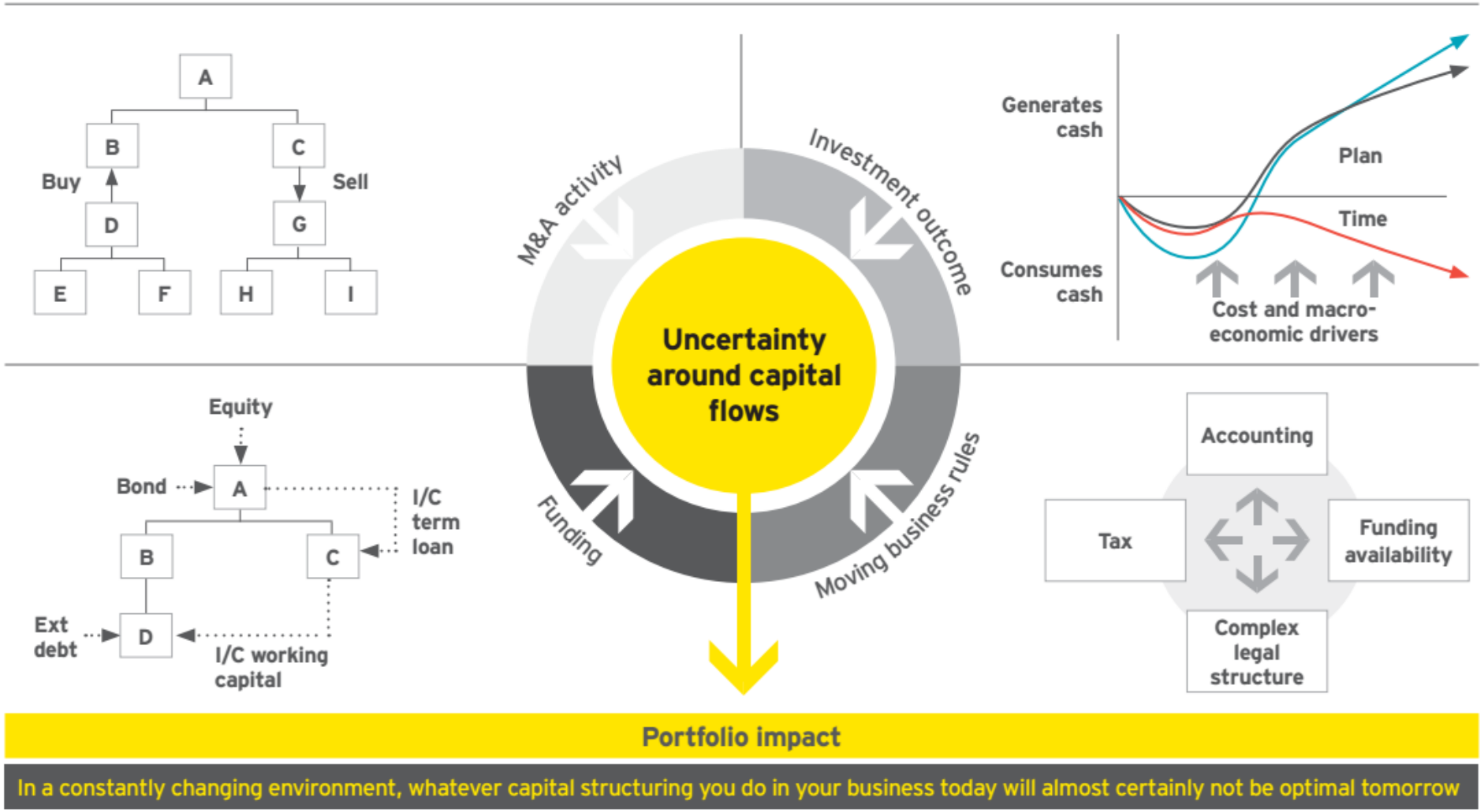
Portfolio Management Components

Optionality

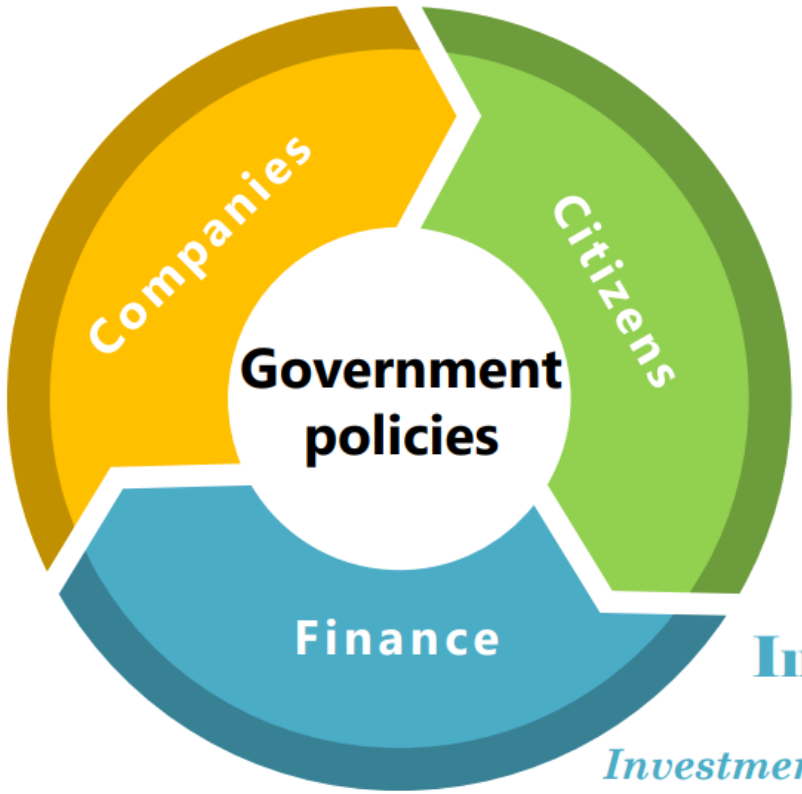
- A company has optionality if it can quickly, effectively & efficiently shift its focus from underperforming businesses, assets & projects to better-performing ones that fit with its current strategy and enhance the overall value of the portfolio.

- A company will best leverage its optionality if it can:
  - Proactively identify potential changes in its operating environment and review the impact of these changes on its project and portfolio
  - Rapidly decide on a suitable course of action that would at the very least preserve, but ideally enhance, the value of its portfolio
  - Act in a timely, cost-efficient and effective manner

