The Upstream Oil Industry: Trends & Strategies

Ramin Forouzandeh | November 12th and 19th, 2020 | RIEMP DBA

Instructor

- Strategy, investment & M&A professional in the energy industry
- 10+ years experience as researcher, consultant, and executive
- Educations in engineering, economics and management
- Vice President, PE and VC at Dana Investment Group
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Agenda

Day One

- Introduction 30’
- Resources 30’
- The Energy Cake 60’
- The Oil Market 60’
- US Shale Oil 60’
- Investment & Finance 60’

Day Two

- Peak Oil 30’
- 8 MBPD Agenda 30’
- E&P and OFS 60’
- Free Discussion 30’
- Strategic View 90’
- Case Study 30’

Goals

- Drawing an integrated systemic framework to analyze upstream oil industry
- Getting familiar with state-of-art analysis method for analysis
- Discussing major trends affecting the energy industry
- Deploying top information sources for upstream analysis

Questions

US Shale Oil Production

Biggest Independent E&P Company

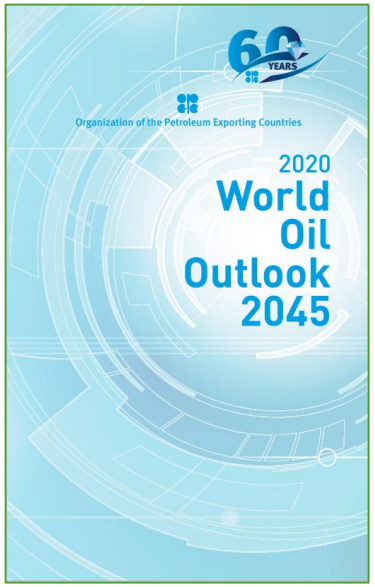
Energy Industry’s Greatest Challenges

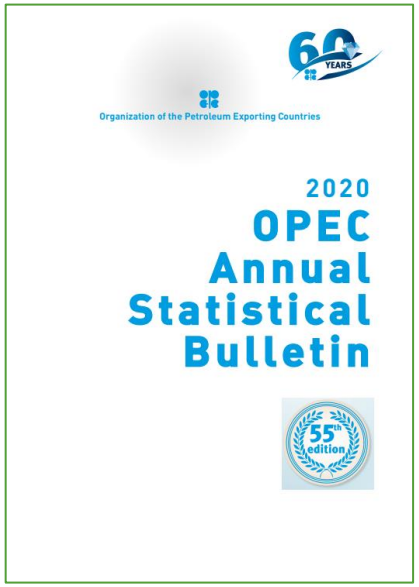
Resources

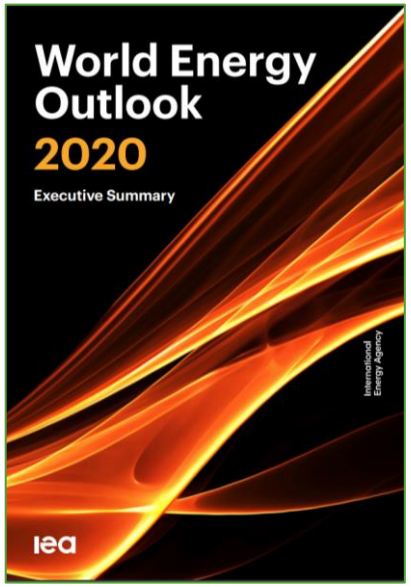
Sources

Institutions	Data & Consultancy Services	Management Consultants	Financial Services Providers
IEA	Platts	McKinsey	EY
EIA	Argus	BCG	Deloittte
OPEC	IHSMarkit	Bain	KPMG
GECF	FGE	Accenture	PWC
OIES	Wood Mackenzie		
Chatham House	Rystad Energy		

10 reports to follow







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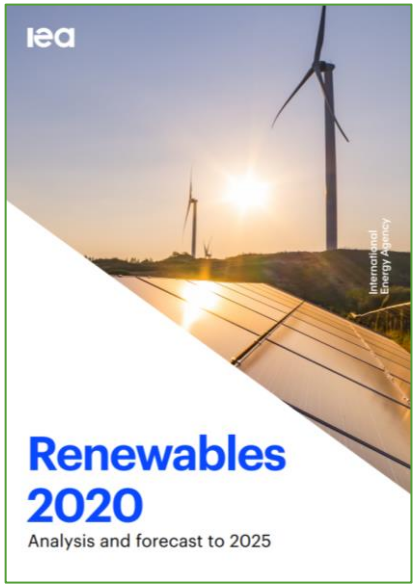
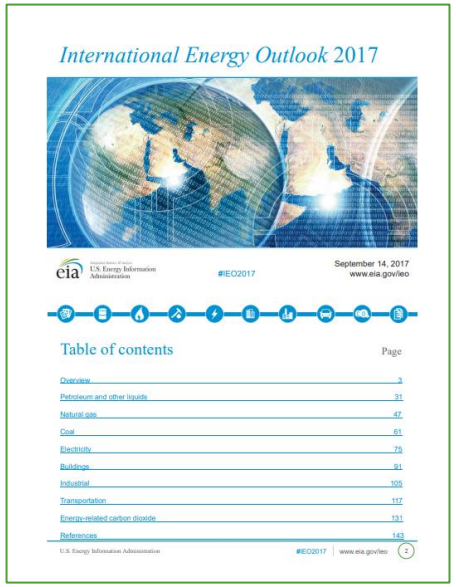
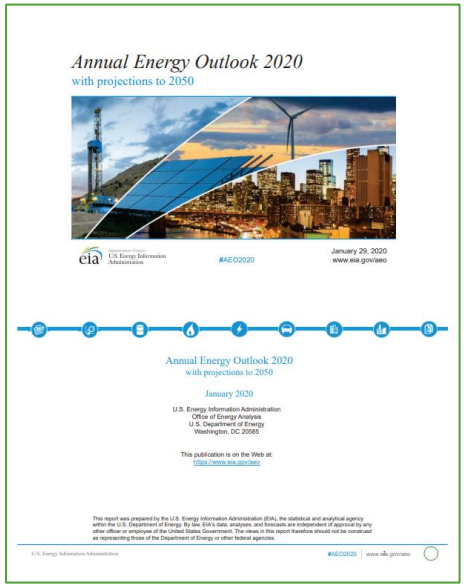
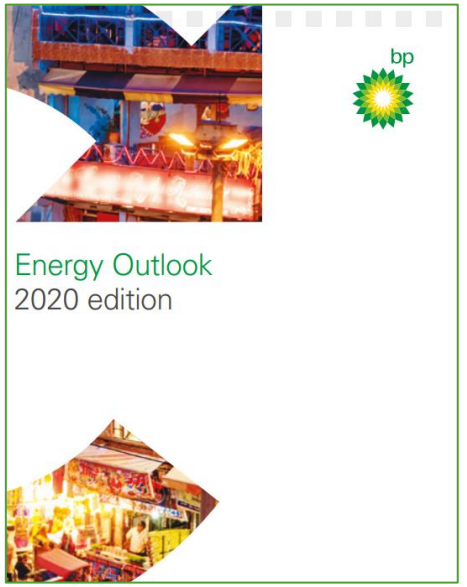
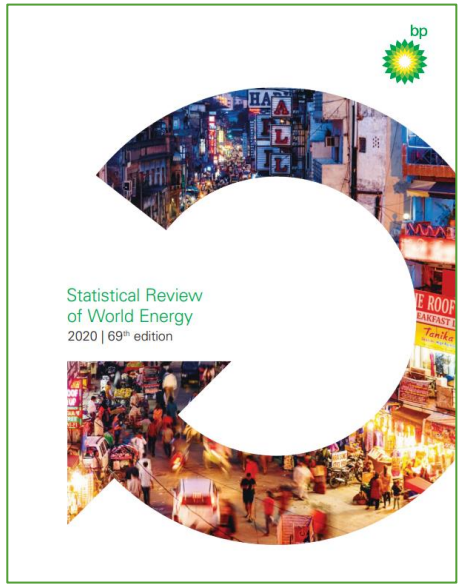




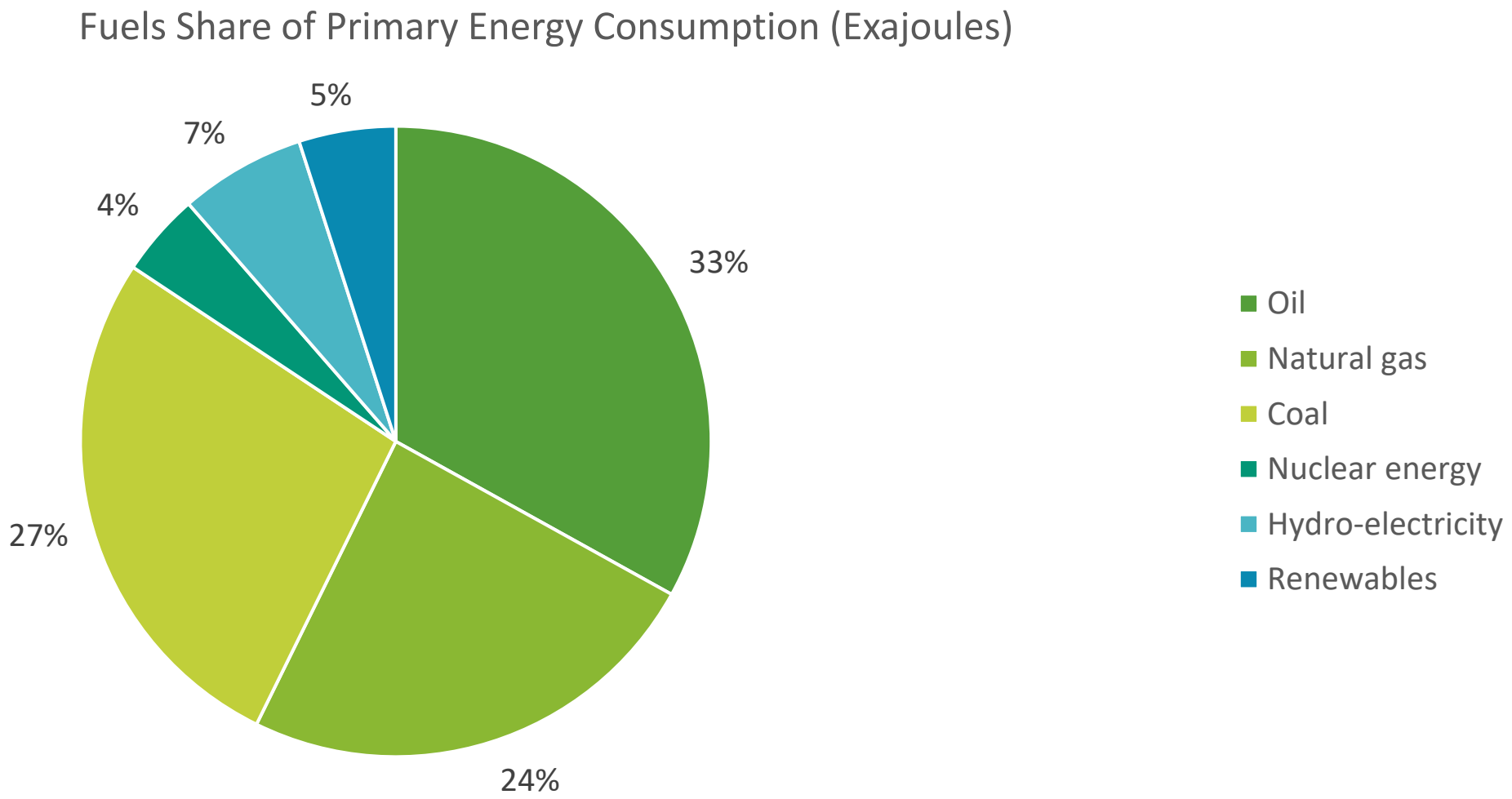




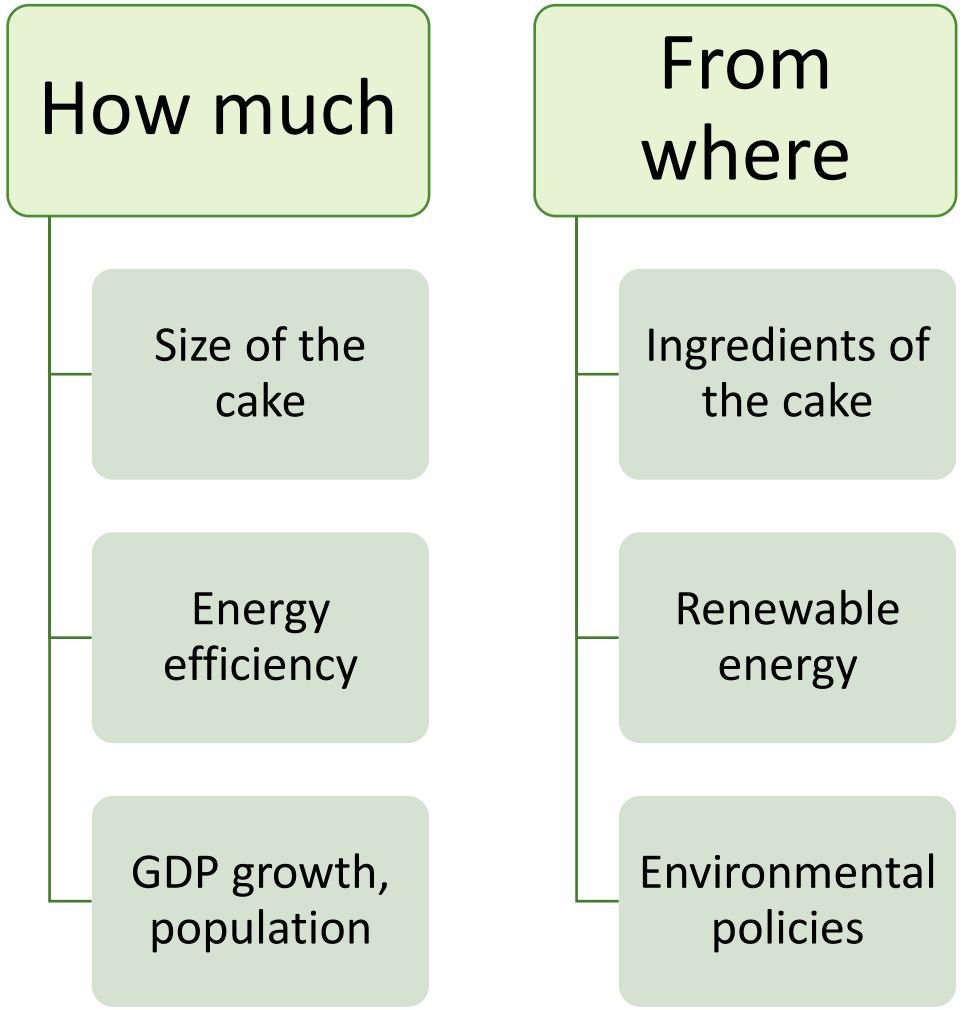


The Energy Cake

The Energy Cake



Two Aspects of the Cake



Drivers of Energy Transition

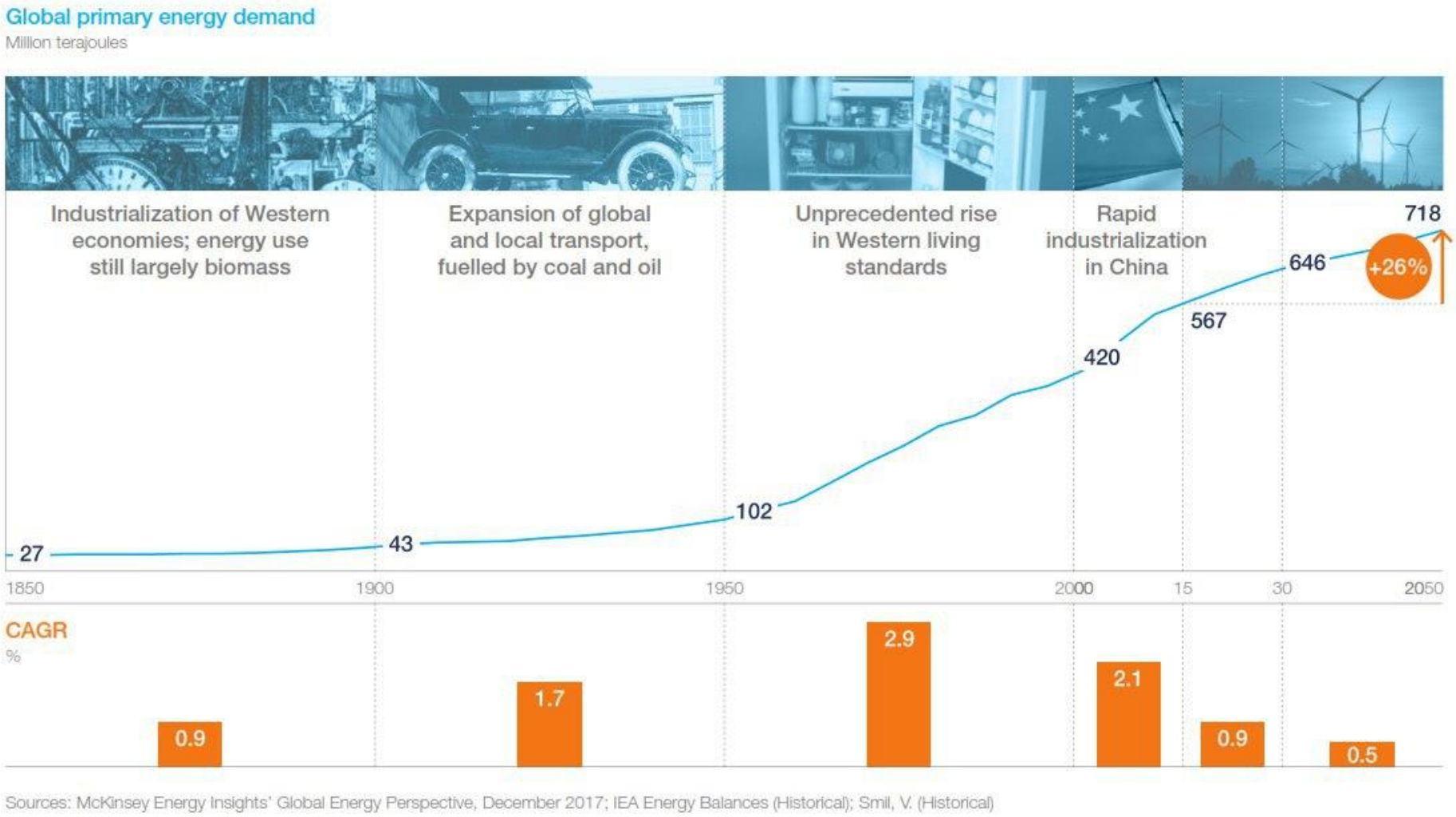
Shape of GDP

- increase in share of the services sector

- **Efficiency**
- less energy for the same GDP level

- **Electrification**
- High growth of electricity

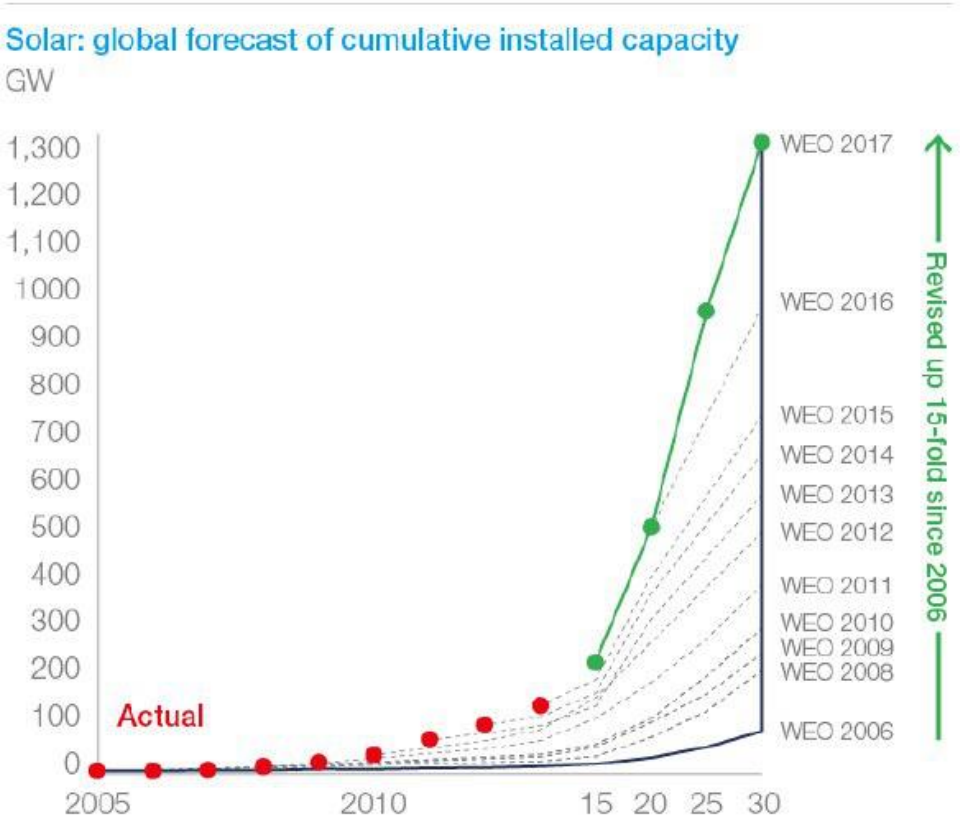
Energy Demand

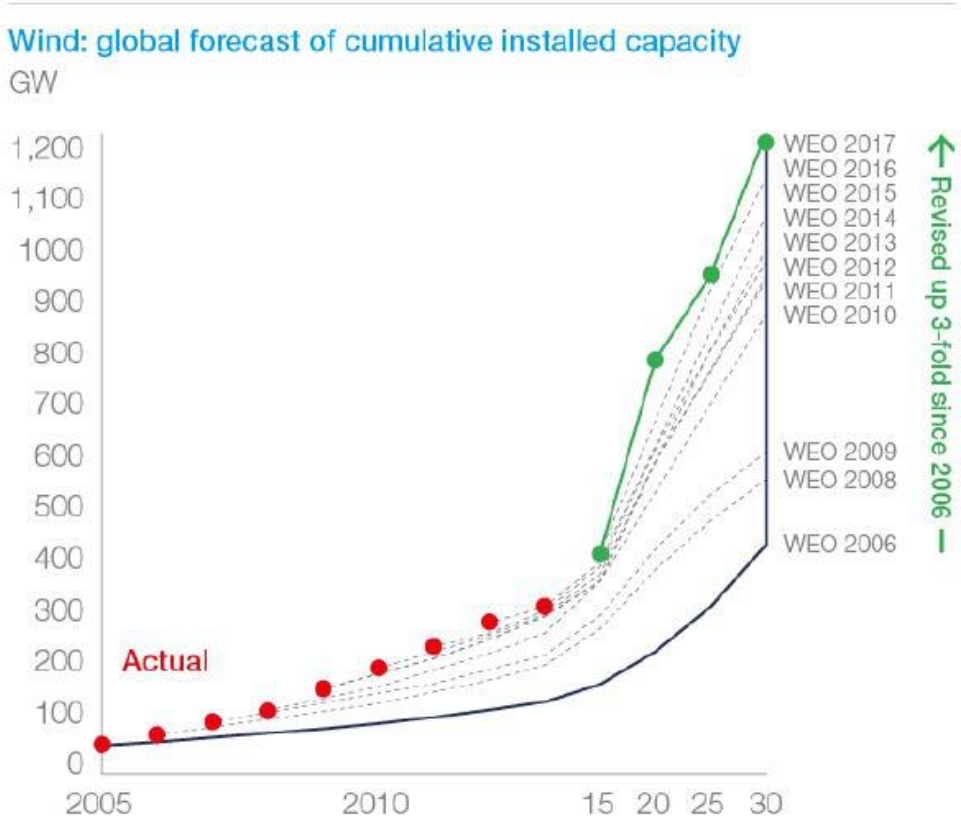


Sources: McKinsey Energy Insights' Global Energy Perspective, December 2017; IEA Energy Balances (Historical); Smil, V. (Historical)