Optionality at the Corporate Level



Net-Zero by 2050 Demands Unprecedented Efforts



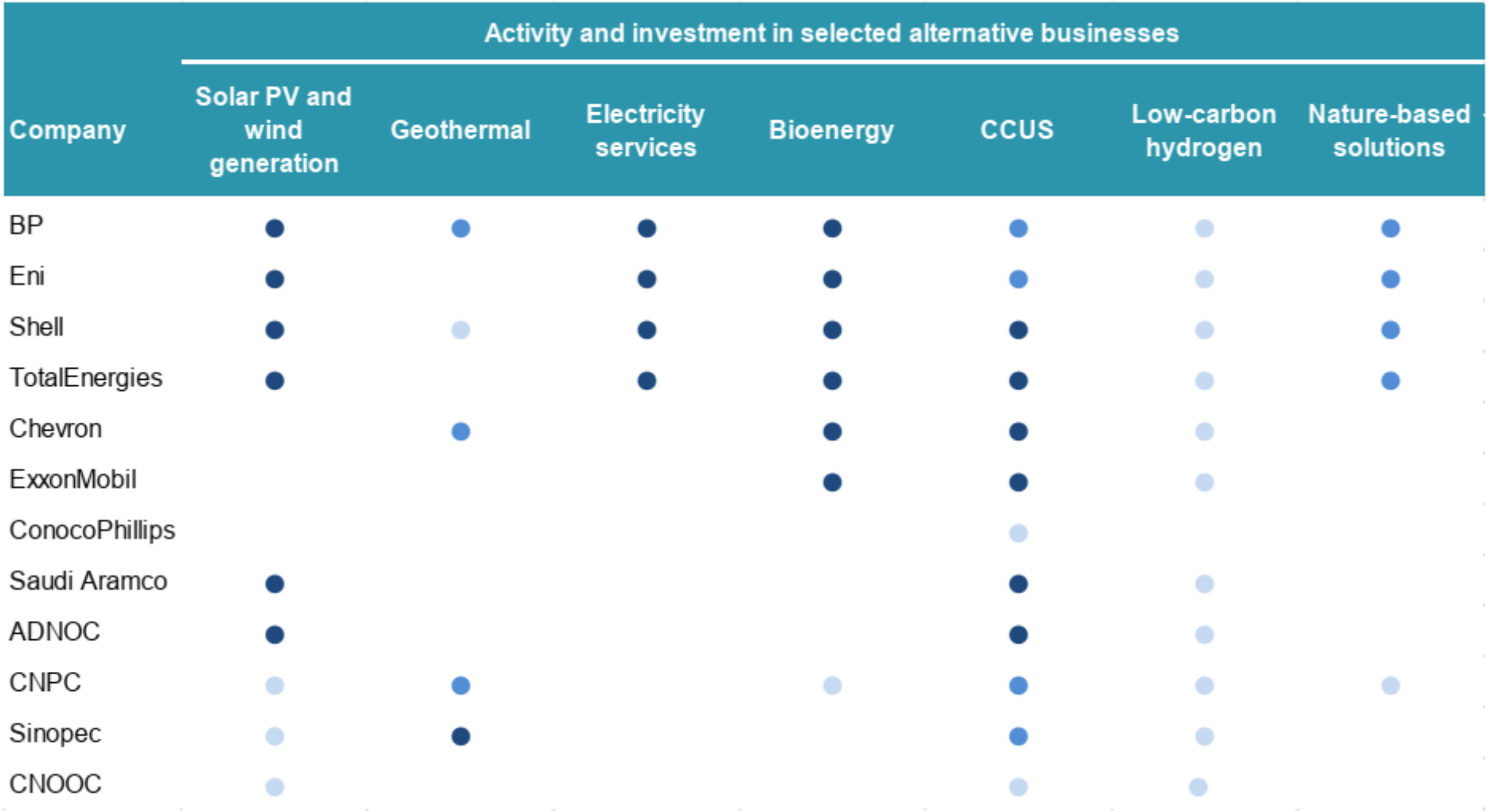
Build wind onshore and offshore
Eliminate flaring
Improve product efficiency
Hydrogen
Equip with CCUS
Deploy solar
Widespread digitalisation
Fuel-cell trucks
Low-carbon gases
Innovation
Low-emissions shipping
Extend and digitalise grids
batteries & electrolysers
Modernise hydropower
Advanced biofuel production
Expand nuclear power & develop SMRs

Electric cars
Install batteries and solar at home
Buy energy efficient appliances
Walk or cycle short trips
Turn down air conditioning
Fly less often
Work from home
Upgrade home heating to heat pumps
Drive more slowly
Increase recycling
Retrofit homes

Clean electricity investment
Invest in innovation
Align portfolios with low-emissions activities
Develop new financial tools to unlock private capital
Investment guidelines
Improve bankability of efficiency investments
Manage risks for new technologies
Increase investment in renewables

IEA

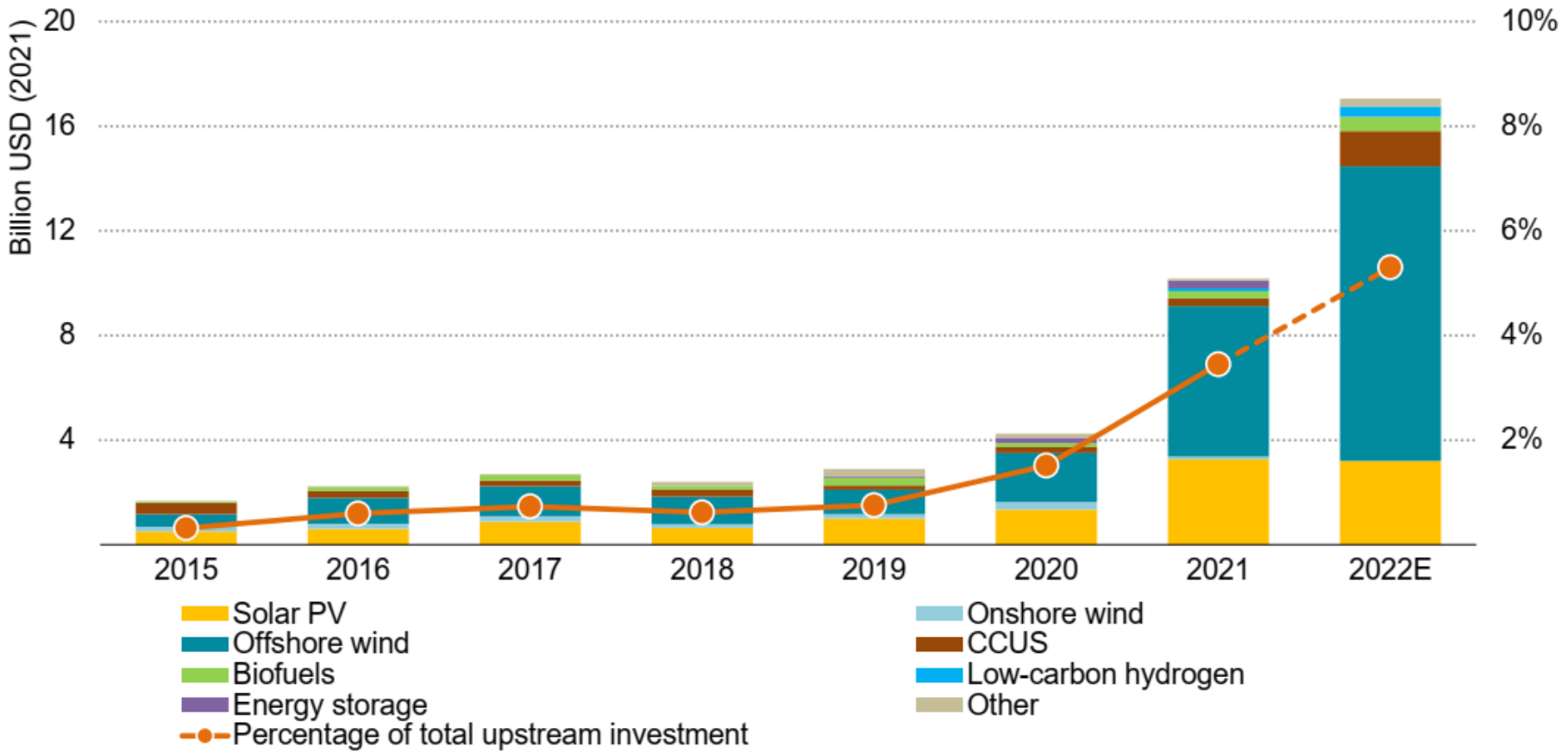
Current Diversification Options by Selected International Oil Companies and NOCs



Company	Activity and investment in selected alternative businesses						
	Solar PV and wind generation	Geothermal	Electricity services	Bioenergy	CCUS	Low-carbon hydrogen	Nature-based solutions
BP	●	●	●	●	●	●	●
Eni	●		●	●	●	●	●
Shell	●	●	●	●	●	●	●
TotalEnergies	●		●	●	●	●	●
Chevron		●		●	●	●	
ExxonMobil				●	●	●	
ConocoPhillips					●		
Saudi Aramco	●				●	●	
ADNOC	●				●	●	
CNPC	●	●		●	●	●	●
Sinopec	●	●			●	●	
CNOOC	●				●	●	

IEA World Energy Investment 2022

Capex by Selected Oil and Gas Companies on Clean Energy Technologies



Notes: Includes the majors, ADNOC, CNPC, CNOOC, Equinor, Gazprom, Kuwait Petroleum Corporation, Lukoil, Petrobras, Repsol, Rosneft, Saudi Aramco, Sinopec and Sonatrach. The estimated clean capex in 2022 is based on investment spending announced to 31 March 2022 and assumes that this pace of investment is maintained throughout the year.