McKinsey & Company

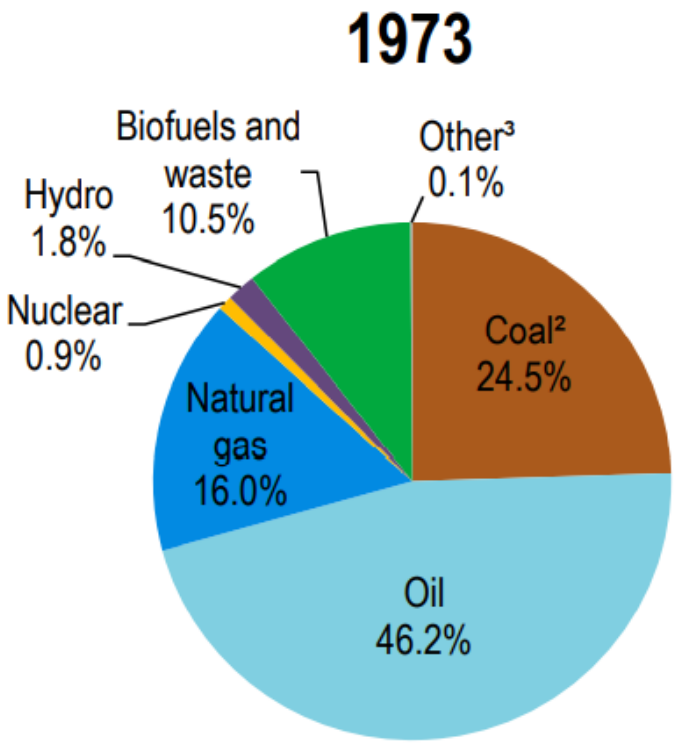
Underestimating Renewables

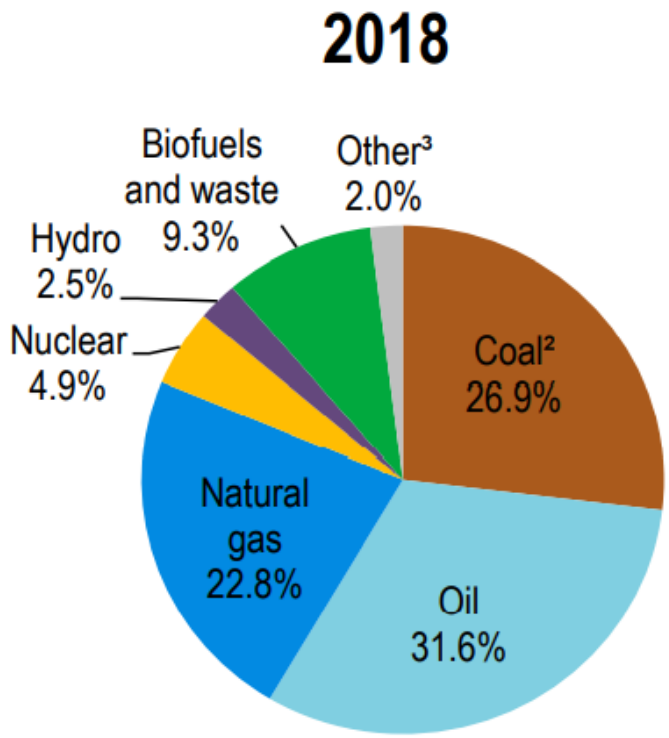




Source: IEA World Energy Outlook – New Policy Scenario

World Total Energy Supply by Source

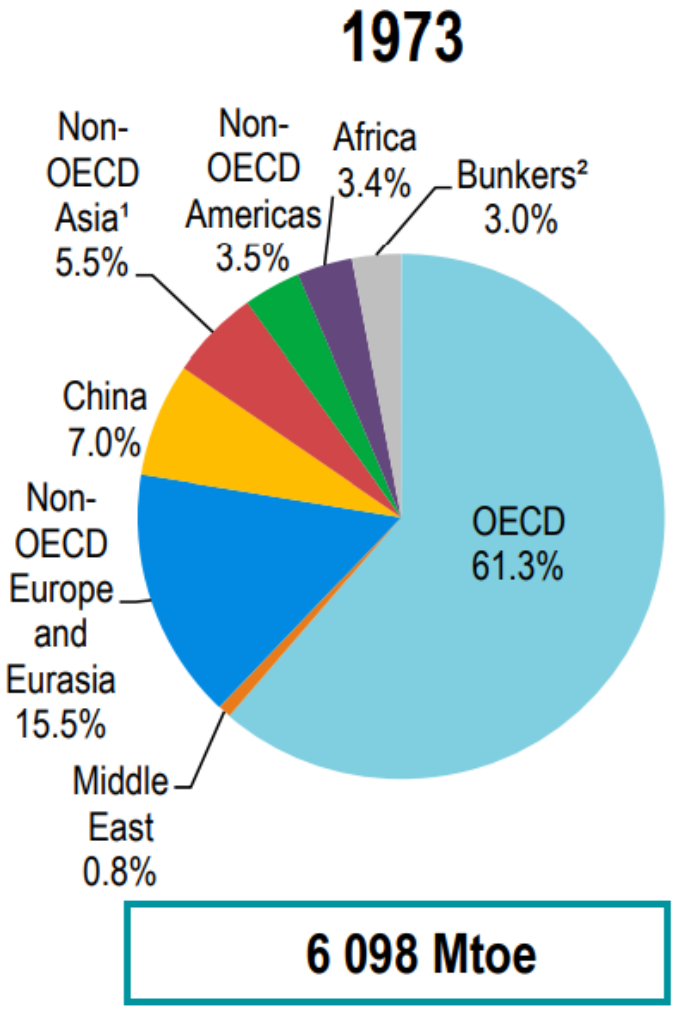


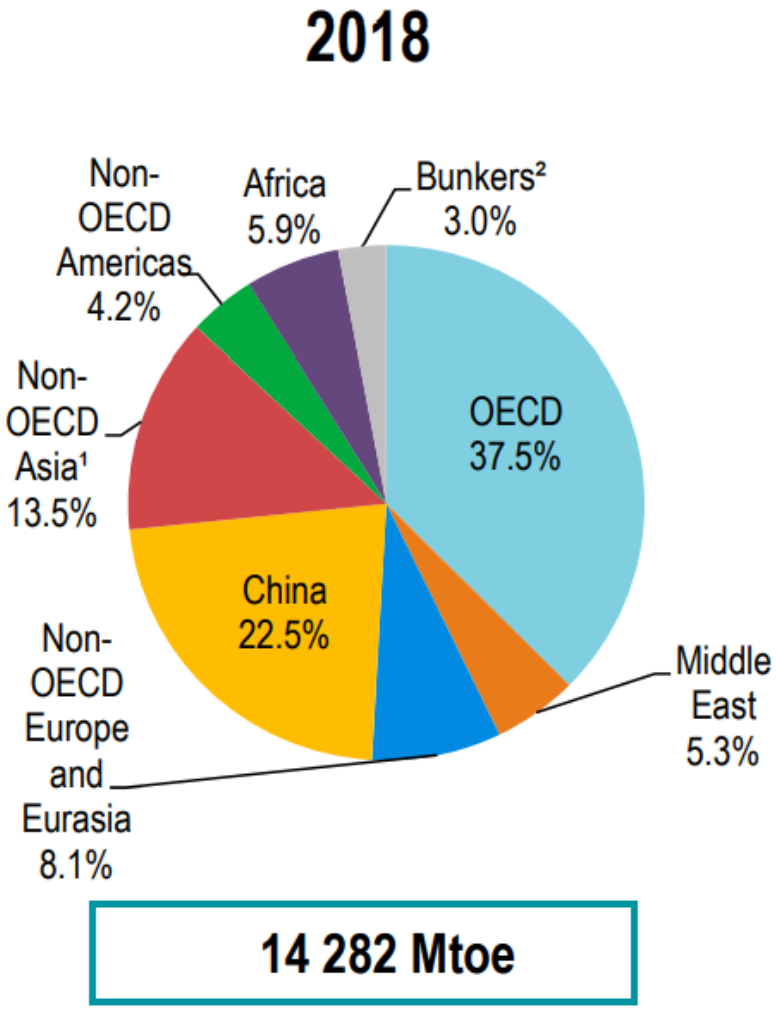


6 098 Mtoe

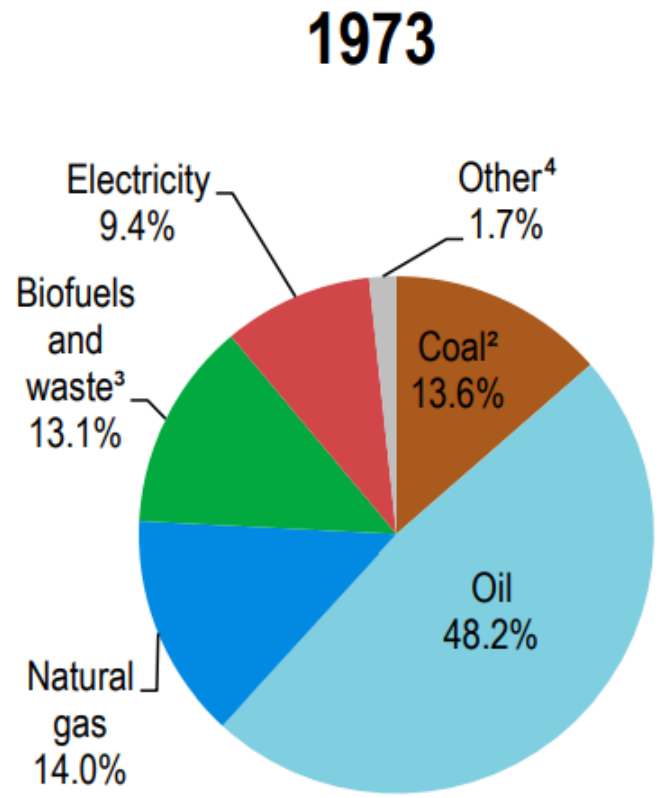
14 282 Mtoe

World Total Energy Supply by Region

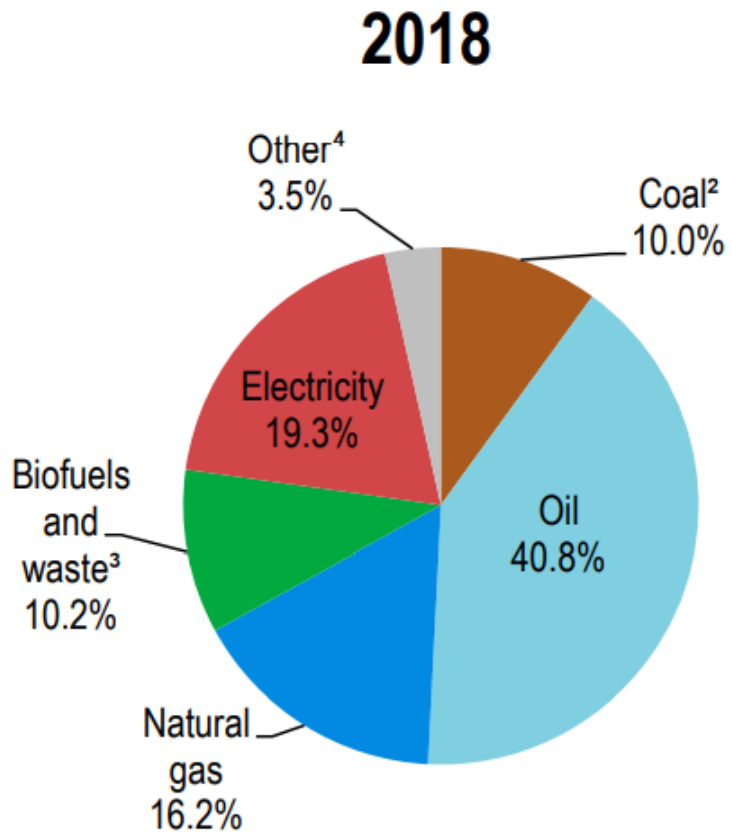




World Total Final Consumption by Source

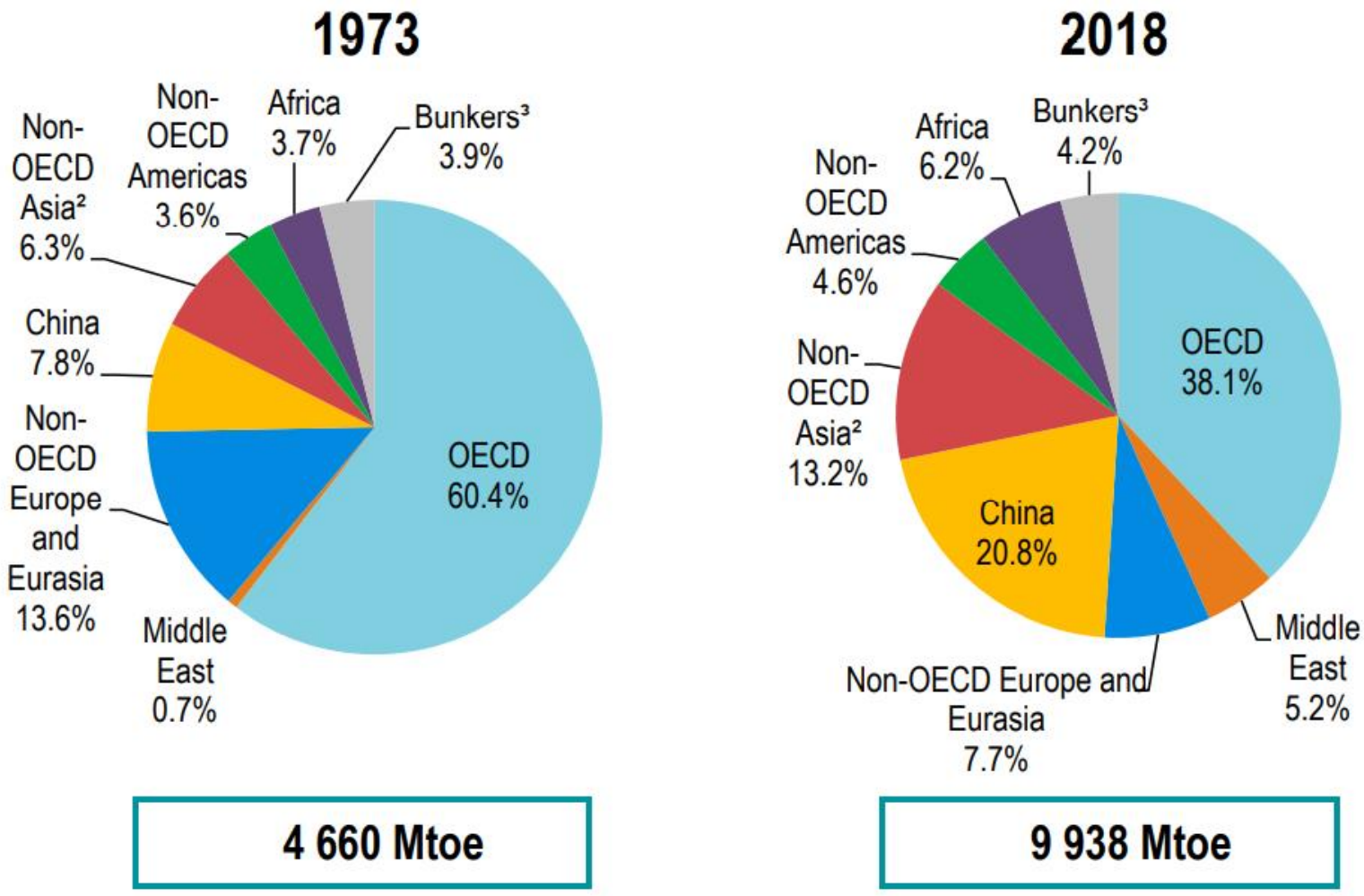


4 660 Mtoe

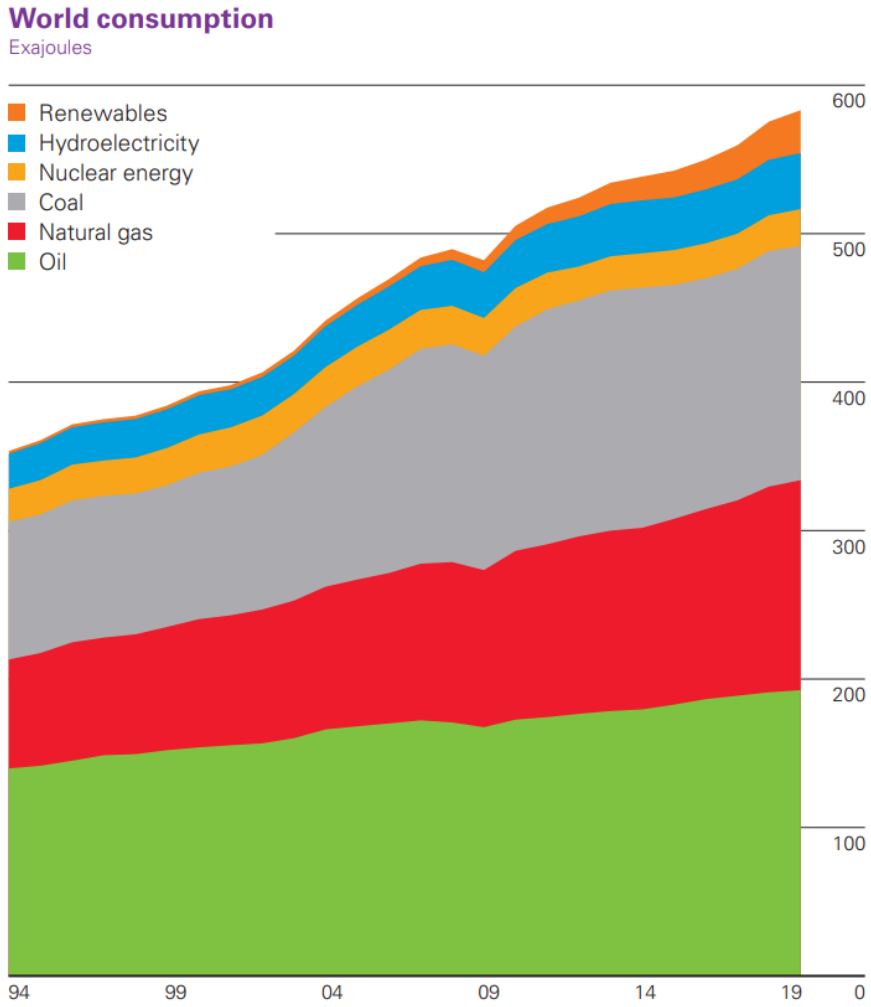


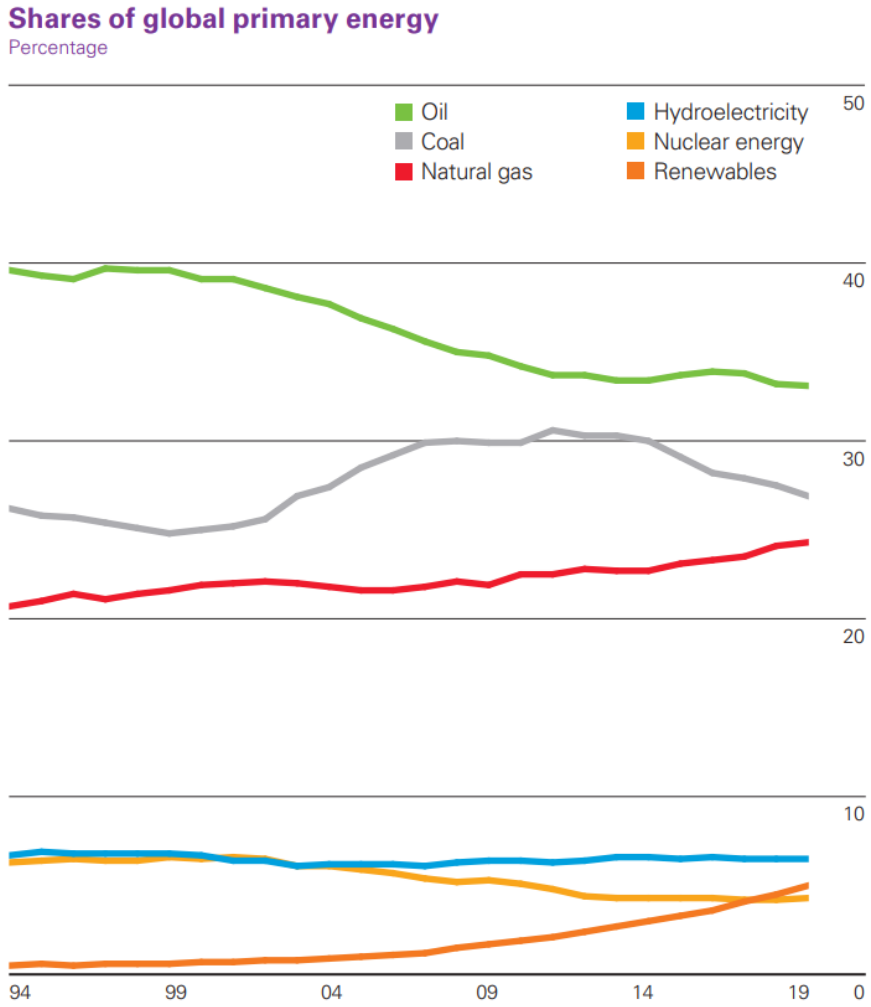
9 938 Mtoe

World Total Final Consumption by Region



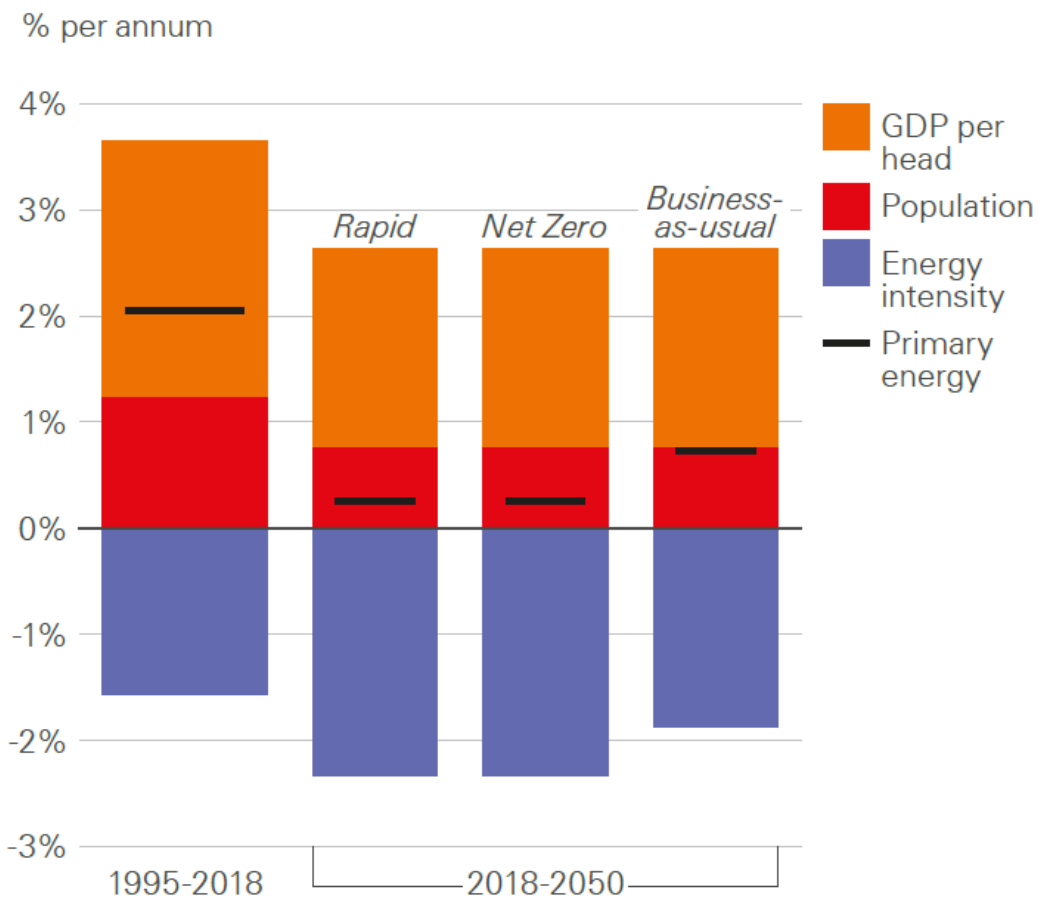
World Energy Consumption



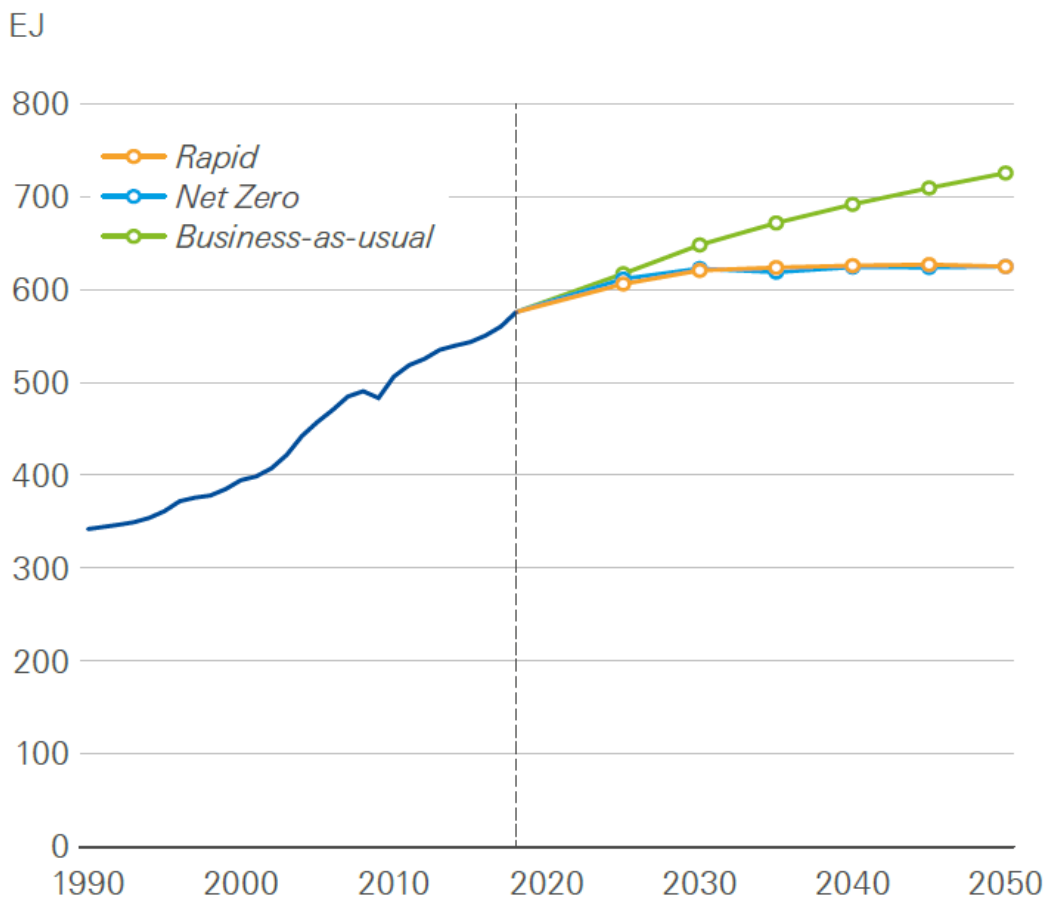


Primary Energy Demand

Contribution to primary energy demand growth

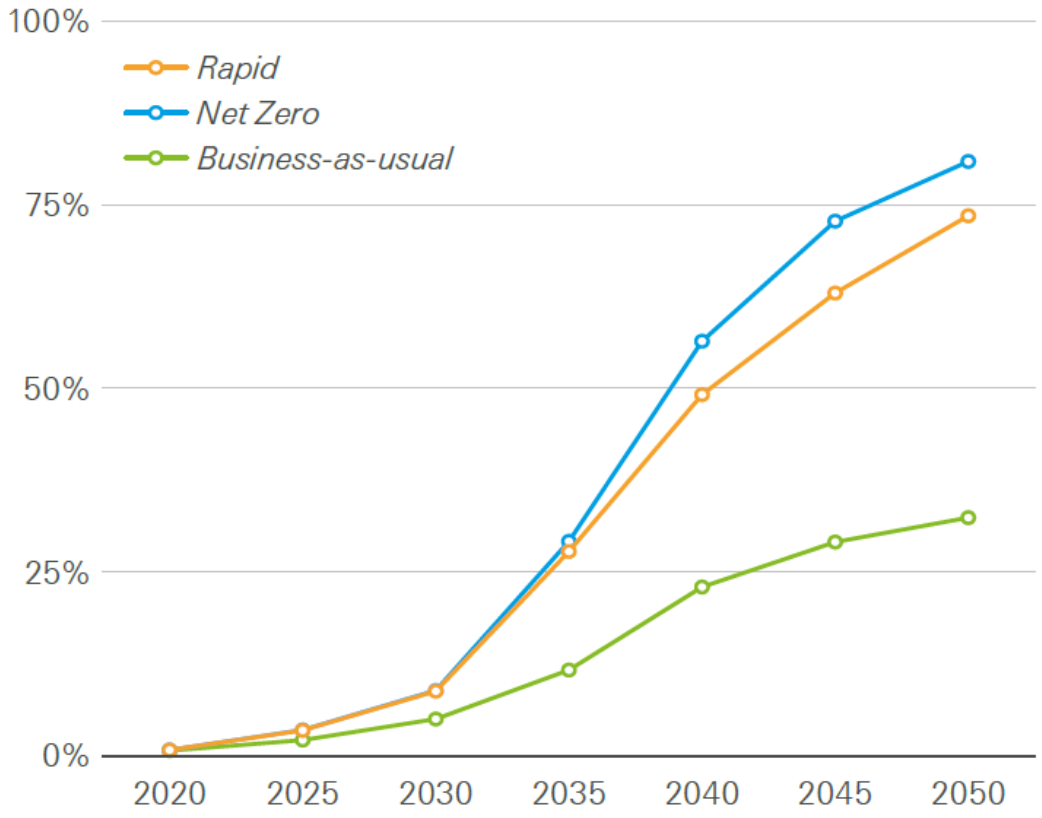


Global primary energy demand

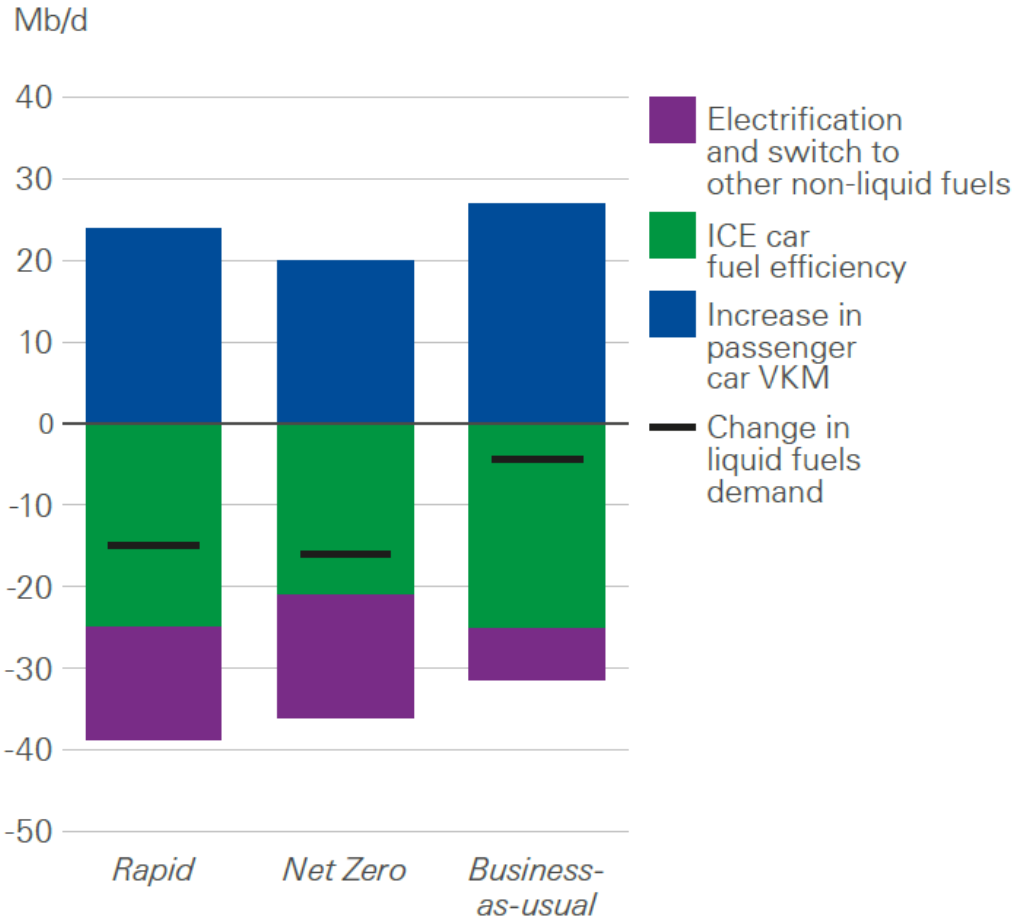


Energy Use in Road Transport

Share of car and truck vehicle kilometres electrified*

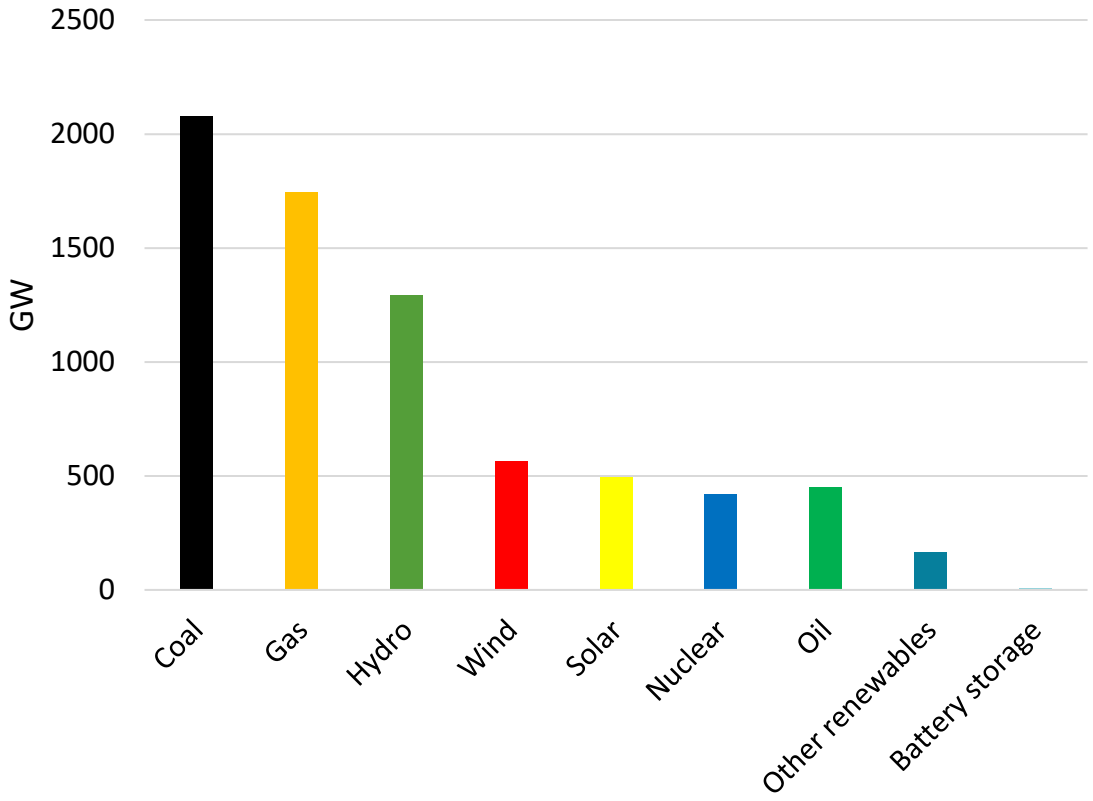


Factors impacting passenger car liquid fuels demand over the outlook

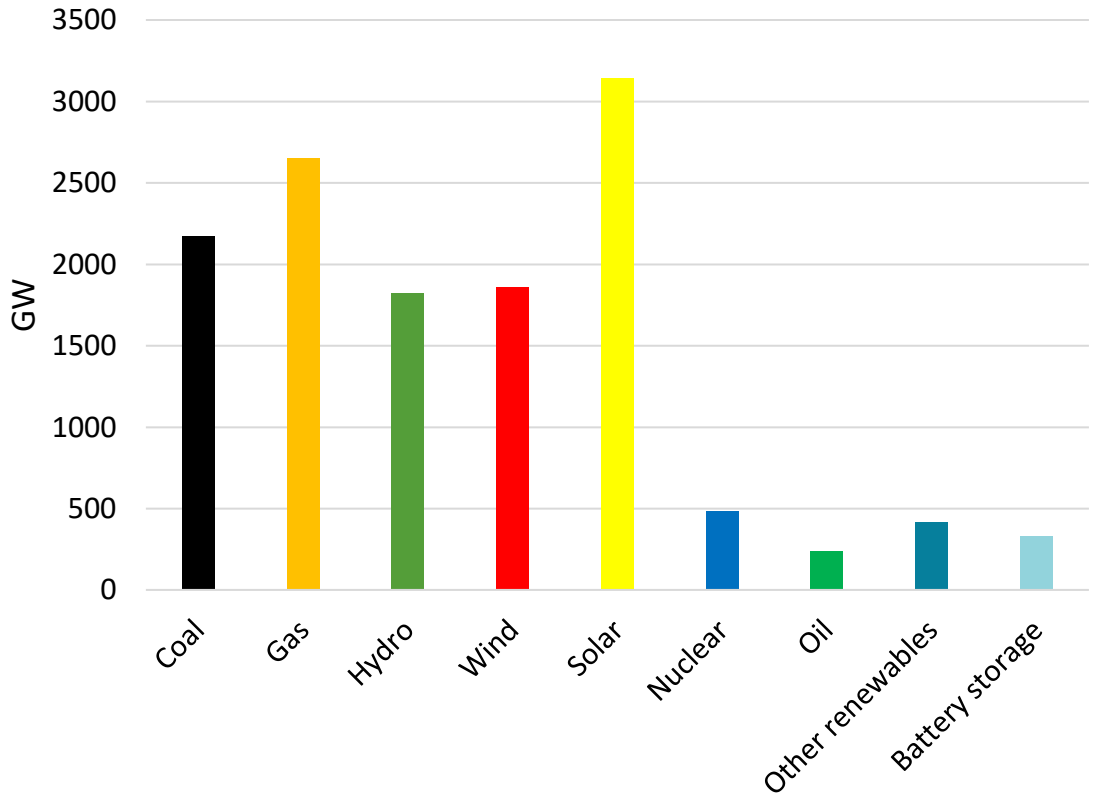


Electrification by the Renewables

Global power capacity by source in the Stated Policies Scenario (2018)