IEA World Energy Investment 2022

Changes to Follow

Resource Abundance and Importance of Costumer Preference

More Competitive and Productive Landscape For The Industry

Major Changes in Global Economy Shape and Living Standards

Lower for Longer Prices and Peak Demand for Liquid Fuels

Digitalization of the World Economy with Effects on the Industry

Increasing Pressure From Regulators and Society to Lower Emissions

Strategic Decisions

Focus on Core Competencies	Deploy key internal capabilities and divesting non-core assets through bold M&A actions (DNO, BP, Perenco)
Diversification and Internationalization	Expand into other geographical areas to investment in new opportunities (QE, Petronas)
Low-carbon Investment	Investment in low-carbon energy (gas and renewables), and in carbon capture and hydrogen (BP)
Integration and Consolidation	Mergers of upstream and downstream assets to build an integrated energy company (Aramco, OQ, ADNOC)
Partnership	Leverage technical and financial capabilities to be present through whole energy value chain (ADNOC)

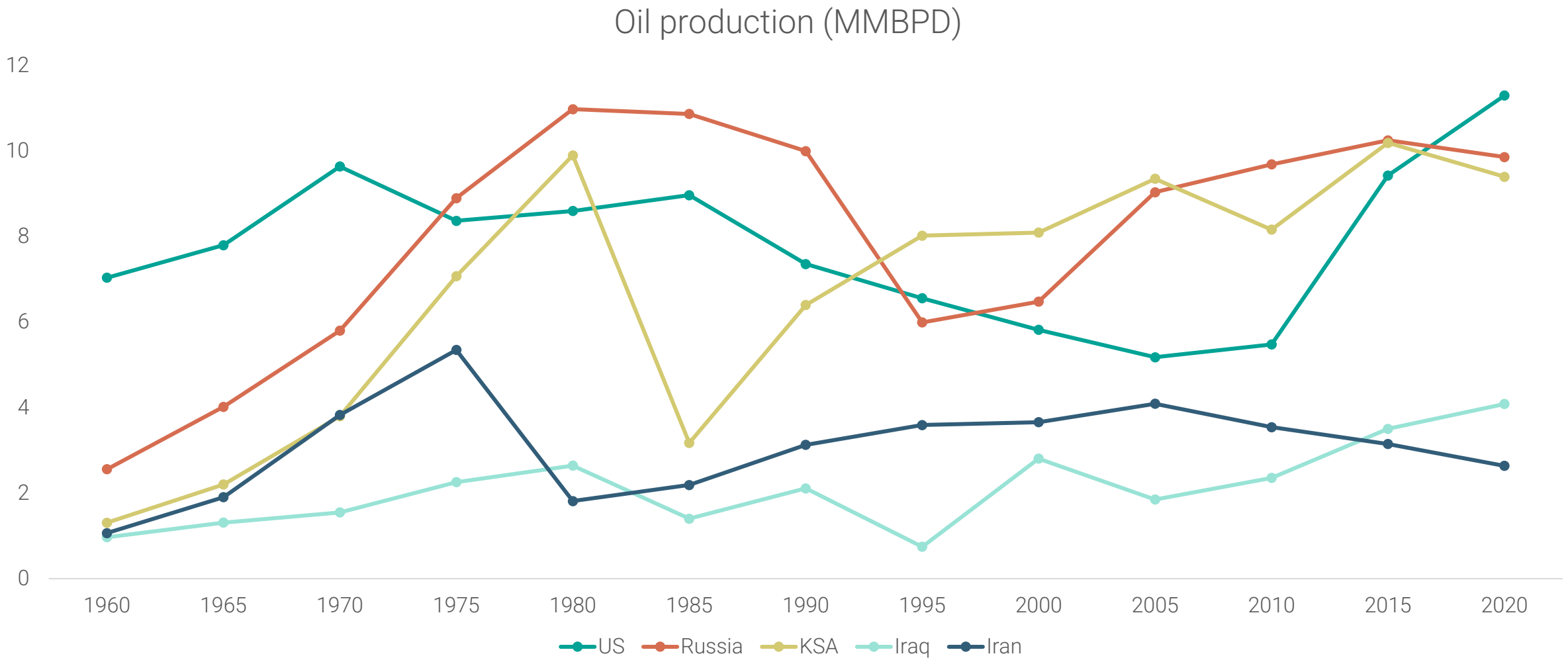
Iran's Oil Potential

To provide a basis for understanding Iran’s oil production potential

Iran’s Oil Production Potential

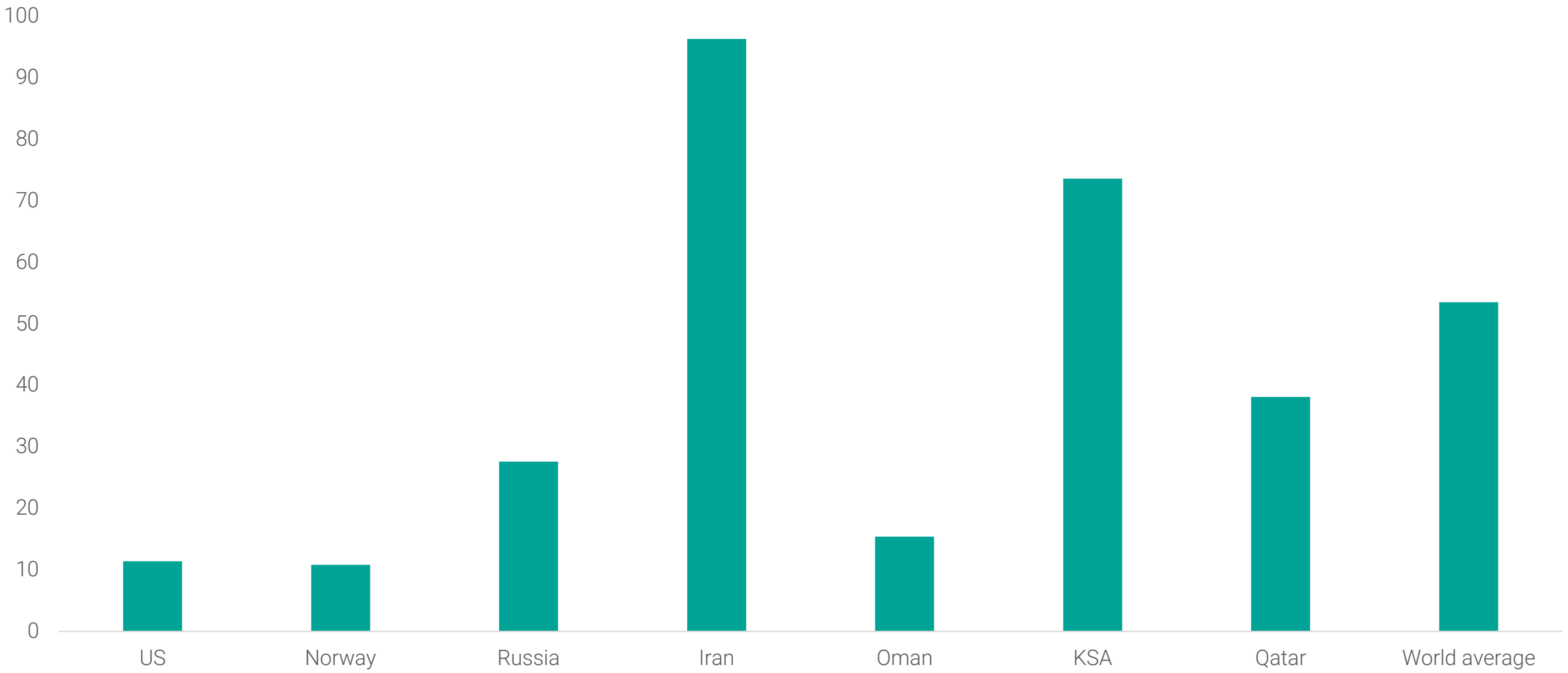
Economics and Oil Telegram Channel

Oil Production: Iran Versus Competitors



EIA, OPEC, Brookings

Reserve to Production Ratio (Years)