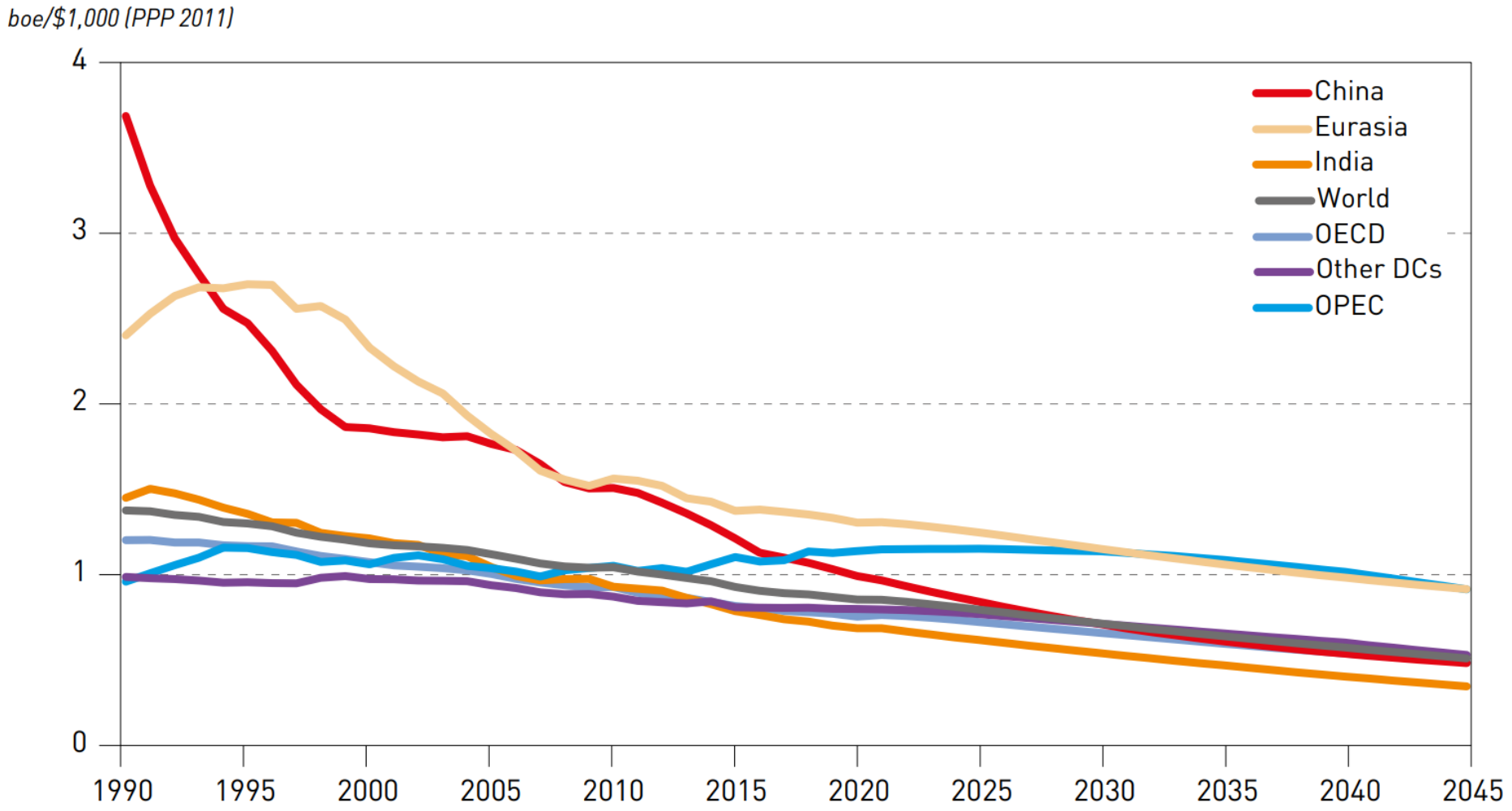
Global power capacity by source in the Stated Policies Scenario (2040)



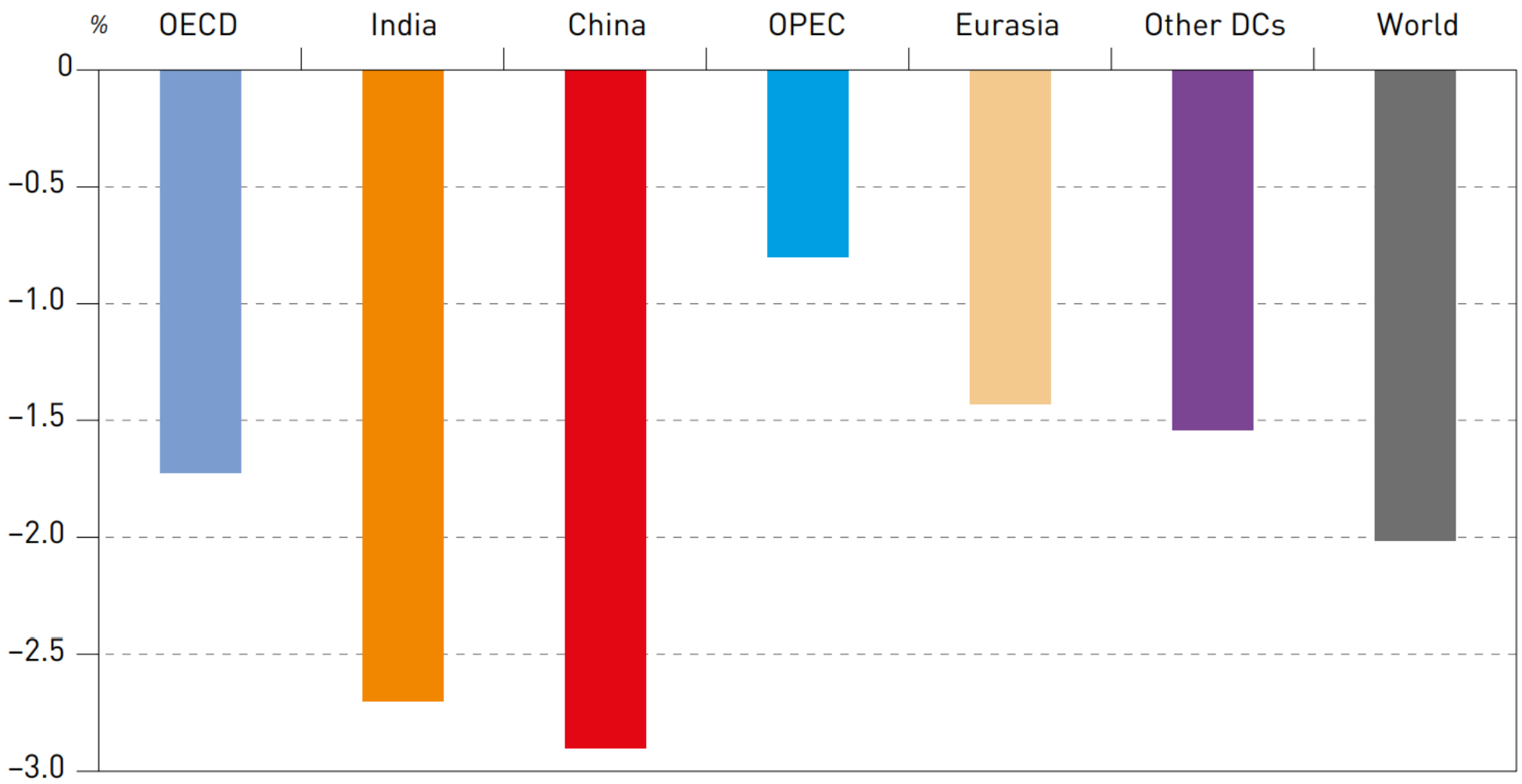
World Primary Energy Demand by Fuel Type

	Levels mboe/d						Growth mboe/d	Growth % p.a.	Fuel share %	
	2019	2025	2030	2035	2040	2045	2019–2045	2019–2045	2019	2045
Oil	91.0	94.4	97.7	99.3	99.7	99.5	8.5	0.3	31.5	27.5
Coal	77.1	75.1	75.1	74.3	72.8	71.0	–6.1	–0.3	26.7	19.7
Gas	66.9	69.8	76.2	82.2	87.3	91.2	24.3	1.2	23.1	25.3
Nuclear	14.4	16.1	17.5	19.1	20.8	22.1	7.7	1.7	5.0	6.1
Hydro	7.3	8.1	8.8	9.5	10.2	10.5	3.2	1.4	2.5	2.9
Biomass	26.4	28.9	31.0	32.9	34.6	35.5	9.1	1.2	9.1	9.8
Other renewables	6.0	10.6	15.5	20.8	26.8	31.4	25.4	6.6	2.1	8.7
Total	**289.1**	**303.0**	**321.9**	**338.1**	**352.3**	**361.3**	**72.1**	**0.9**	**100.0**	**100.0**

Energy Intensity

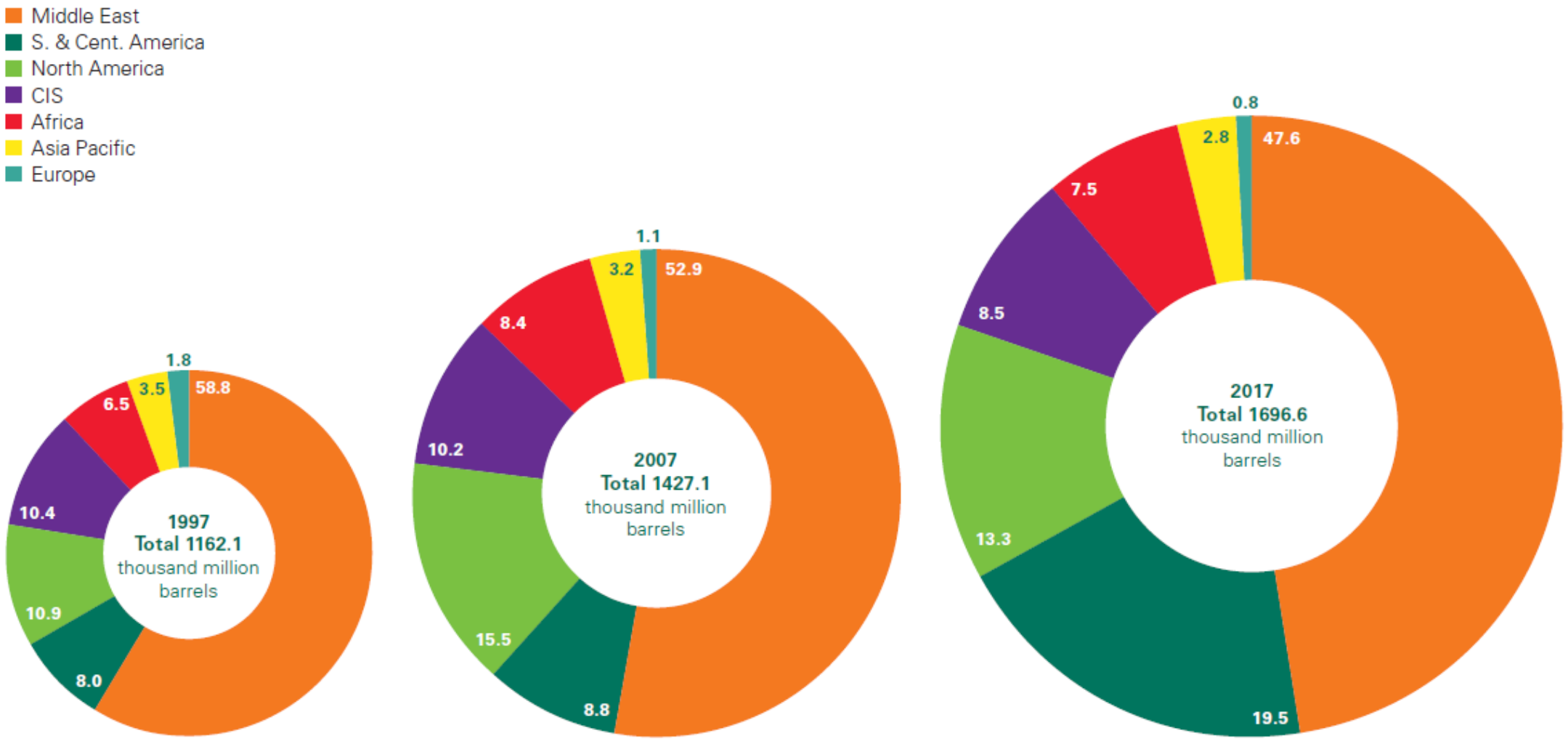


Average Annual Rate of Improvement in Energy Intensity



The Oil Market

Distribution Of Proved Reserves



Top Oil Producers, Net Exporters and Net Importers

Producers	Mt	% of world total
United States	742	16.7
Russian Federation	560	12.6
Saudi Arabia	546	12.3
Canada	265	6.0
Iraq	234	5.3
People's Rep. of China	192	4.3
United Arab Emirates	189	4.3
Islamic Rep. of Iran	146	3.3
Brazil	145	3.3
Kuwait	144	3.2
Rest of the world	1 276	28.7
World	**4 439**	**100.0**

2019 provisional data

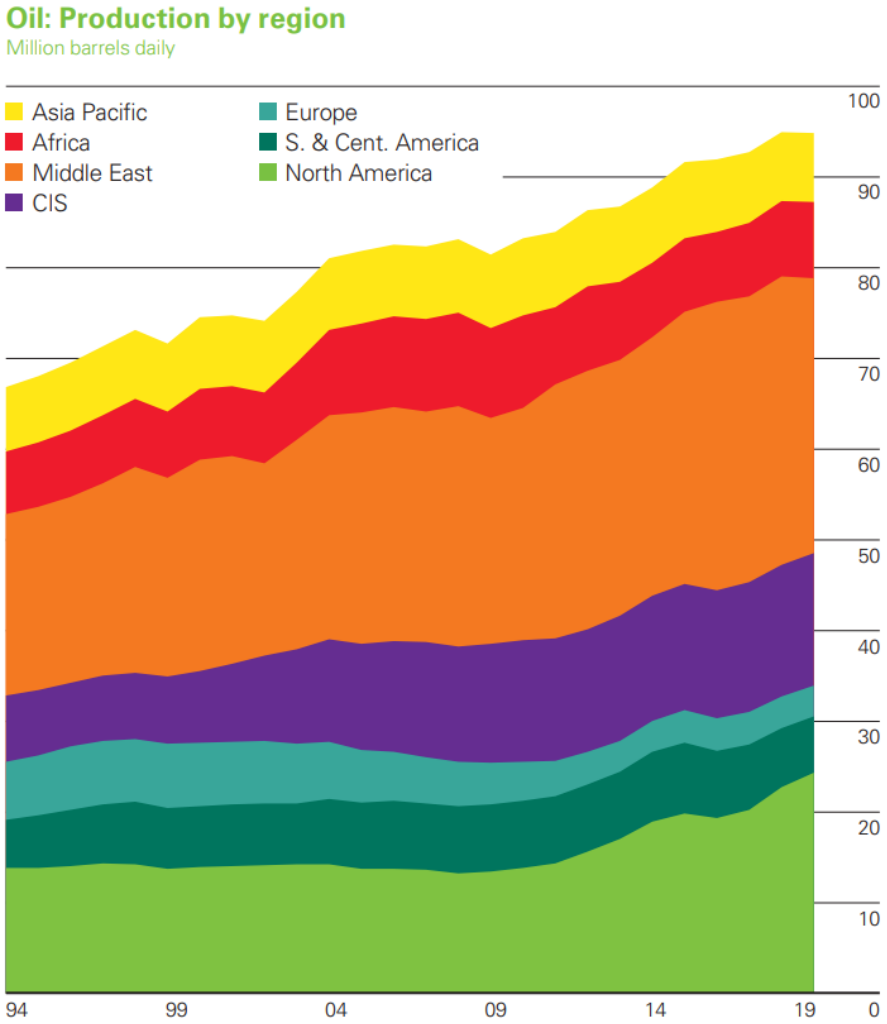
Net exporters	Mt
Saudi Arabia	368
Russian Federation	260
Iraq	190
Canada	148
United Arab Emirates	125
Islamic Rep. of Iran	106
Kuwait	105
Nigeria	93
Kazakhstan	70
Angola	67
Others	550
Total	**2 082**

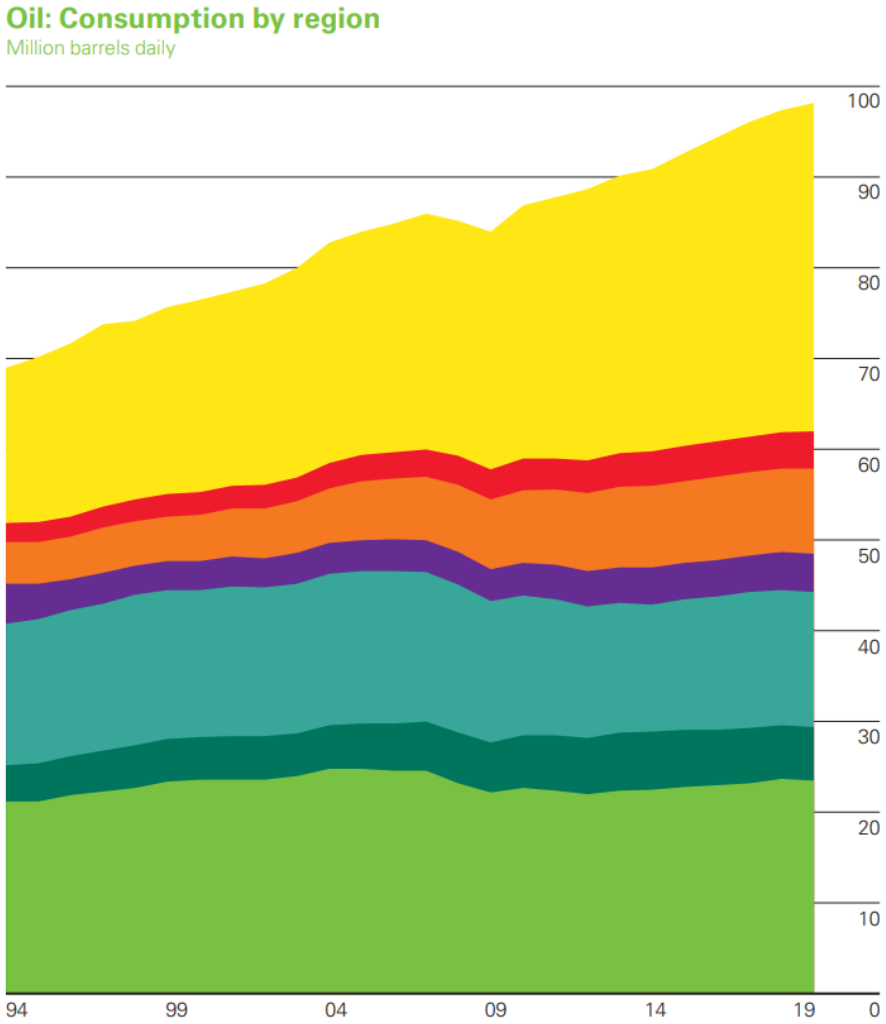
2018 data

Net importers	Mt
People's Rep. of China	459
United States	292
India	226
Korea	151
Japan	151
Germany	85
Spain	67
Italy	63
Netherlands	61
Singapore	55
Others	525
Total	**2 135**

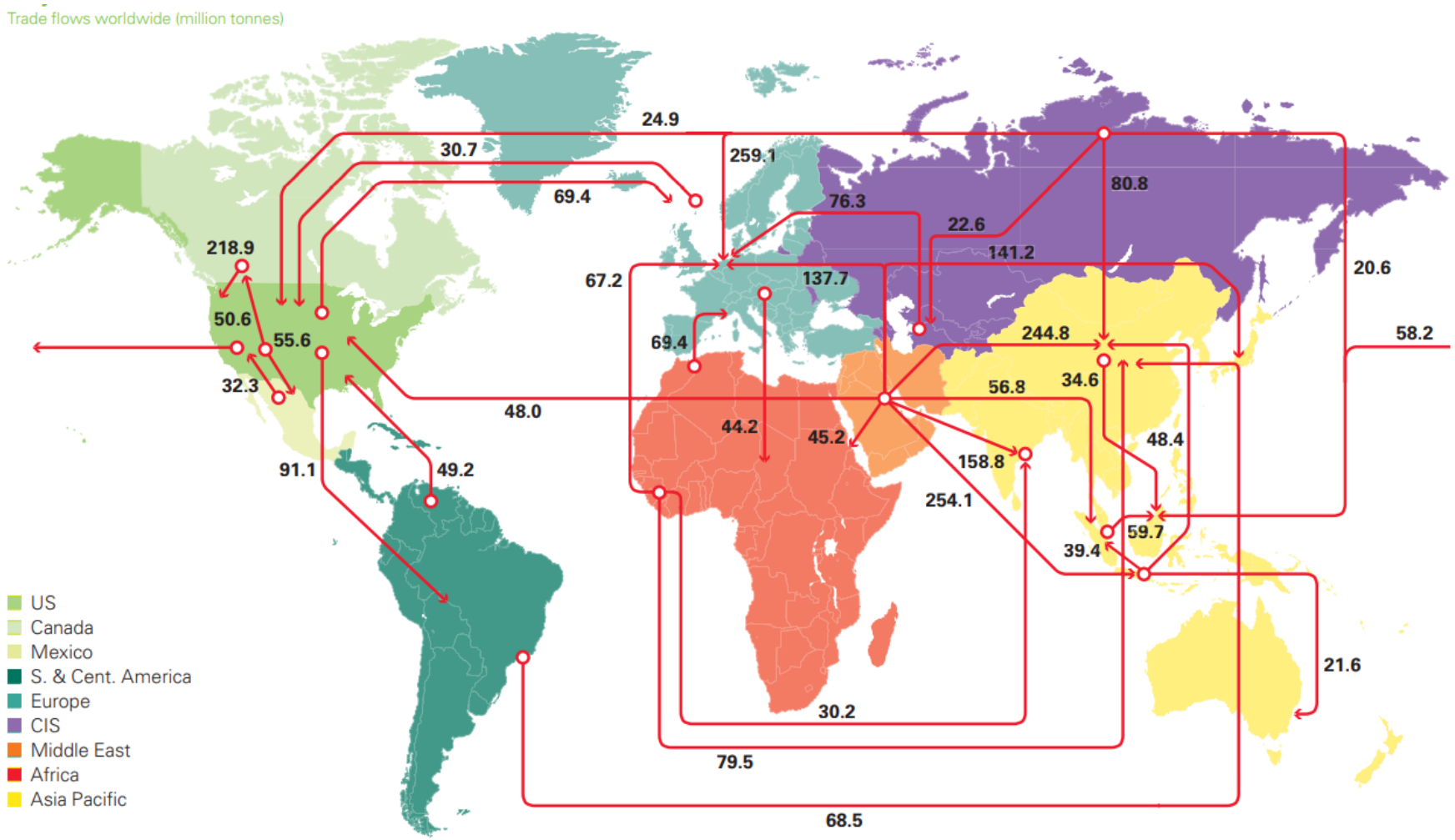
2018 data

The Geopolitics of Oil

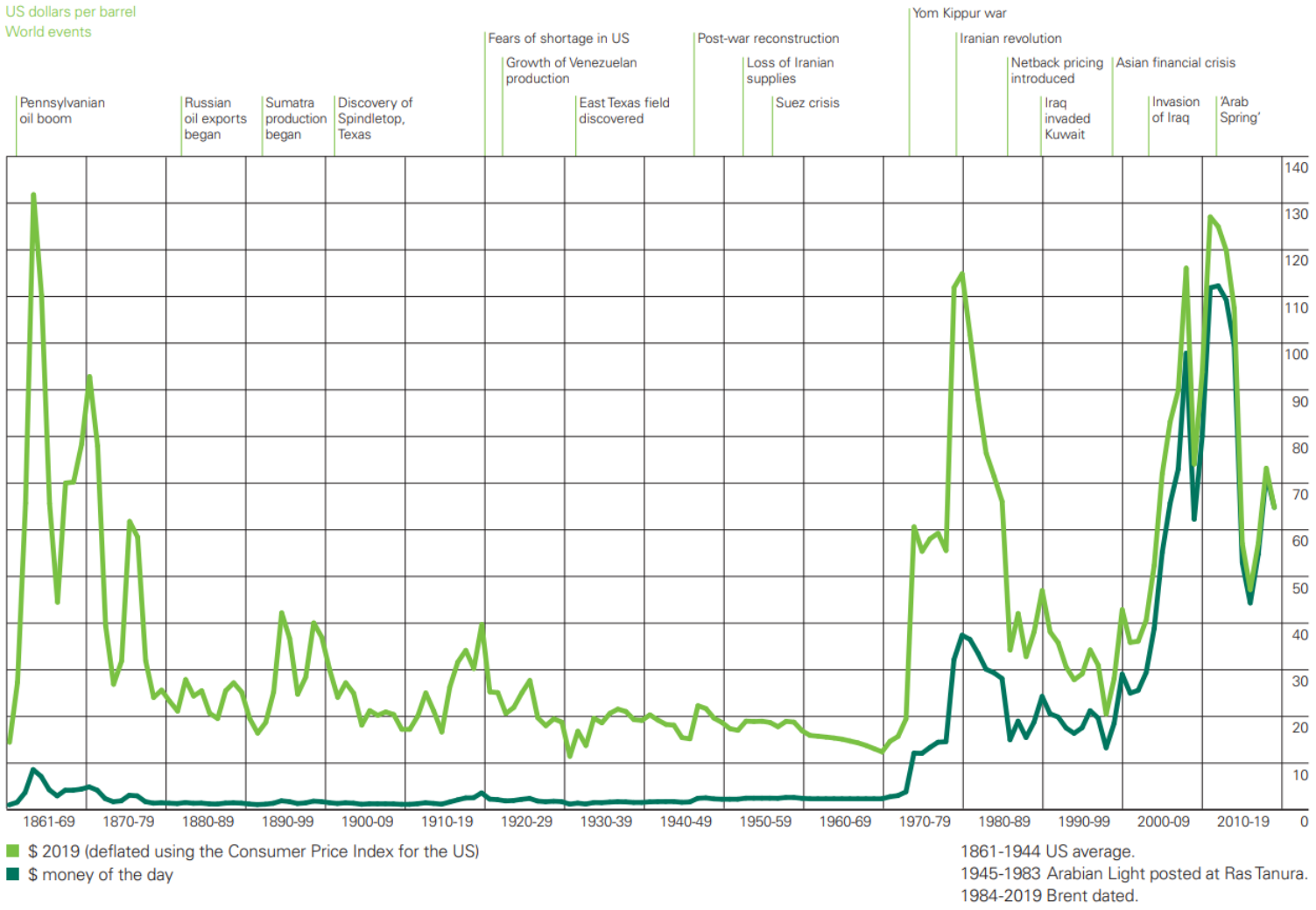




Major Trade Movements 2019

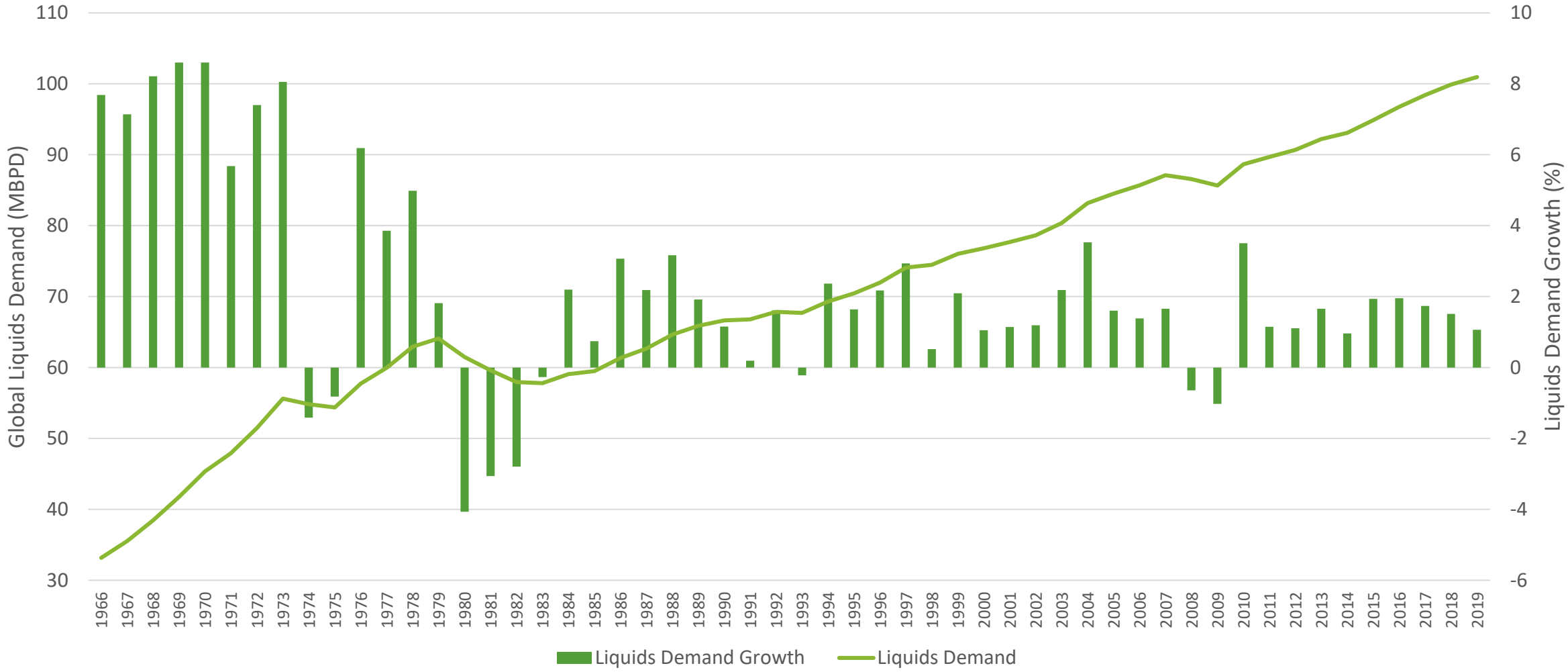


Crude Oil Prices

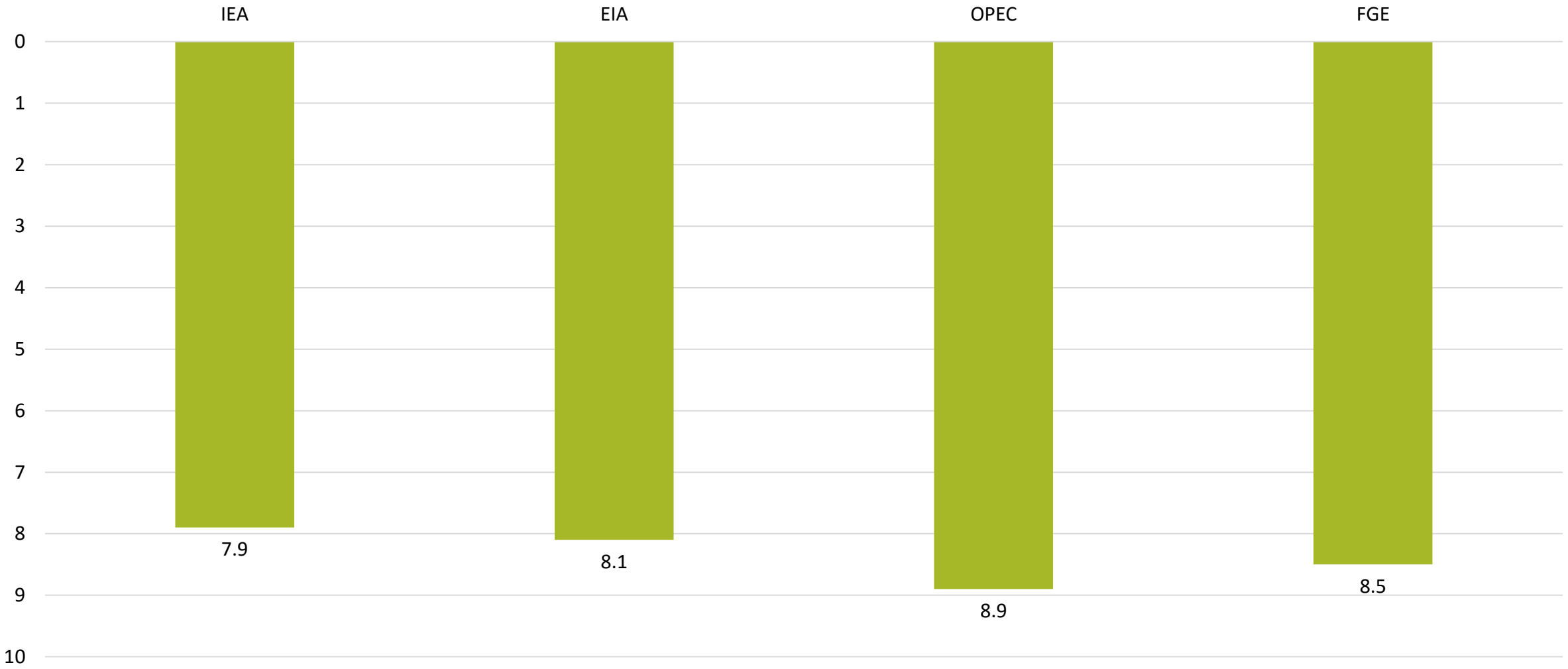


Methodology

Global Liquids Demand



Demand Destruction 2020 vs. 2019 (MBPD)



World Oil Demand (MBPD)

	2020	1Q21	2Q21	3Q21	4Q21	2021	Change 2021/20 Growth	Change 2021/20 %
World oil demand								
Americas	23.25	24.37	25.25	24.89	25.27	24.95	1.70	7.31
of which US	*19.01*	*19.95*	*20.66*	*20.29*	*20.72*	*20.41*	*1.39*	*7.32*
Europe	12.62	13.55	14.29	13.64	13.51	13.75	1.13	8.92
Asia Pacific	7.03	7.80	7.38	7.04	7.55	7.44	0.41	5.81
Total OECD	**42.90**	**45.72**	**46.92**	**45.57**	**46.32**	**46.14**	**3.24**	**7.54**
China	12.53	12.31	13.87	14.00	14.33	13.63	1.10	8.79
India	4.04	4.89	4.19	4.36	4.99	4.61	0.57	14.02
Other Asia	8.26	8.33	8.96	8.79	8.84	8.73	0.47	5.66
Latin America	5.99	6.21	6.27	6.37	6.31	6.29	0.30	5.00
Middle East	7.54	8.07	7.64	8.19	7.75	7.91	0.37	4.89
Africa	4.08	4.46	3.95	4.17	4.39	4.24	0.17	4.05
Eurasia	4.94	5.43	5.17	5.14	5.35	5.28	0.34	6.85
of which Russia	*3.23*	*3.57*	*3.37*	*3.37*	*3.38*	*3.42*	*0.19*	*6.02*
of which Other Eurasia	*1.71*	*1.86*	*1.81*	*1.77*	*1.97*	*1.85*	*0.14*	*8.43*
Total Non-OECD	**47.39**	**49.71**	**50.06**	**51.03**	**51.96**	**50.70**	**3.31**	**6.98**
Total World	**90.29**	**95.43**	**96.98**	**96.60**	**98.28**	**96.84**	**6.54**	**7.25**
Previous Estimate	90.23	95.52	96.14	97.14	98.58	96.86	6.62	7.34
Revision	0.06	-0.09	0.84	-0.54	-0.30	-0.02	-0.08	-0.09

*Note: * 2020-2021 = Forecast. Totals may not add up due to independent rounding.*

Non-OPEC Liquids Production

Non-OPEC liquids production	2020	1Q21	2Q21	3Q21	4Q21	2021	Change 2021/20 Growth	Change 2021/20 %
Americas	24.77	24.58	24.75	25.44	26.27	25.27	0.50	2.01
of which US	*17.77*	*17.51*	*17.84*	*18.12*	*18.75*	*18.06*	*0.29*	*1.62*
Europe	3.96	4.08	3.98	4.01	4.28	4.09	0.13	3.23
Asia Pacific	0.56	0.57	0.56	0.59	0.58	0.57	0.02	3.04
Total OECD	**29.28**	**29.23**	**29.29**	**30.04**	**31.12**	**29.93**	**0.64**	**2.20**
China	4.12	4.06	4.06	4.09	4.17	4.10	-0.03	-0.70
India	0.80	0.82	0.80	0.85	0.85	0.83	0.03	4.33
Other Asia	2.52	2.52	2.51	2.51	2.50	2.51	-0.01	-0.38
Latin America	6.19	6.44	6.40	6.35	6.58	6.44	0.25	4.07
Middle East	3.13	3.11	3.12	3.13	3.14	3.13	-0.01	-0.23
Africa	1.45	1.39	1.38	1.36	1.34	1.37	-0.08	-5.76
Eurasia	13.22	13.19	13.18	13.18	13.17	13.18	-0.04	-0.32
of which Russia	*10.35*	*10.36*	*10.36*	*10.36*	*10.36*	*10.36*	*0.01*	*0.09*
of which other Eurasia	*0.45*	*0.44*	*0.43*	*0.43*	*0.42*	*0.43*	*-0.02*	*-5.26*
Total Non-OECD	**31.44**	**31.53**	**31.44**	**31.47**	**31.76**	**31.55**	**0.11**	**0.36**
Total Non-OPEC production	60.72	60.76	60.73	61.51	62.88	61.48	0.76	1.25
Processing gains	2.07	2.20	2.20	2.20	2.20	2.20	0.13	6.17
Total Non-OPEC liquids production	**62.79**	**62.96**	**62.93**	**63.71**	**65.08**	**63.68**	**0.89**	**1.41**
Previous estimate	62.47	62.69	62.79	63.47	64.89	63.47	0.99	1.59
Revision	0.32	0.26	0.14	0.24	0.18	0.21	-0.11	-0.18

OPEC Crude Oil Production

Table 5 - 9: OPEC crude oil production based on *secondary sources*, tb/d

Secondary sources	2018	2019	1Q20	2Q20	3Q20	Jul 20	Aug 20	Sep 20	Change Sep/Aug
Algeria	1,042	1,022	1,016	878	839	808	857	854	-3
Angola	1,505	1,401	1,388	1,267	1,216	1,186	1,218	1,246	27
Congo	317	324	295	296	285	287	286	283	-3
Equatorial Guinea	125	117	122	110	112	114	118	103	-15
Gabon	187	208	195	201	185	192	184	180	-4
Iran, I.R.	3,553	2,356	2,059	1,958	1,945	1,930	1,942	1,964	22
Iraq	4,550	4,678	4,560	4,127	3,698	3,752	3,648	3,694	46
Kuwait	2,745	2,687	2,741	2,464	2,246	2,161	2,285	2,292	7
Libya	951	1,097	348	84	122	107	104	156	53
Nigeria	1,718	1,786	1,800	1,617	1,465	1,467	1,467	1,461	-6
Saudi Arabia	10,311	9,771	9,796	9,212	8,763	8,417	8,922	8,957	35
UAE	2,986	3,094	3,204	2,871	2,604	2,503	2,773	2,533	-239
Venezuela	1,354	796	730	501	359	345	351	383	32
Total OPEC	**31,344**	**29,337**	**28,255**	**25,585**	**23,839**	**23,268**	**24,153**	**24,106**	**-47**

Notes: Totals may not add up due to independent rounding.
Source: OPEC.