BP Statistical Review of Worle Energy 2021

Iran Upstream Asset Lifecycle Issues

Exploration and Appraisal

- New Exploration Opportunities
- Shale Exploration
- Appraisal of Opportunities

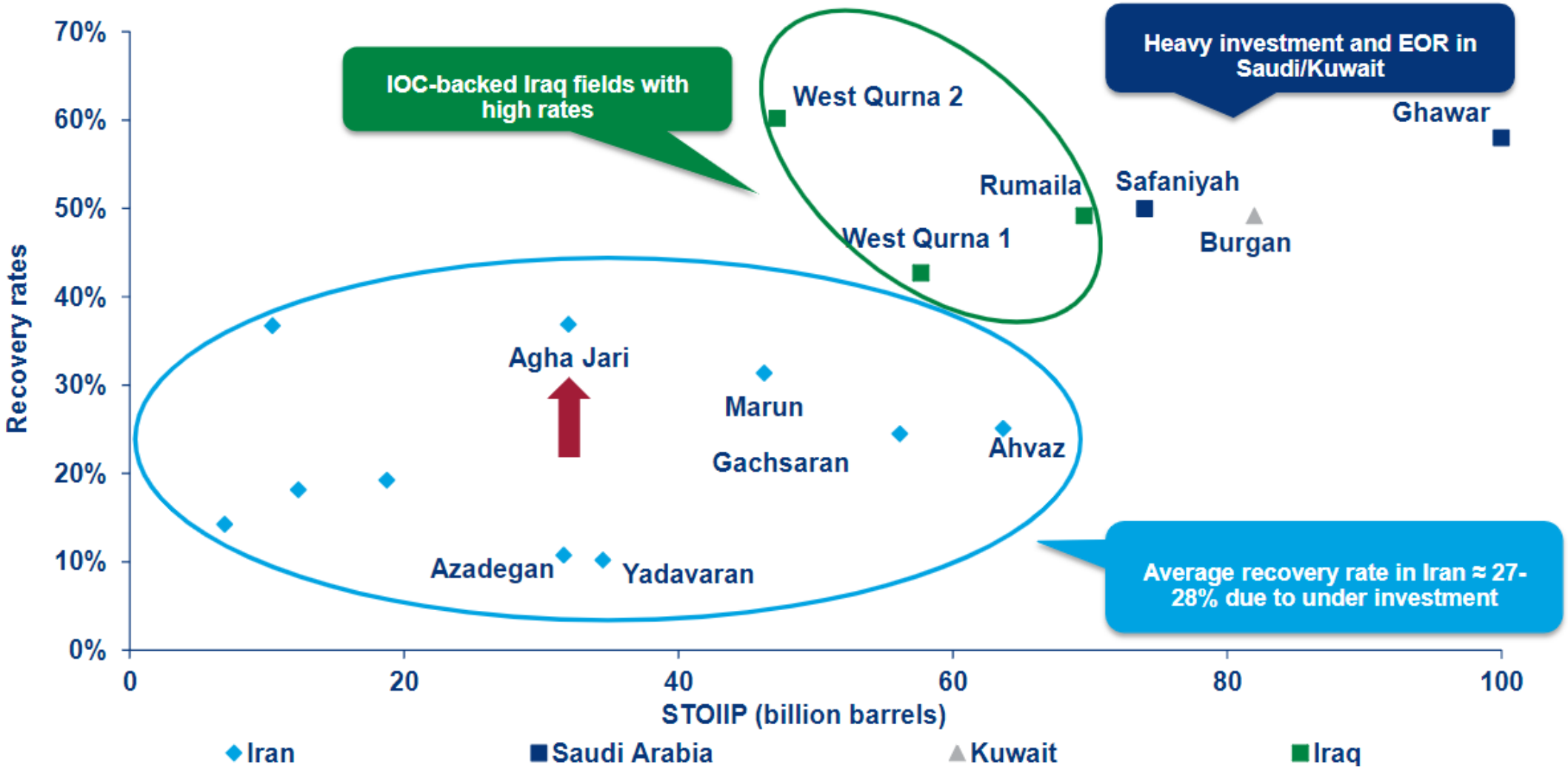
Development and Production

- 200+ Undeveloped Assets
- Limited Production
- Low OPEX in Brownfields

IOR / EOR

- Recovery Factor Around 25%
- Focus on IOR/EOR
- Limited access to Technology

Recovery Factor in Selected MENA Countries' Assets



Wood Mackenzie Opportunities in Middle East, Iraq & Iran 2018

“The Stone Age did not end for lack of stone, and the Oil Age will end long before the world runs out of oil.”

Sheikh Zaki Yamani