Table 5 - 10: OPEC crude oil production based on *direct communication*, tb/d

Direct communication	2018	2019	1Q20	2Q20	3Q20	Jul 20	Aug 20	Sep 20	Change Sep/Aug
Algeria	1,040	1,023	1,018	874	843	809	859	861	2
Angola	1,473	1,373	1,402	1,267	1,253	1,275	1,266	1,216	-50
Congo	323	329	308	311	301	301	292	311	19
Equatorial Guinea	120	110	126	107	115	116	117	112	-6
Gabon	193	218	224	227	201	204	201	200	-1
Iran, I.R.	..	..	..	..	..	..	..	..	..
Iraq	4,410	4,576	4,490	4,088	3,625	3,697	3,578	3,600	22
Kuwait	2,737	2,678	2,744	2,474	2,245	2,158	2,289	2,290	1
Libya	..	..	..	..	..	..	..	..	..
Nigeria	1,602	1,737	1,761	1,515	1,344	1,353	1,368	1,310	-58
Saudi Arabia	10,317	9,808	9,755	9,317	8,813	8,479	8,984	8,982	-2
UAE	3,008	3,058	3,173	2,921	2,525	2,406	2,693	2,476	-217
Venezuela	1,510	1,013	821	568	395	392	396	397	1
Total OPEC	..	..	..	..	..	..	..	..	..

Notes: .. Not available. Totals may not add up due to independent rounding.
Source: OPEC.

Market Balance

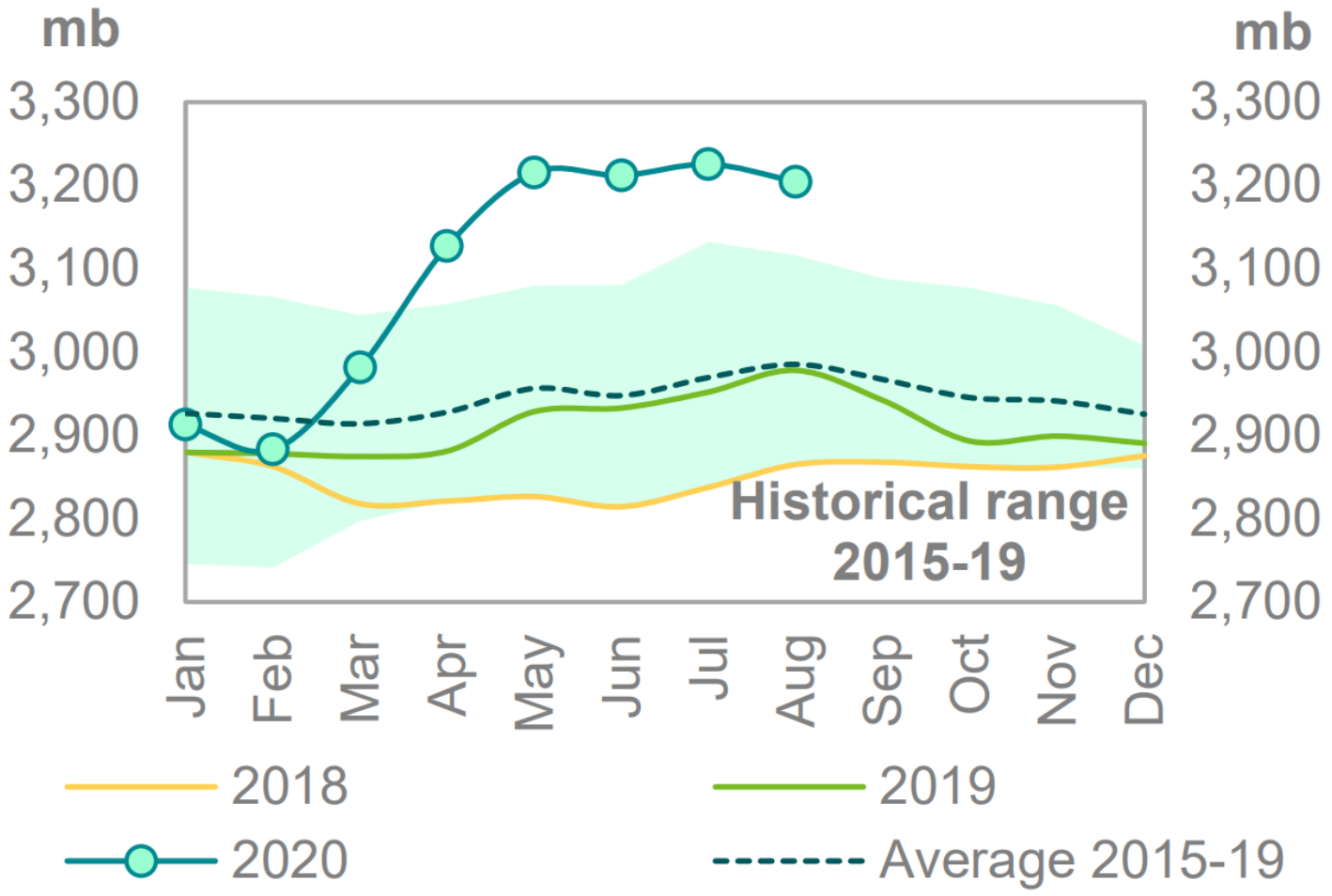
Table 10 - 1: Supply/demand balance for 2020*, mb/d

	2019	1Q20	2Q20	3Q20	4Q20	2020	*Change* 2020/19
(a) World oil demand	**99.76**	**92.68**	**82.58**	**90.99**	**94.86**	**90.29**	**-9.47**
Non-OPEC liquids production	65.16	66.57	60.83	61.50	62.27	62.79	-2.37
OPEC NGL and non-conventionals	5.26	5.35	5.09	5.04	5.13	5.15	-0.11
(b) Total non-OPEC liquids production and OPEC NGLs	**70.42**	**71.93**	**65.92**	**66.54**	**67.40**	**67.94**	**-2.48**
Difference (a-b)	**29.35**	**20.75**	**16.66**	**24.45**	**27.46**	**22.35**	**-6.99**
OPEC crude oil production	**29.34**	**28.25**	**25.59**	**23.84**			
Balance	**-0.01**	**7.50**	**8.92**	**-0.61**			

*Note: * 2020 = Forecast. Totals may not add up due to independent rounding.*

OECD Commercial Stocks

Graph 9 - 1: OECD commercial oil stocks



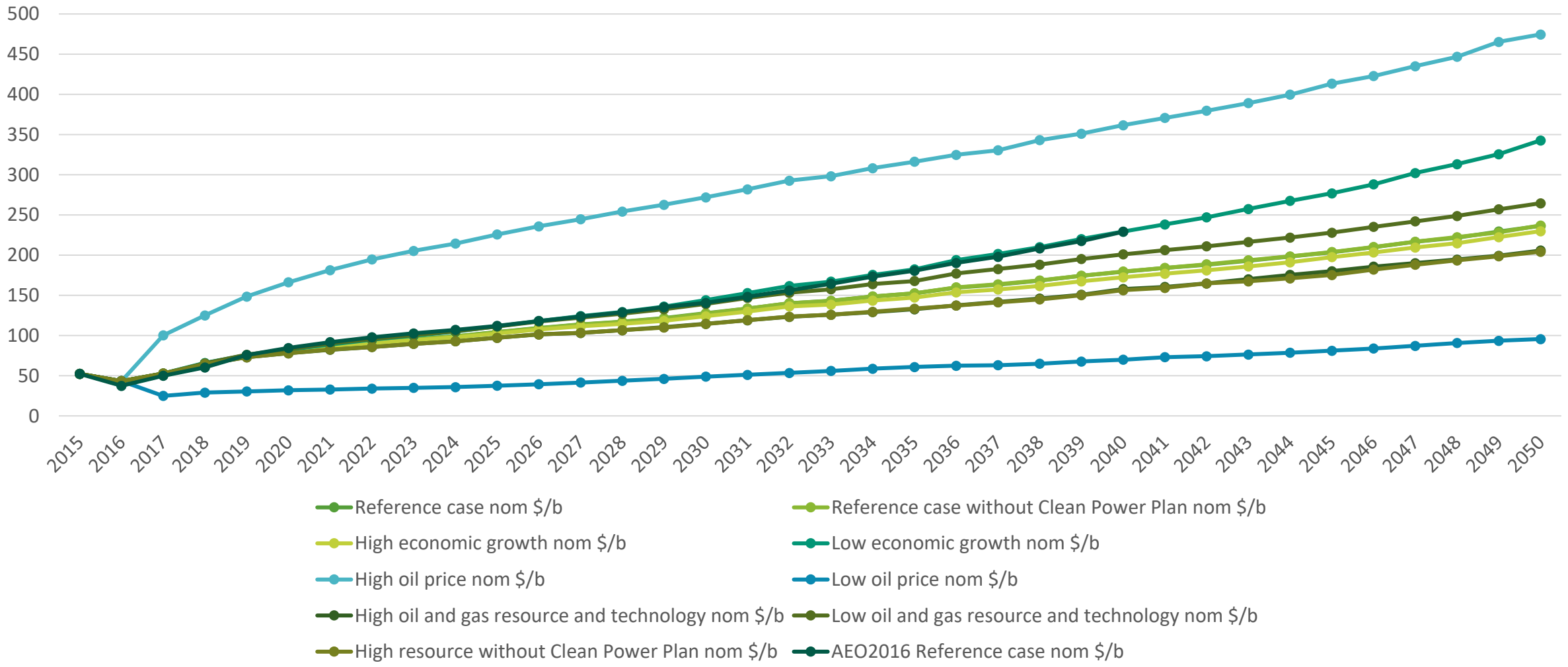
Long-term Oil Demand Outlook by Sector

	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**

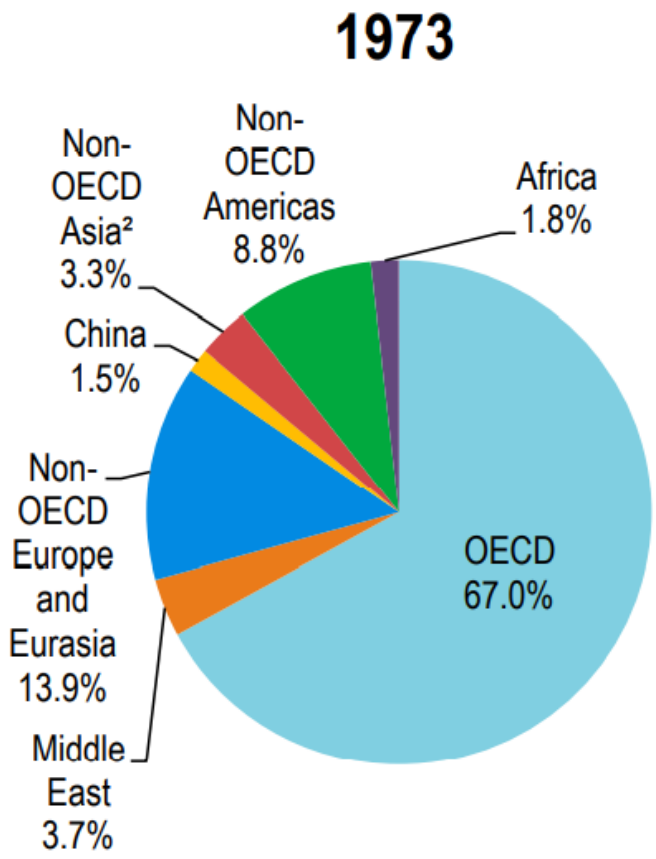
Long-term Global Liquids Supply Outlook

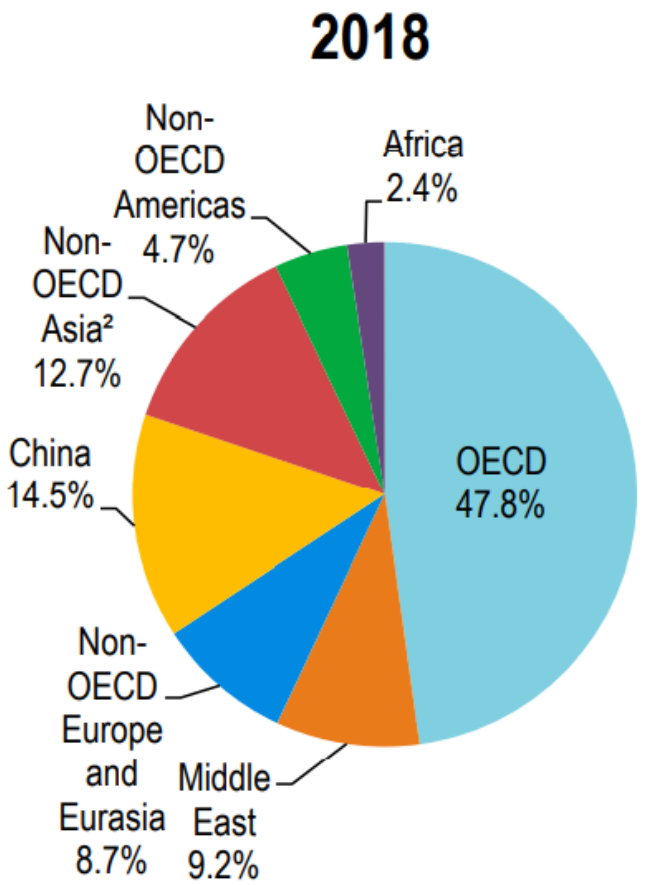
	2019	2020	2025	2030	2035	2040	2045	Change 2019–2045
OECD	30.0	28.5	32.5	32.3	30.8	29.1	27.7	–2.3
of which: US	*18.4*	*17.0*	*19.8*	*20.3*	*19.1*	*17.7*	*16.6*	*–1.8*
of which: tight liquids	*11.7*	*10.9*	*14.5*	*15.8*	*15.4*	*14.3*	*13.3*	*1.6*
Non-OECD	32.8	31.2	35.9	36.7	36.5	35.7	34.7	2.0
Processing 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**

Long-term Oil Price Scenarios

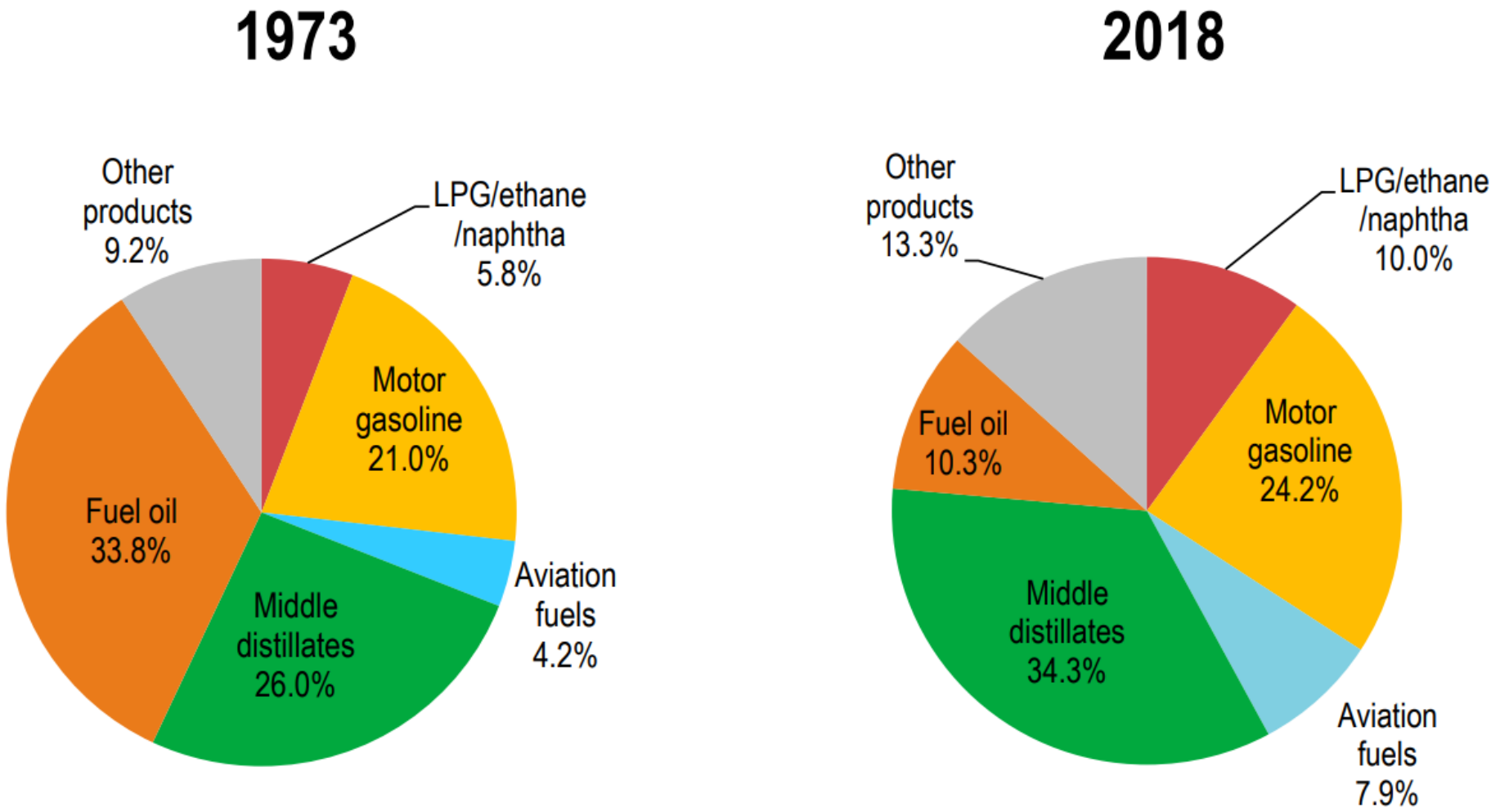


Share of Refining Intake





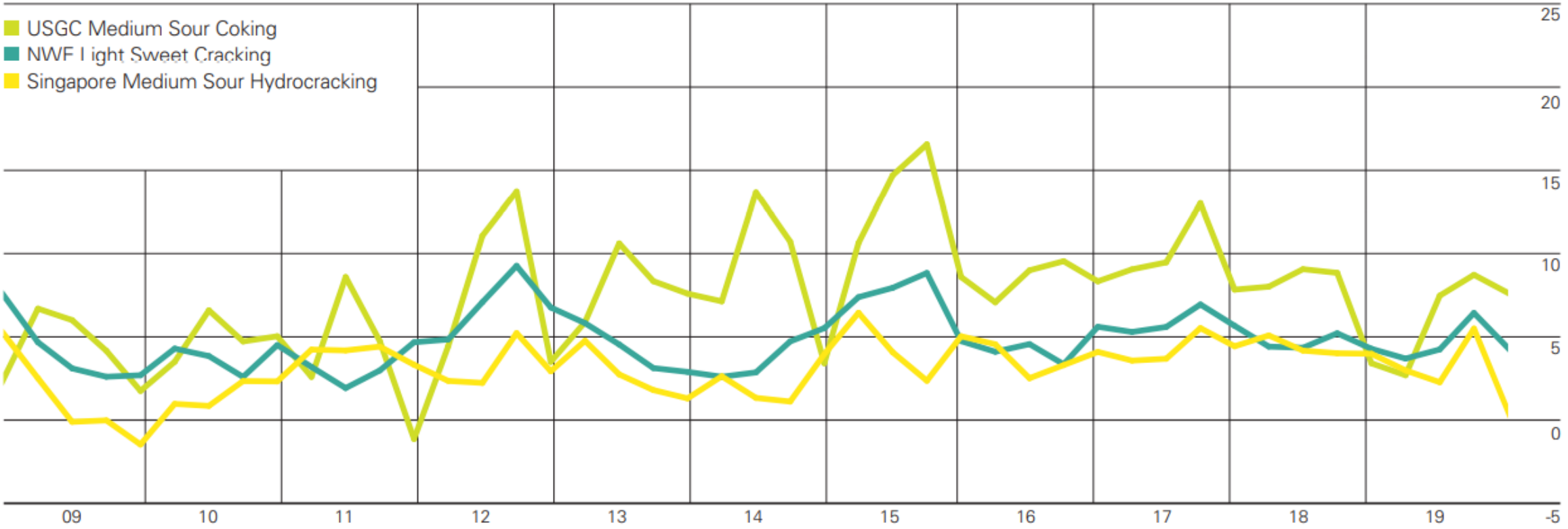
Refinery Output by Product



Refining Margins

Regional refining margins

US dollars per barrel



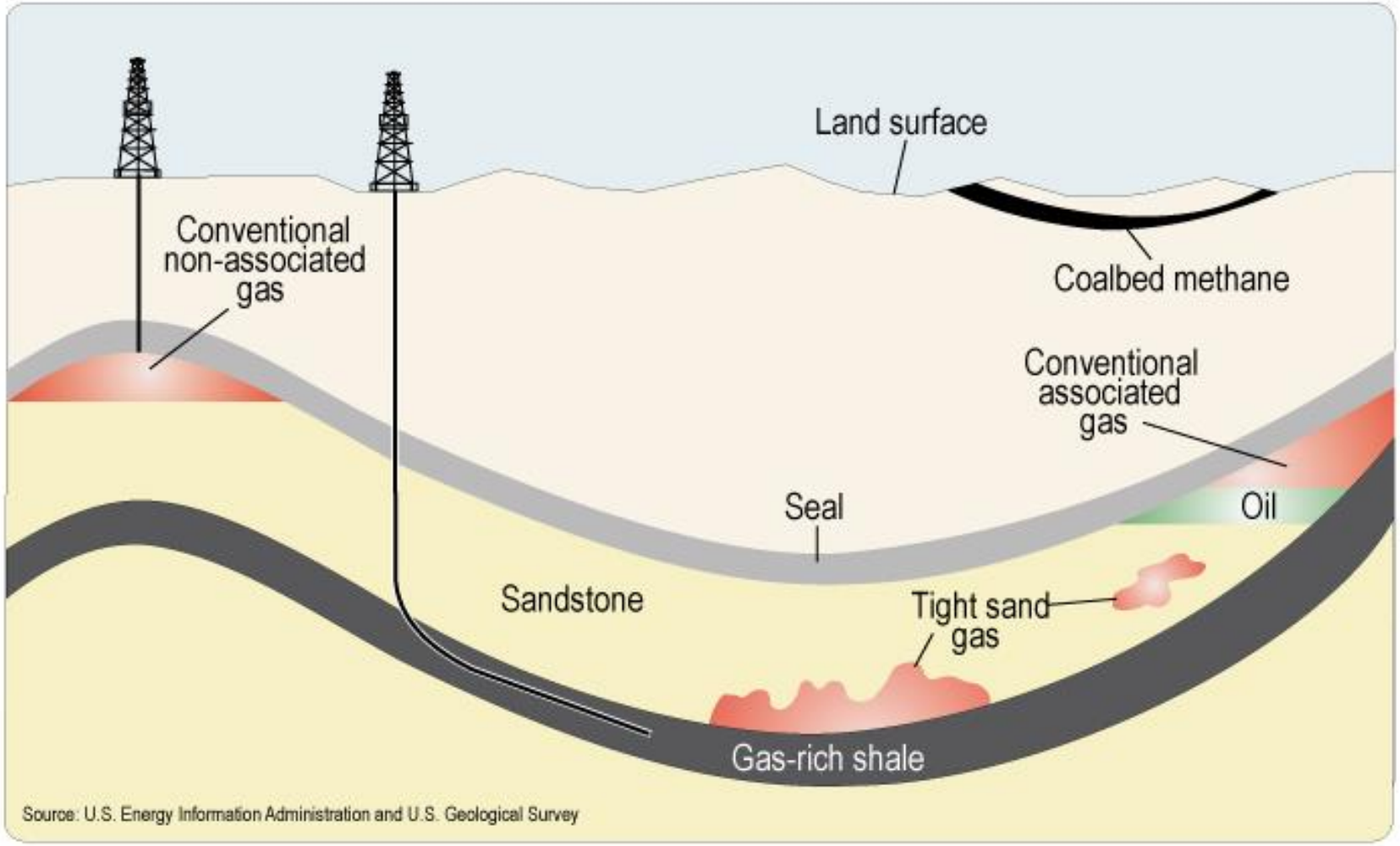
Note: The refining margins presented are benchmark margins for three major global refining centres. US Gulf Coast (USGC), North West Europe (NWE – Rotterdam) and Singapore. In each case they are based on a single crude oil appropriate for that region and have optimized product yields based on a generic 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.

Oil Demand in the Petrochemical Sector

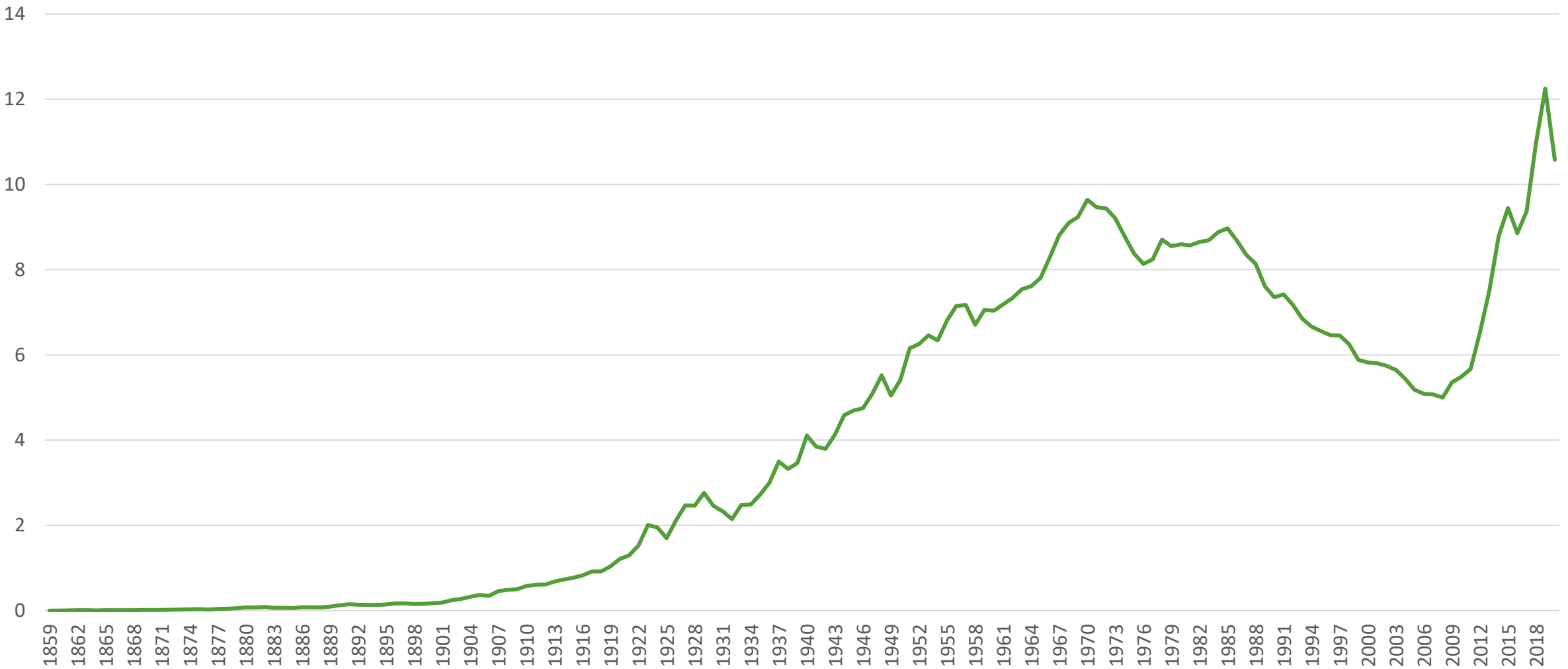
	2019	2020	2025	2030	2035	2040	2045	Growth 2019–2045
OECD Americas	3.5	3.2	3.8	4.1	3.9	3.7	3.5	0.1
OECD Europe	1.9	1.7	1.8	1.8	1.7	1.6	1.5	–0.4
OECD Asia Oceania	2.1	1.9	2.0	2.0	2.0	2.0	2.0	–0.1
OECD	**7.4**	**6.9**	**7.6**	**8.0**	**7.7**	**7.4**	**7.0**	**–0.4**
Latin America	0.3	0.3	0.4	0.4	0.4	0.4	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**

US Shale Oil

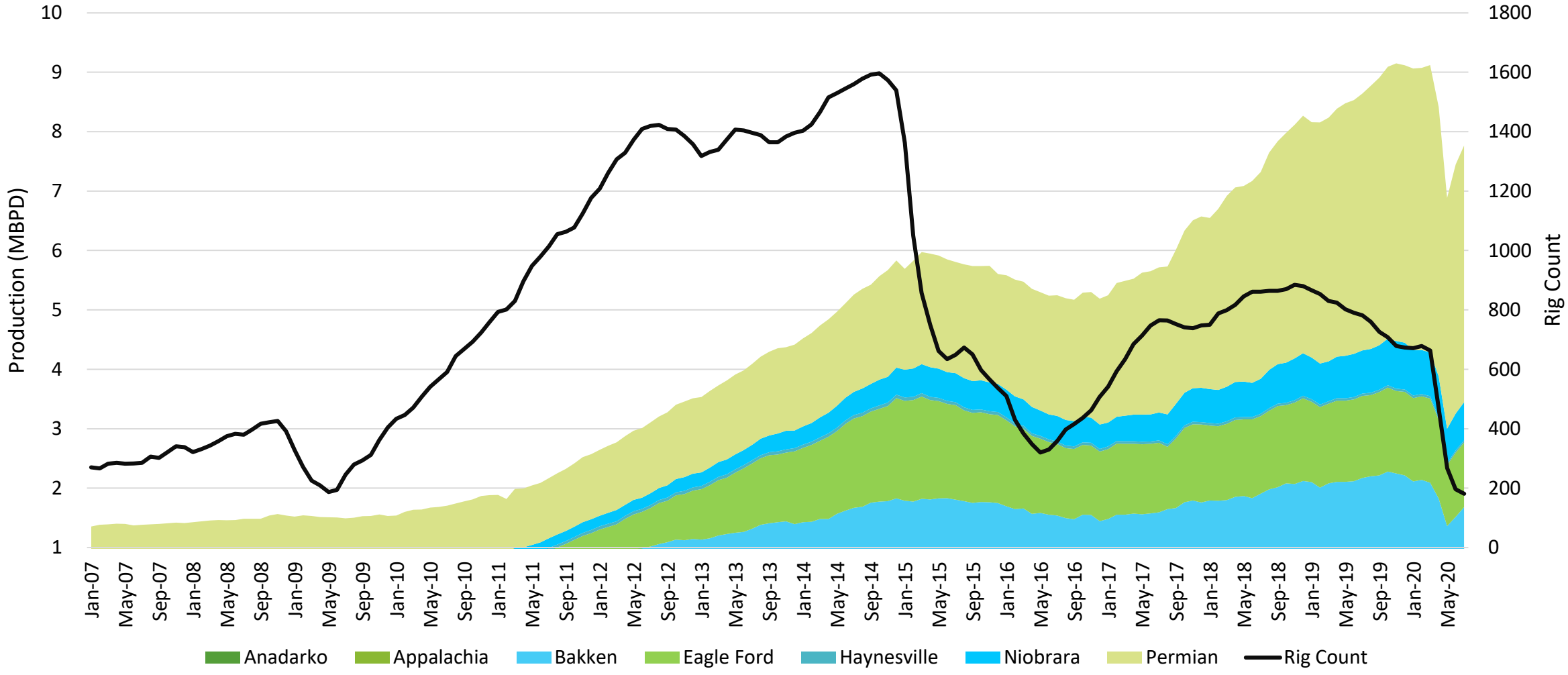
Overview


Land surface
Conventional non-associated gas
Coalbed methane
Conventional associated gas
Seal
Oil
Sandstone
Tight sand gas
Gas-rich shale
Source: U.S. Energy Information Administration and U.S. Geological Survey

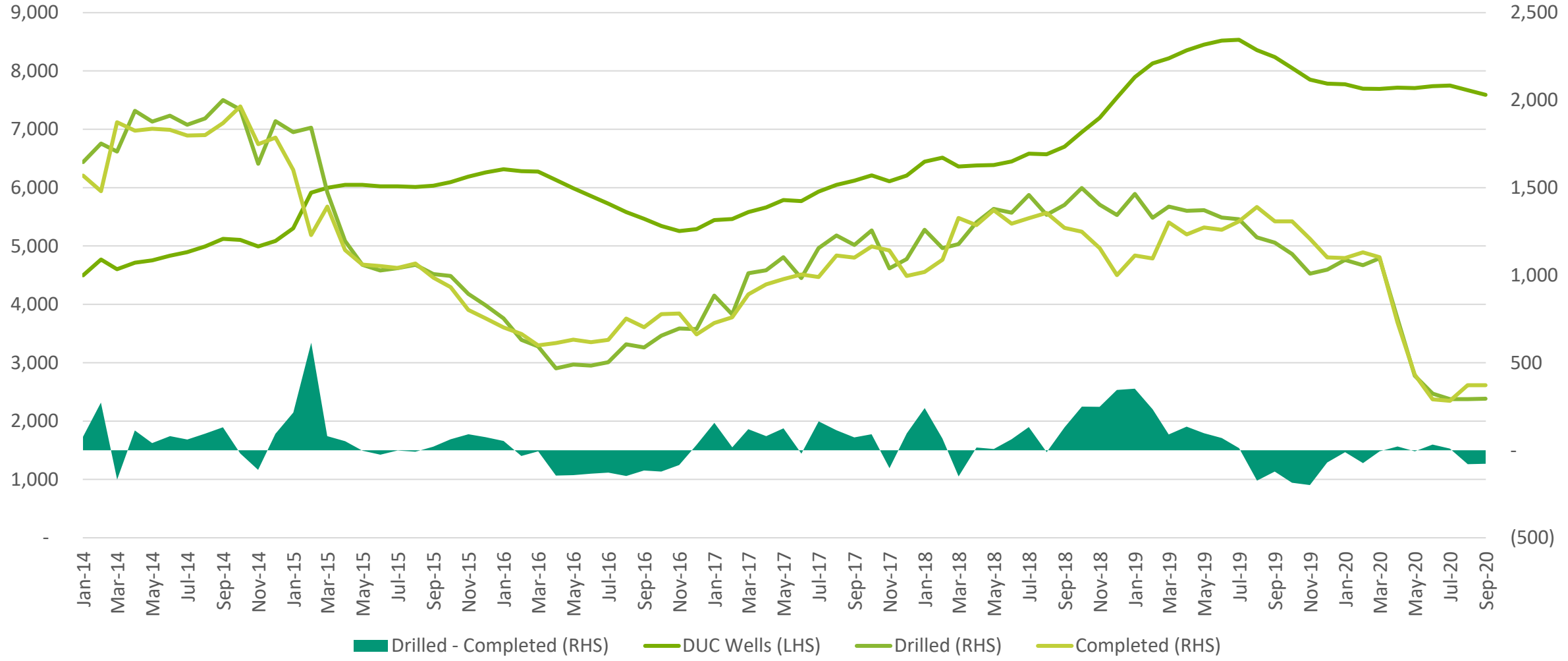
US Oil Production (MBPD)



US Shale Oil Production & Total Rig Count



DUC Wells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7,000
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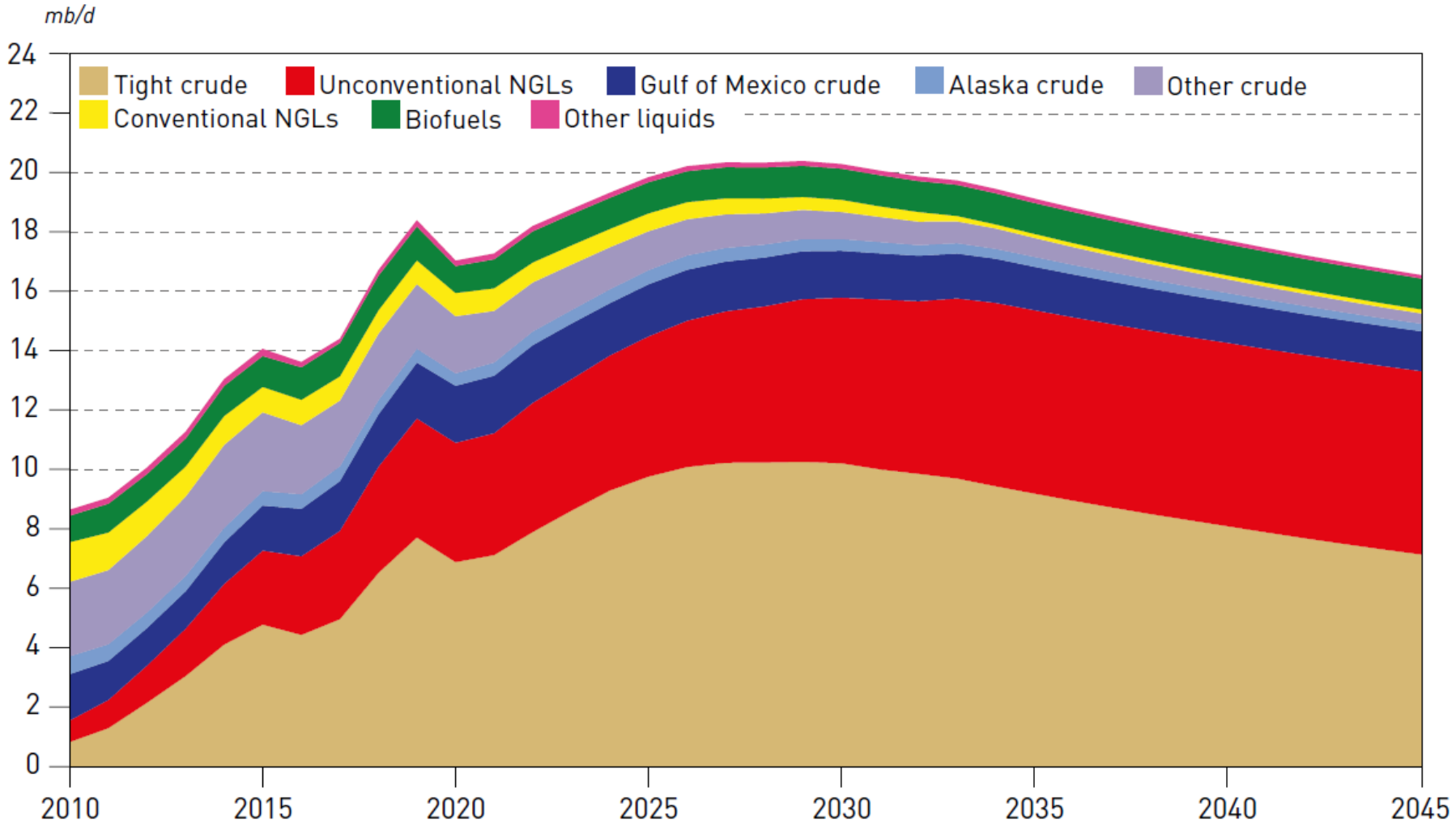
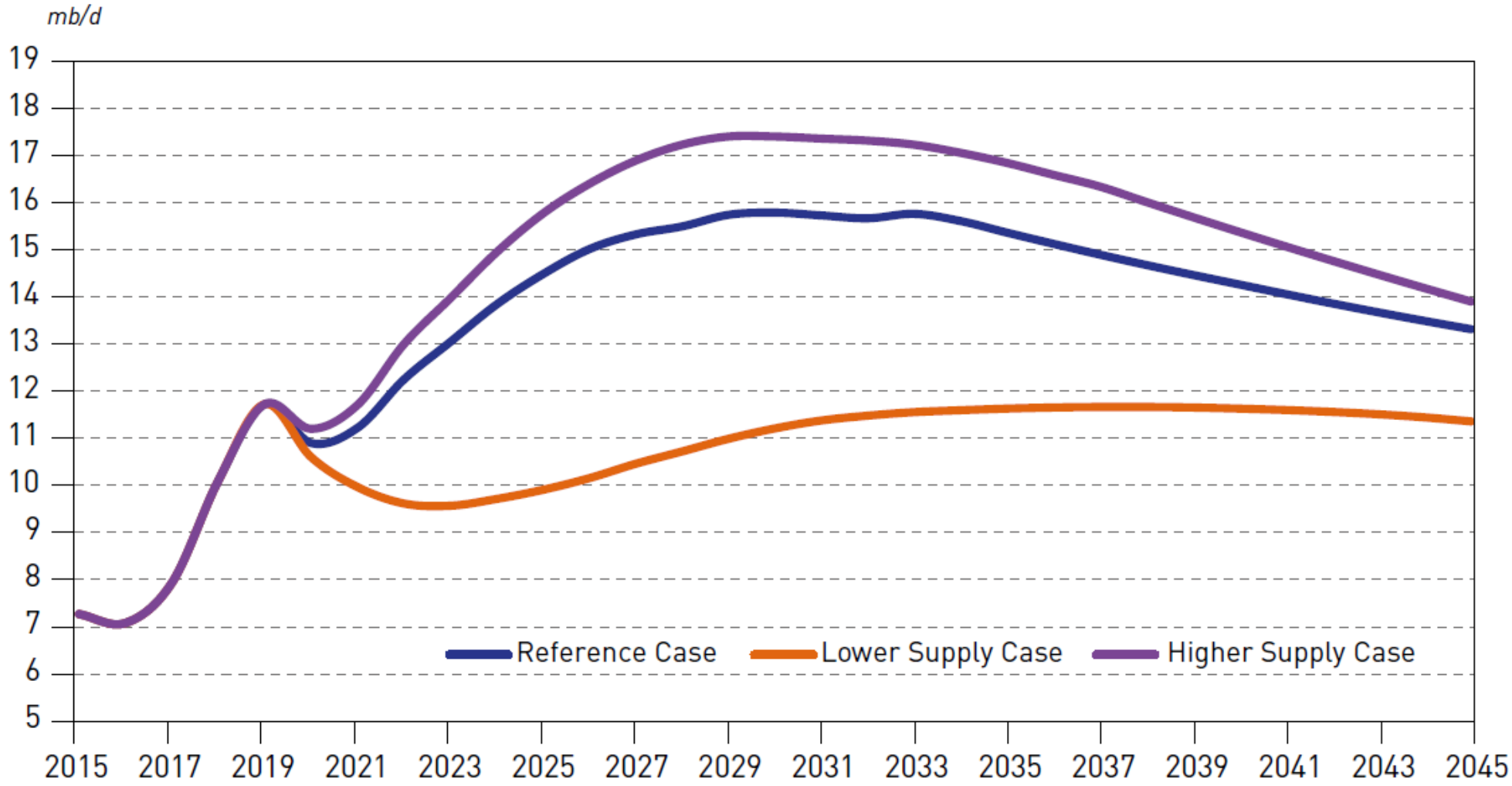
Mar-20
May-20
Jul-20
Sep-20
Drilled - Completed (RHS)
DUC Wells (LHS)
Drilled (RHS)
Completed (RHS)

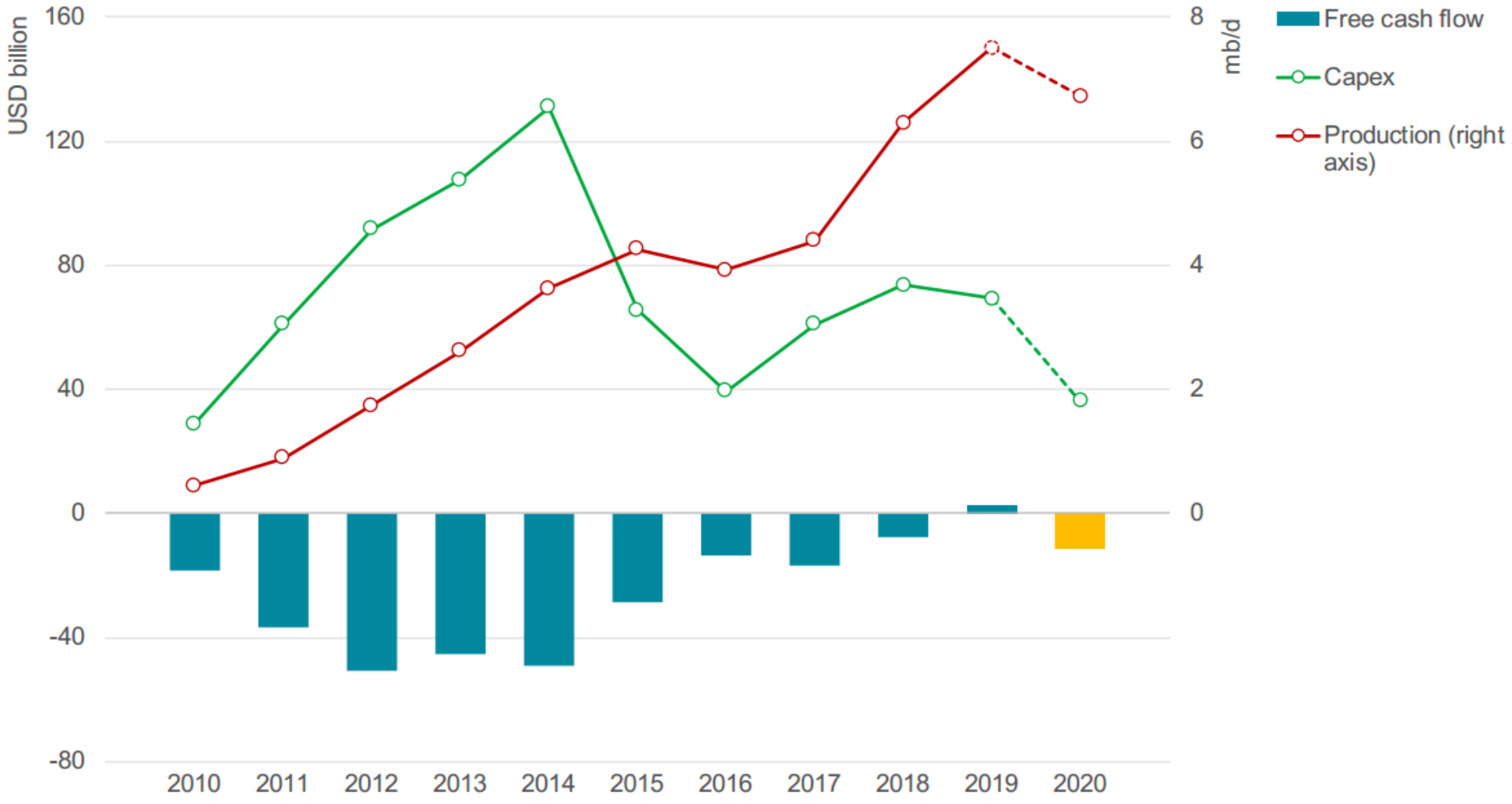
US Liquids Supply Outlook



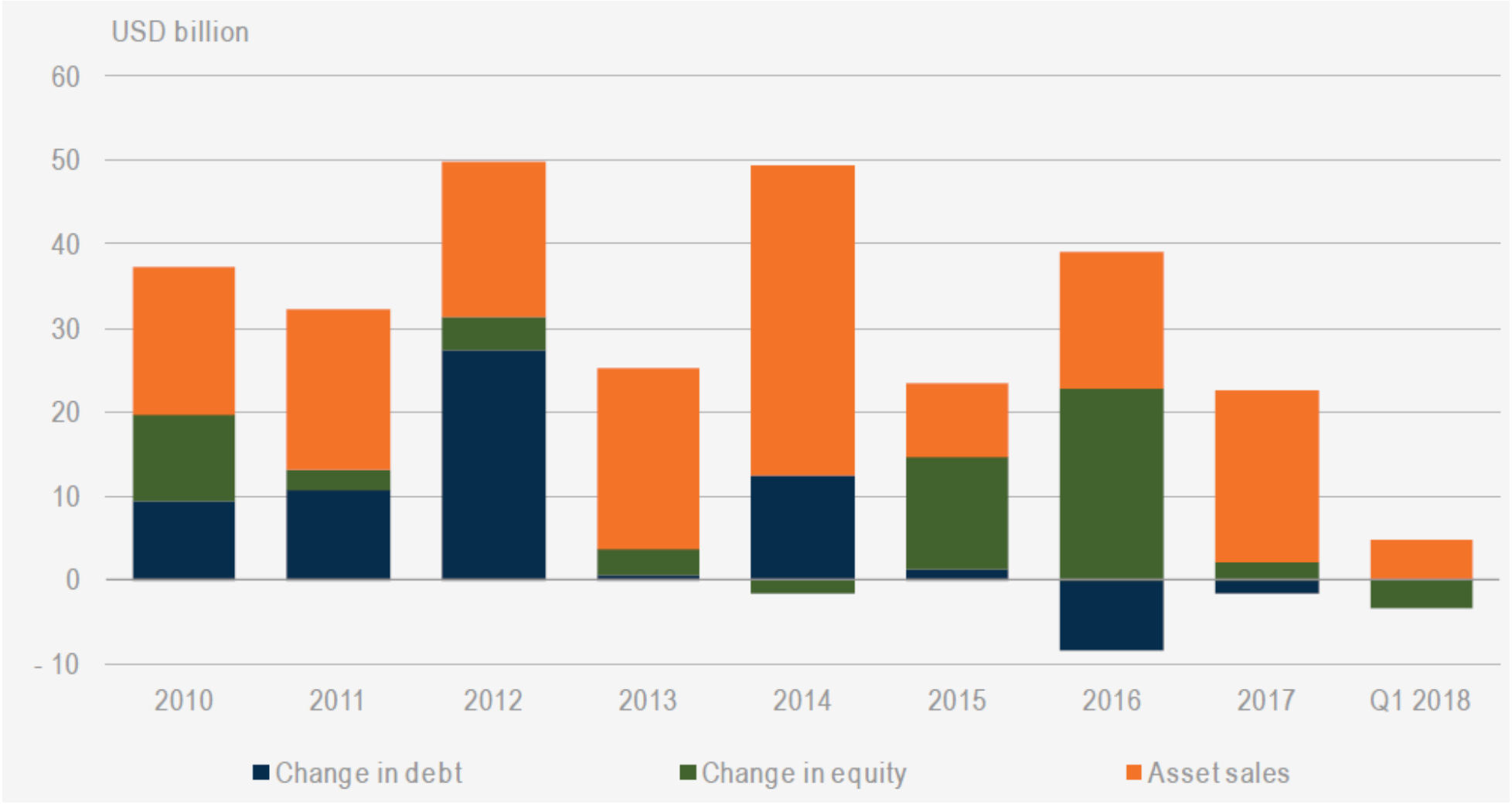
Long-term US Tight Oil Sensitivities



US Tight Oil Production, Investment and FCF



US Shale Finance



Breakeven Reduction

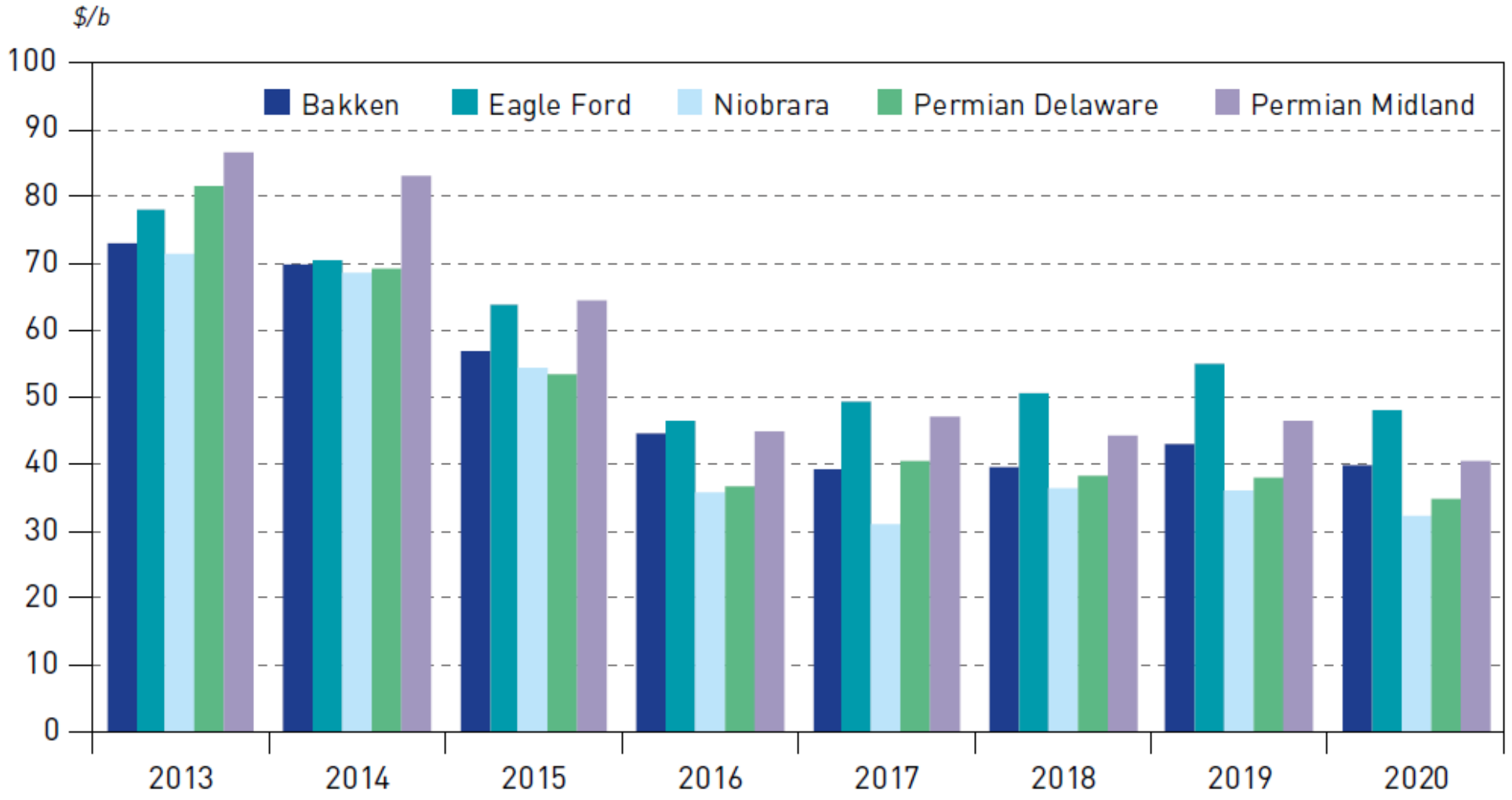
Structural

- Well Productivity
- Drilling & Completion Efficiency

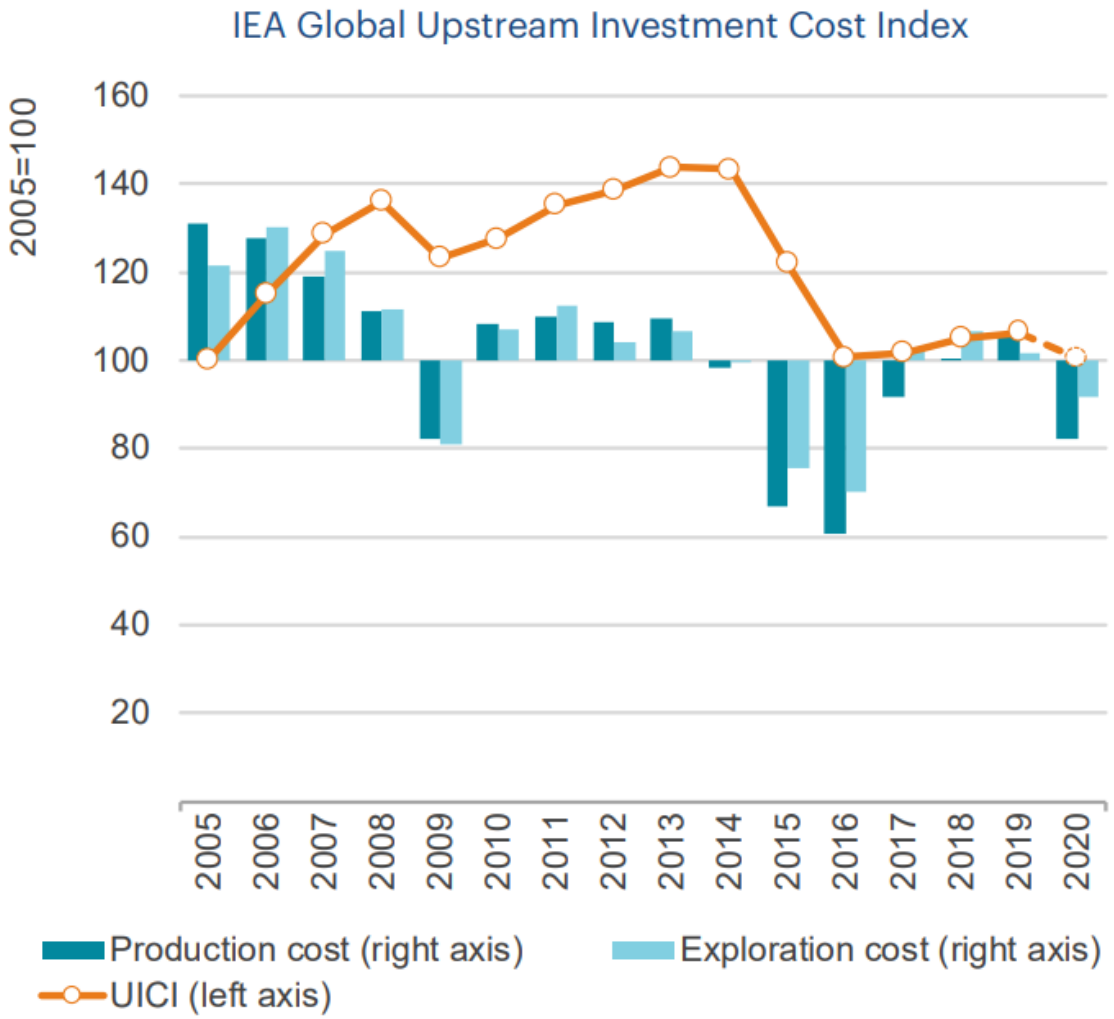
Cyclical

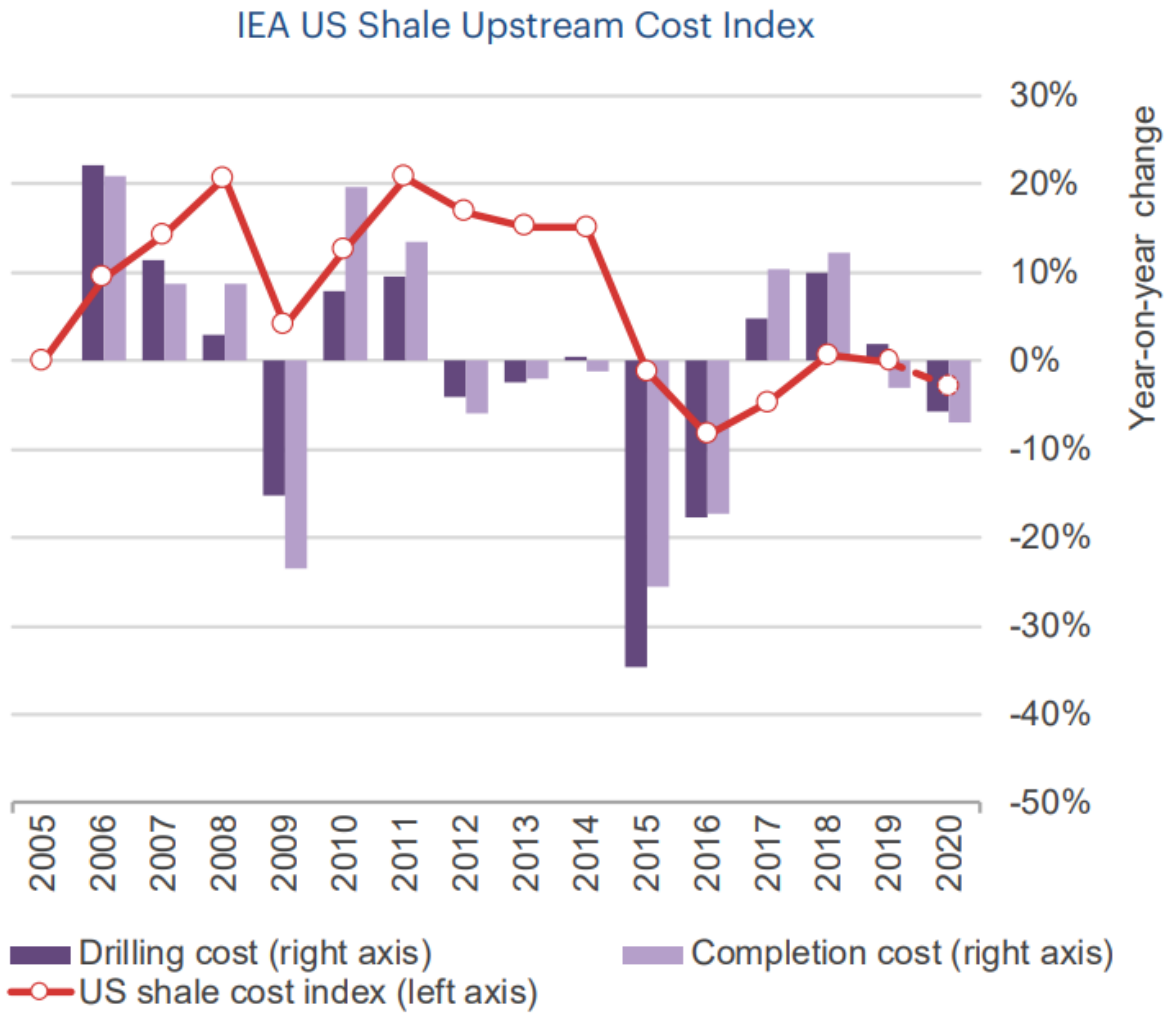
- Cost of Drilling
- High-grading
- Lease Operating Expenses

US Shale Oil Breakeven Point

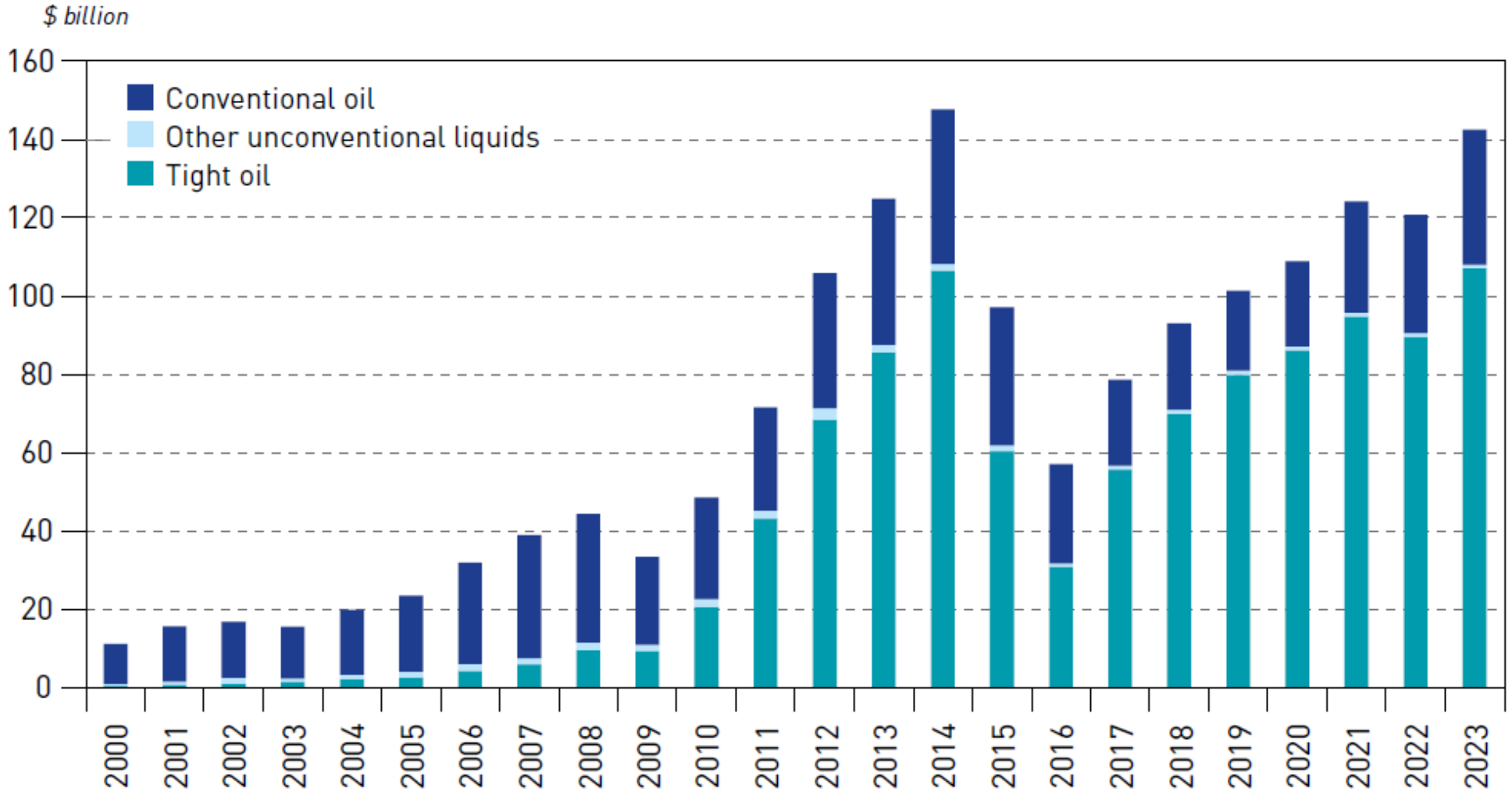


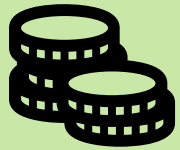
Upstream Investment Cost Index





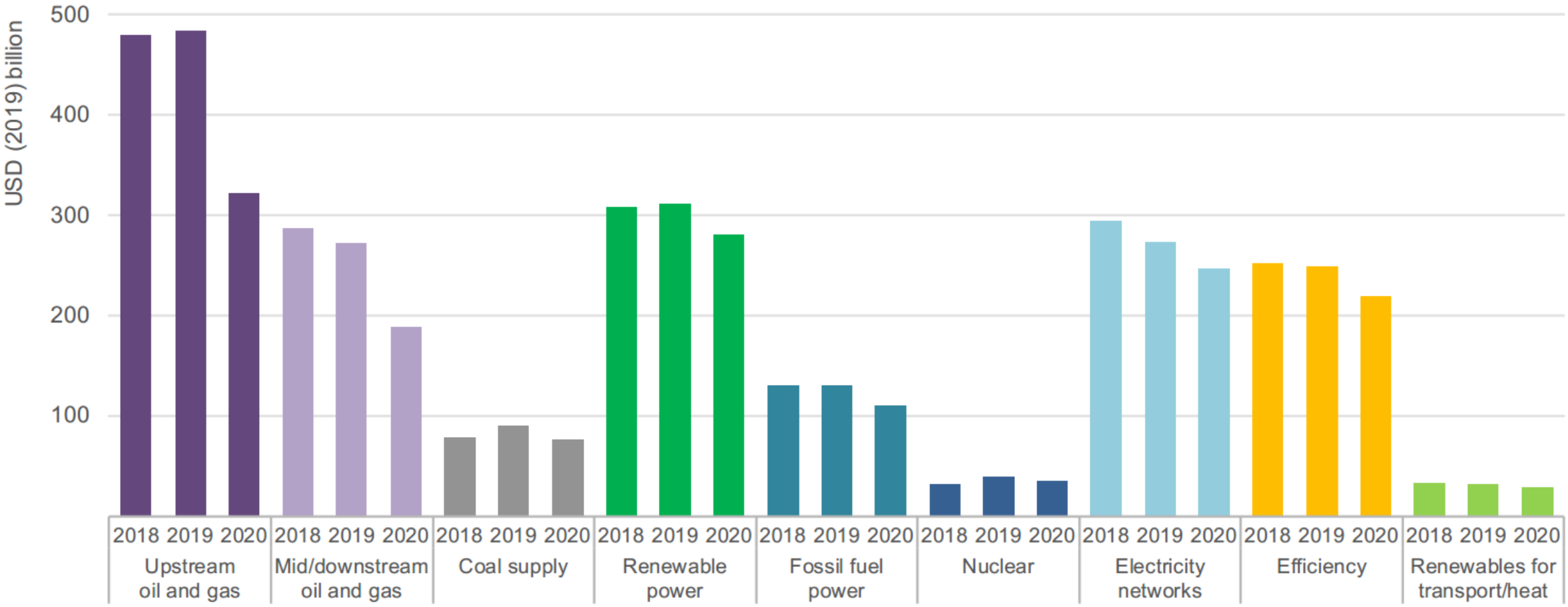
US upstream investment



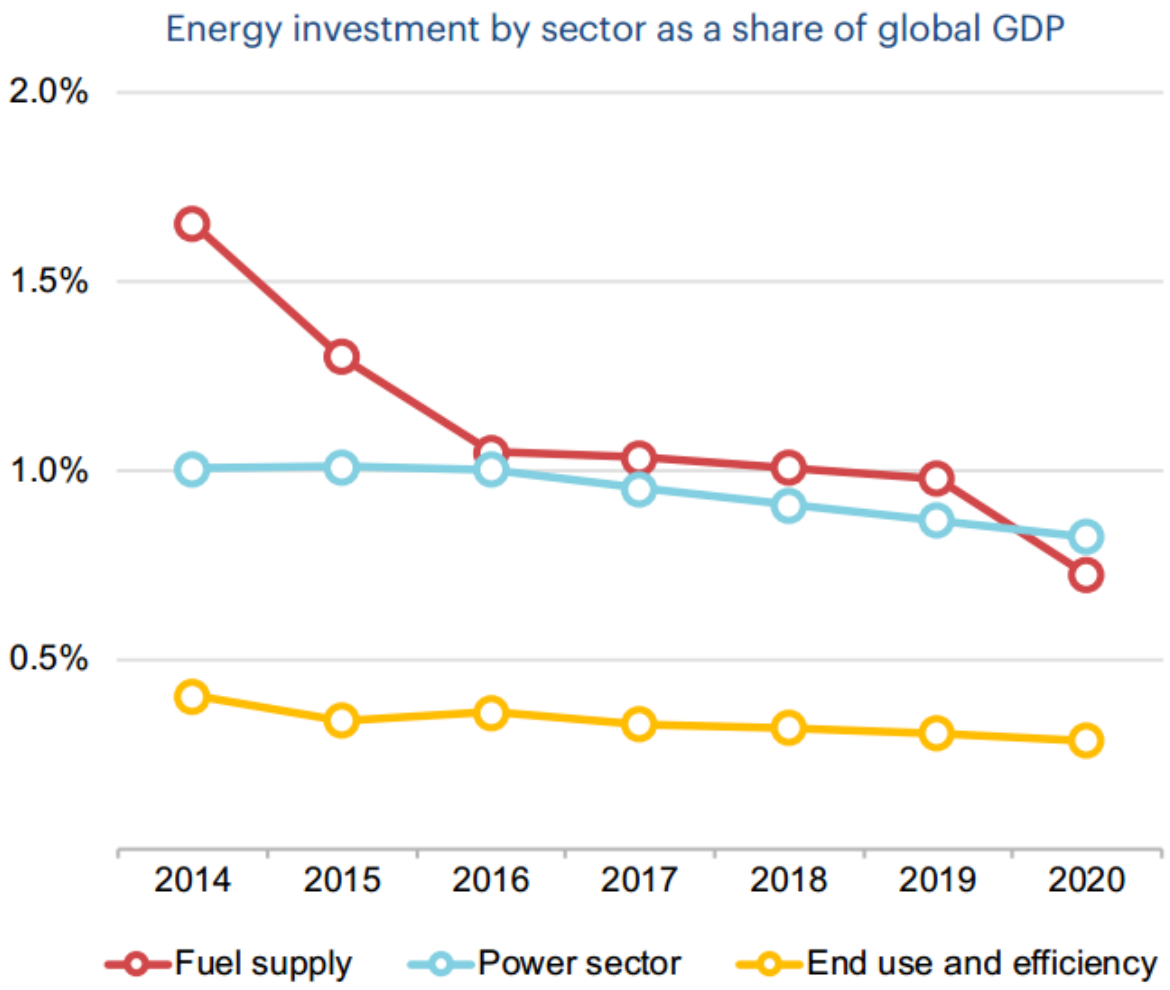


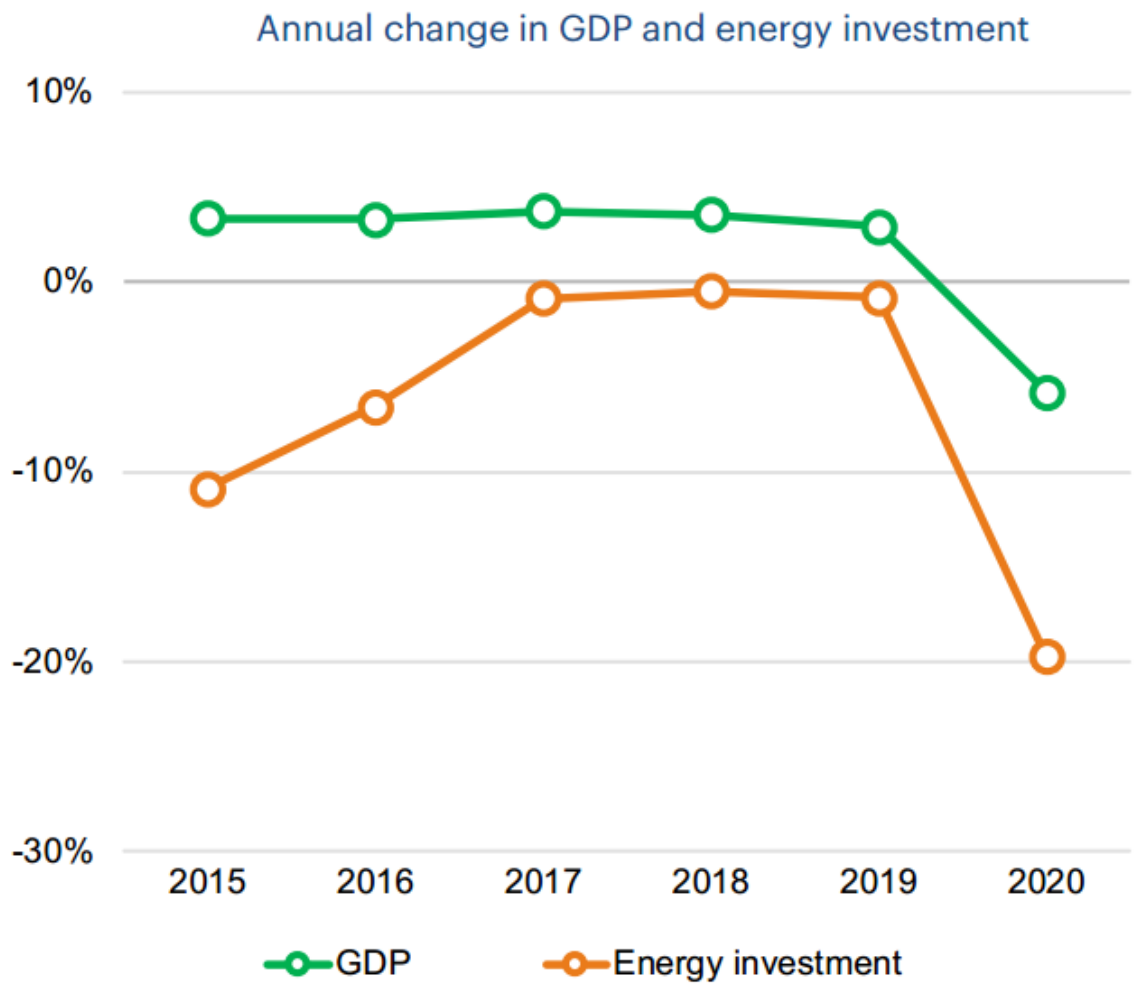
Investment & Finance

World Energy Investment by Sector

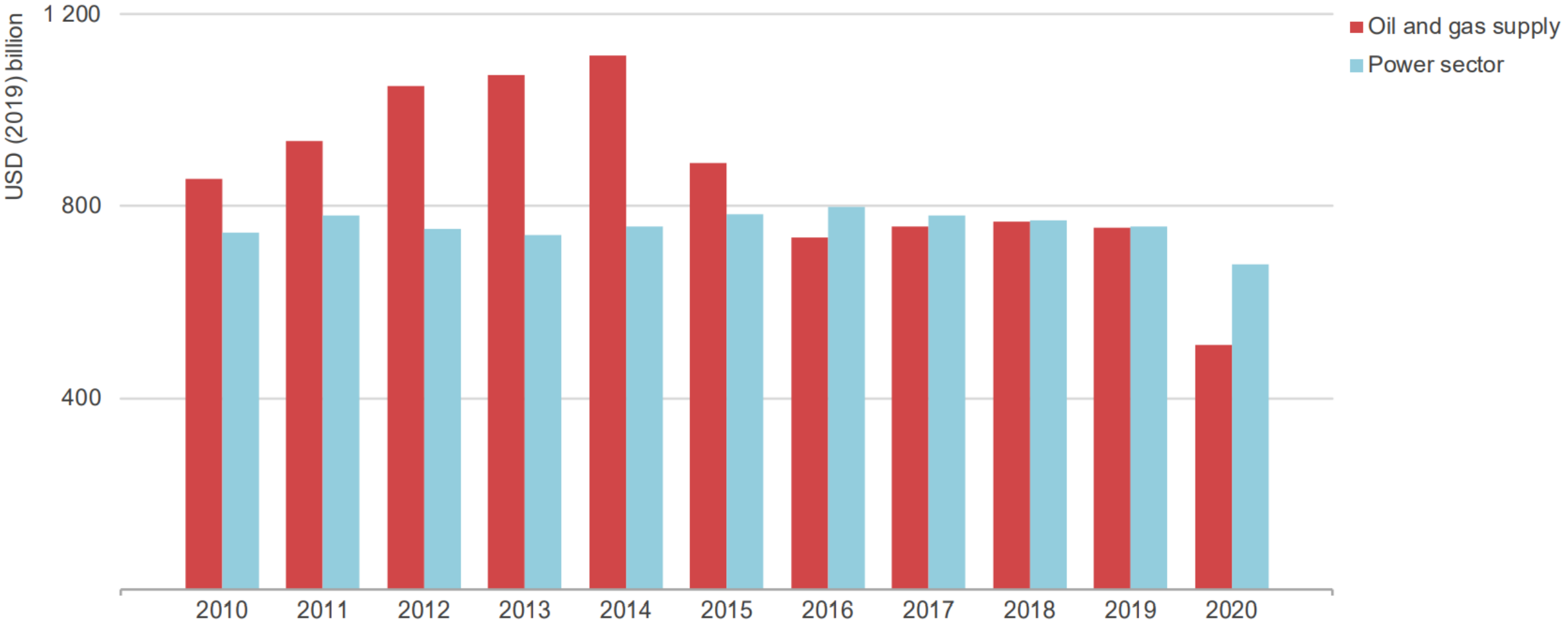


Energy Investment and GDP

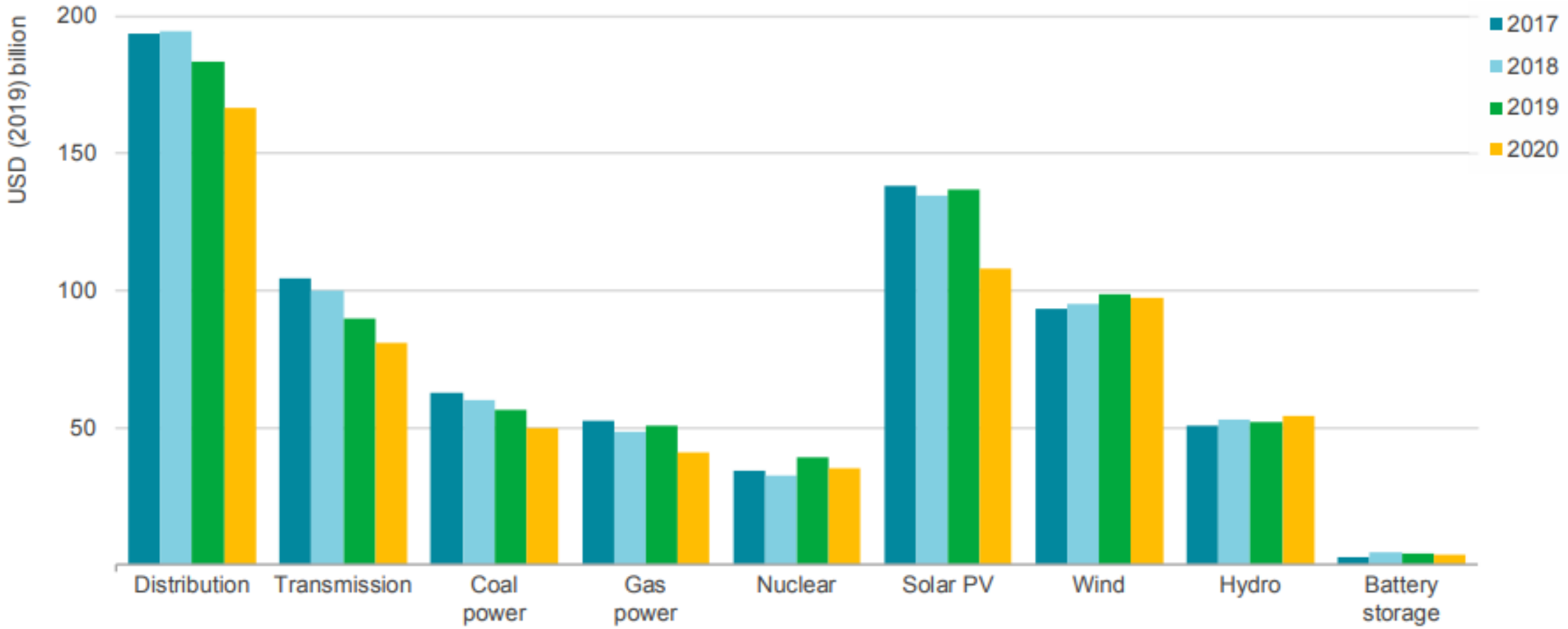




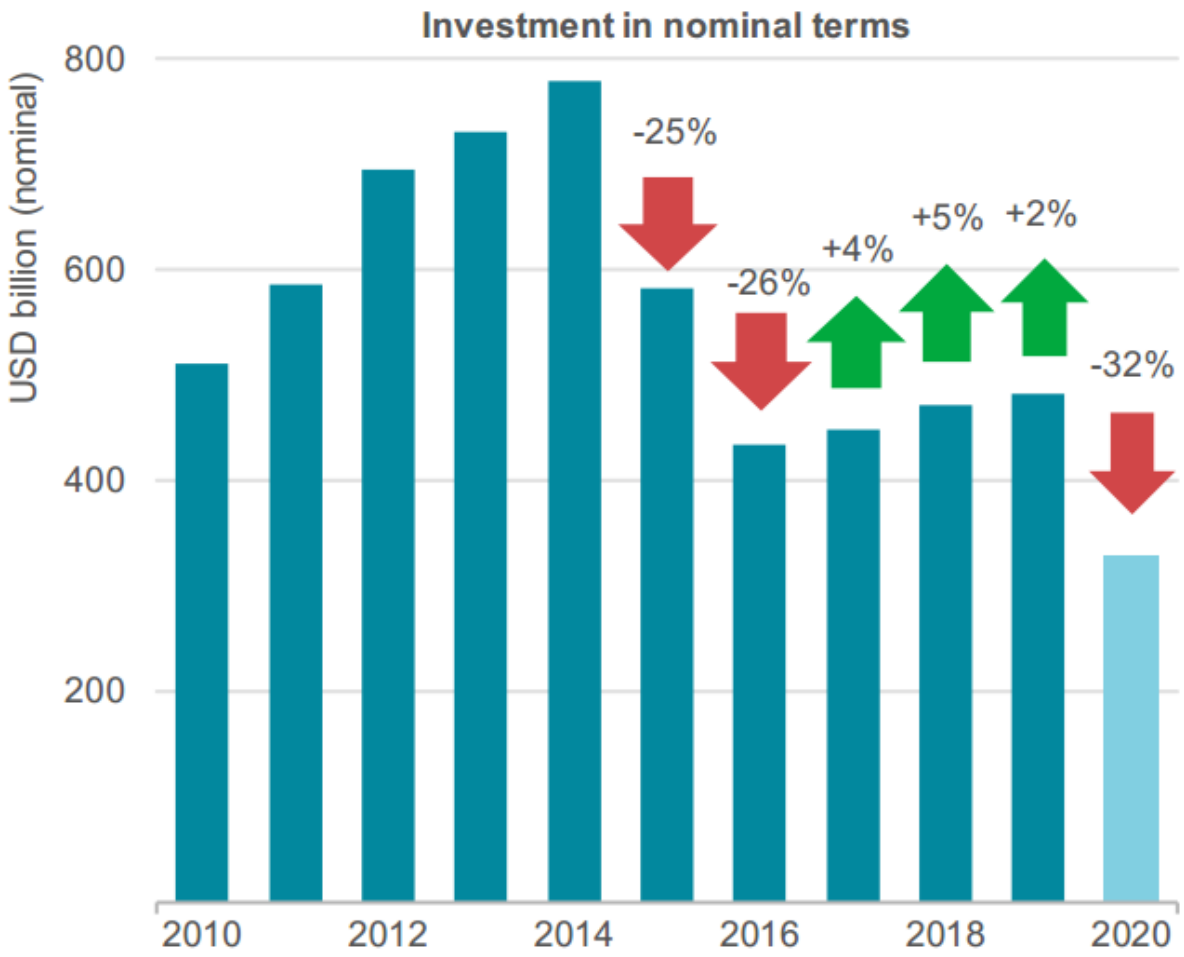
Global Investment in Energy Supply

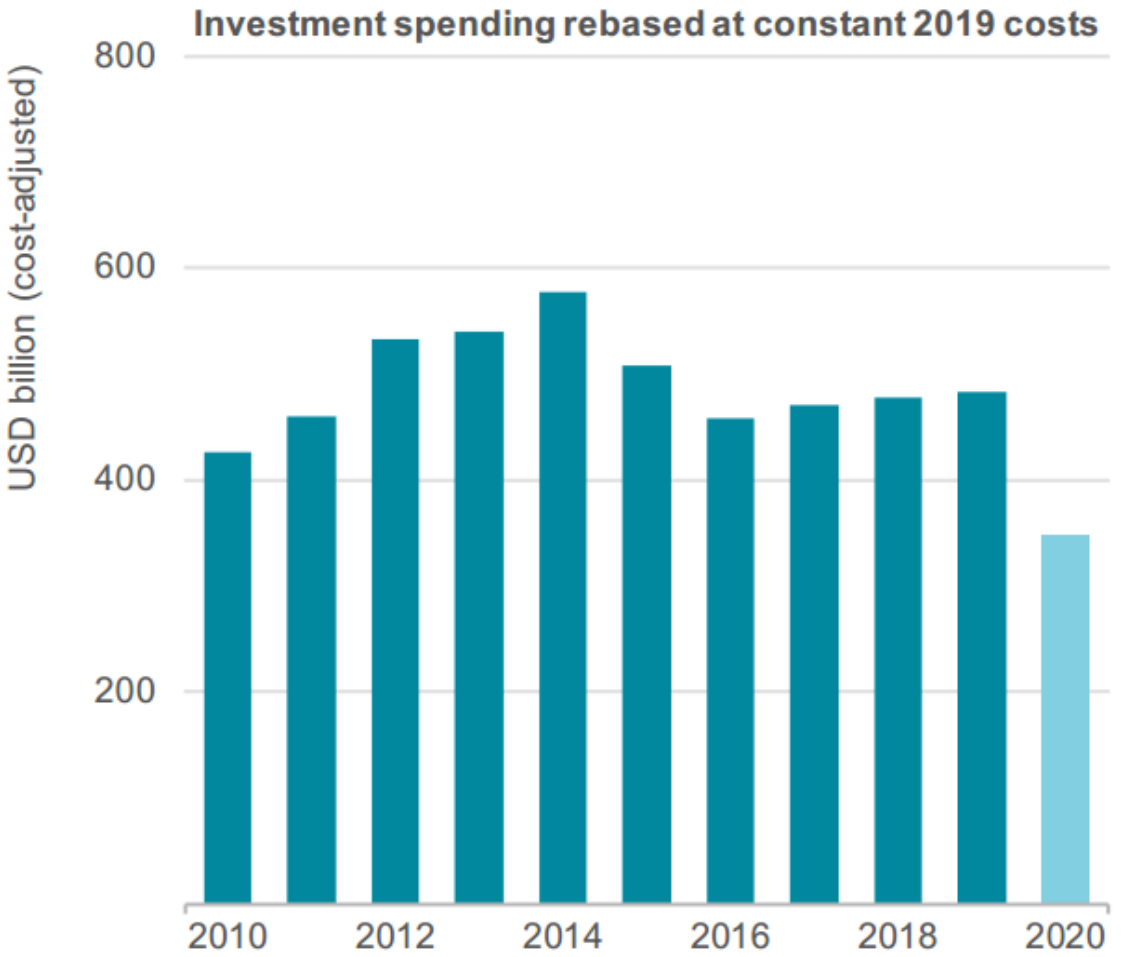


Global Investment in the Power Sector

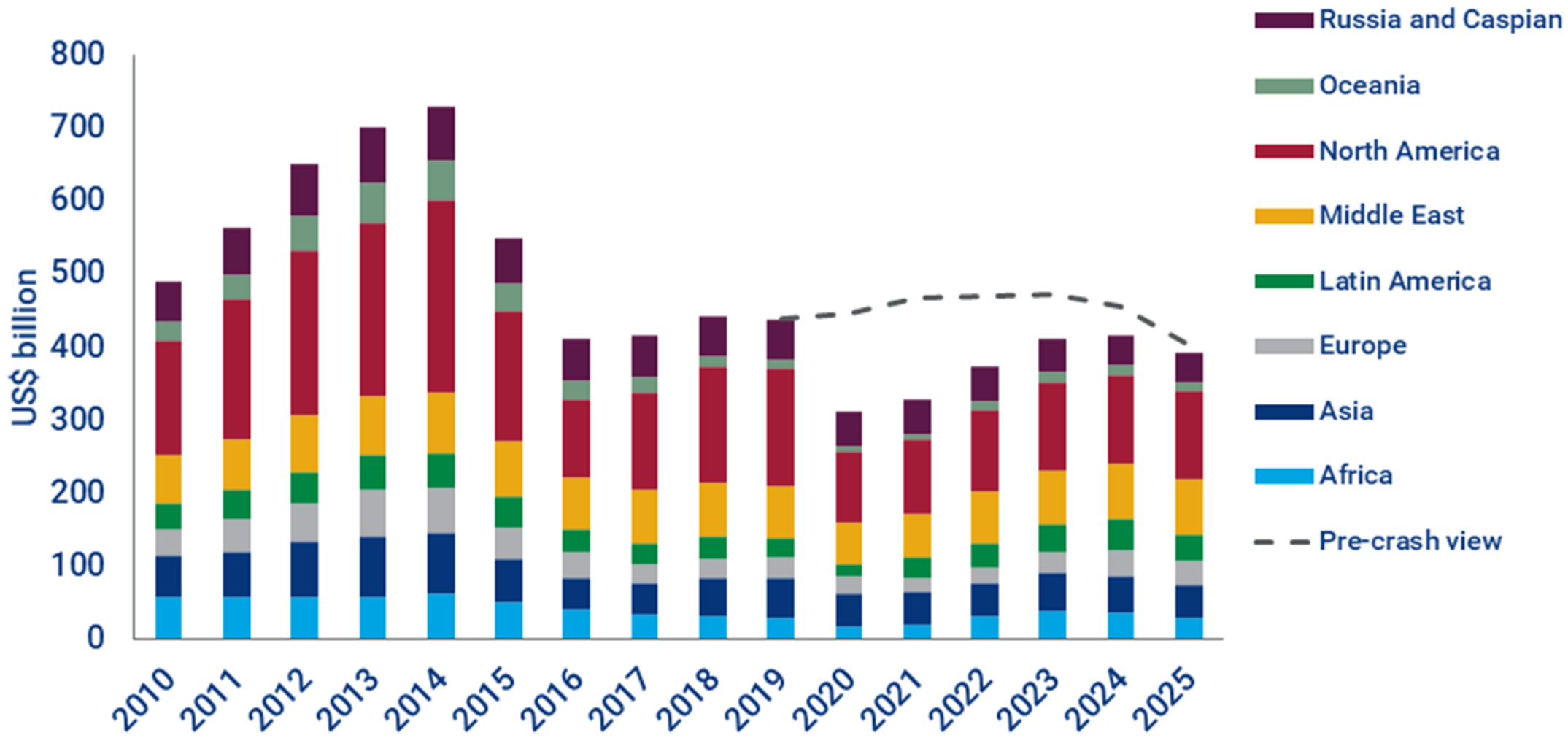


World Upstream Investment

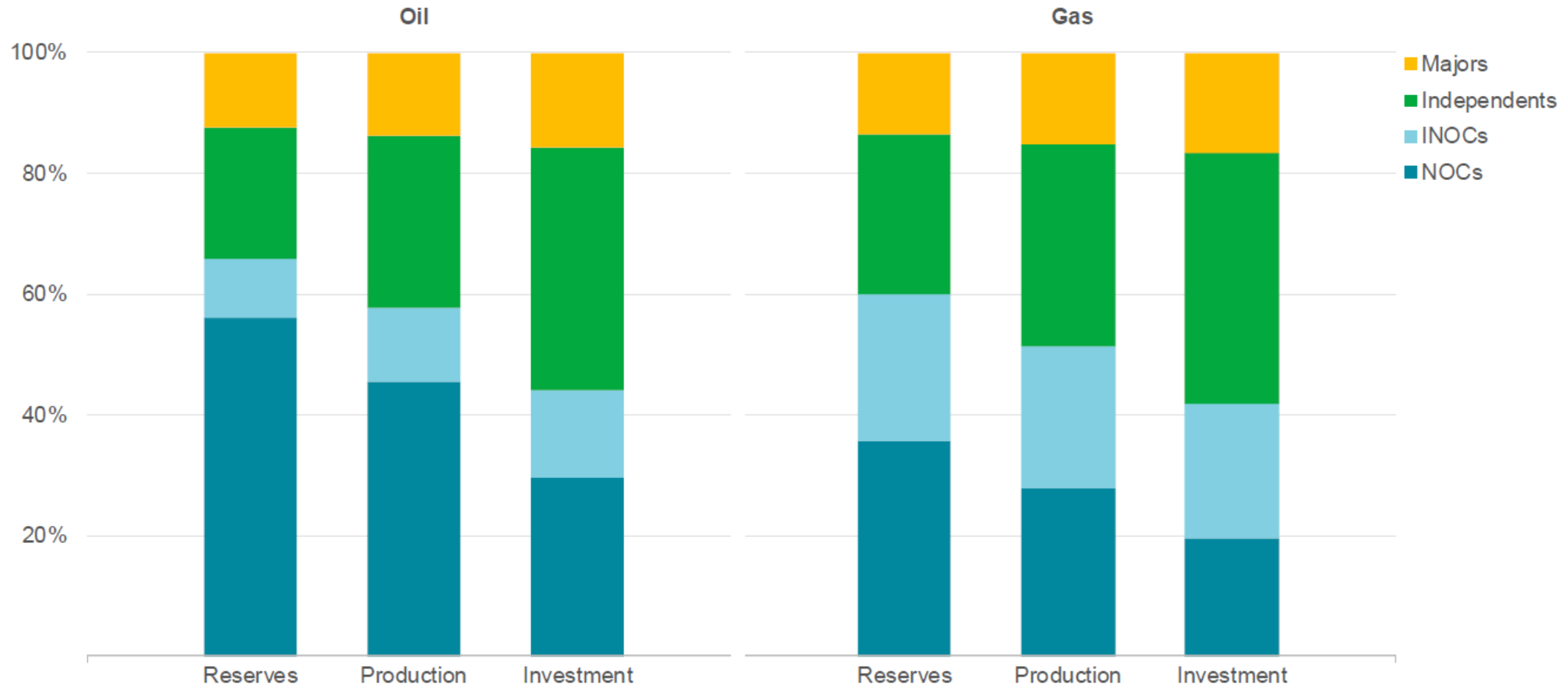




World Upstream Investment

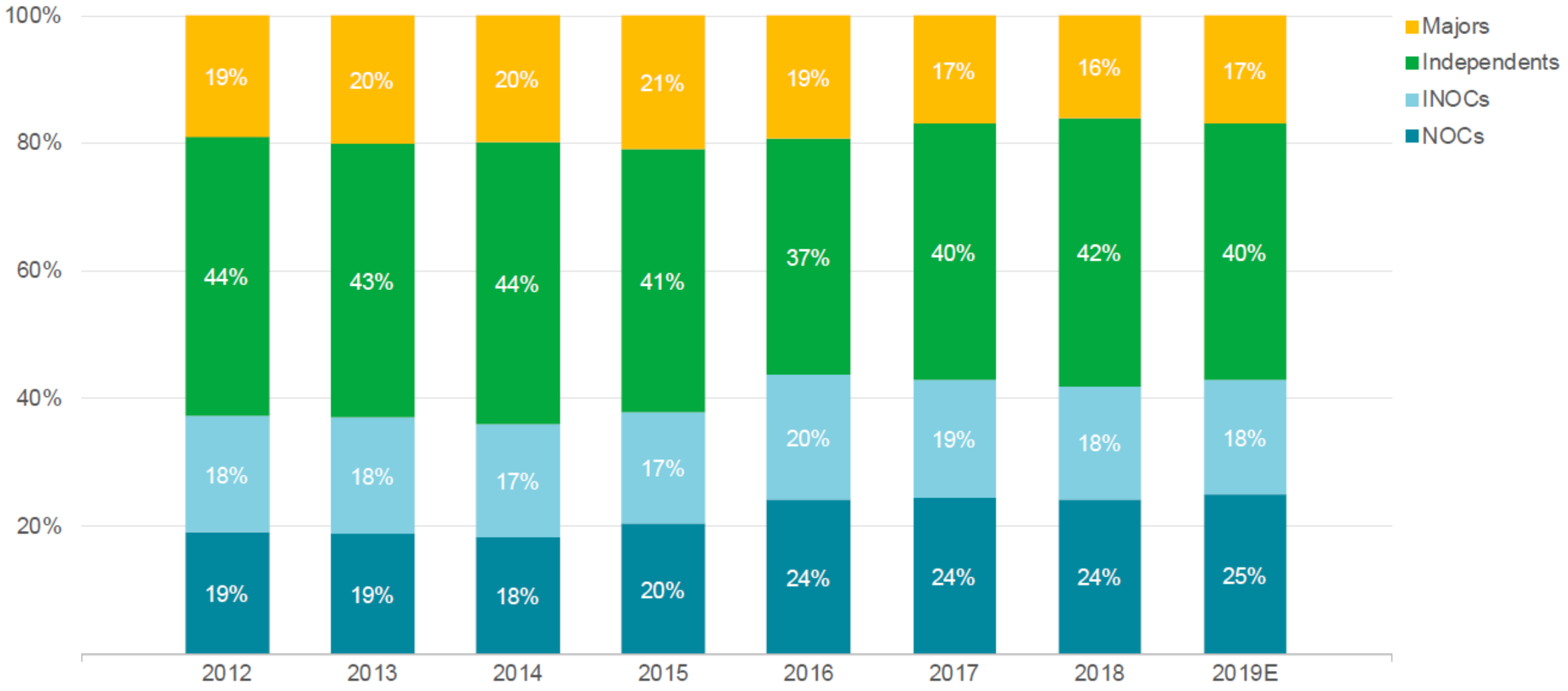


Ownership, Production & Investment

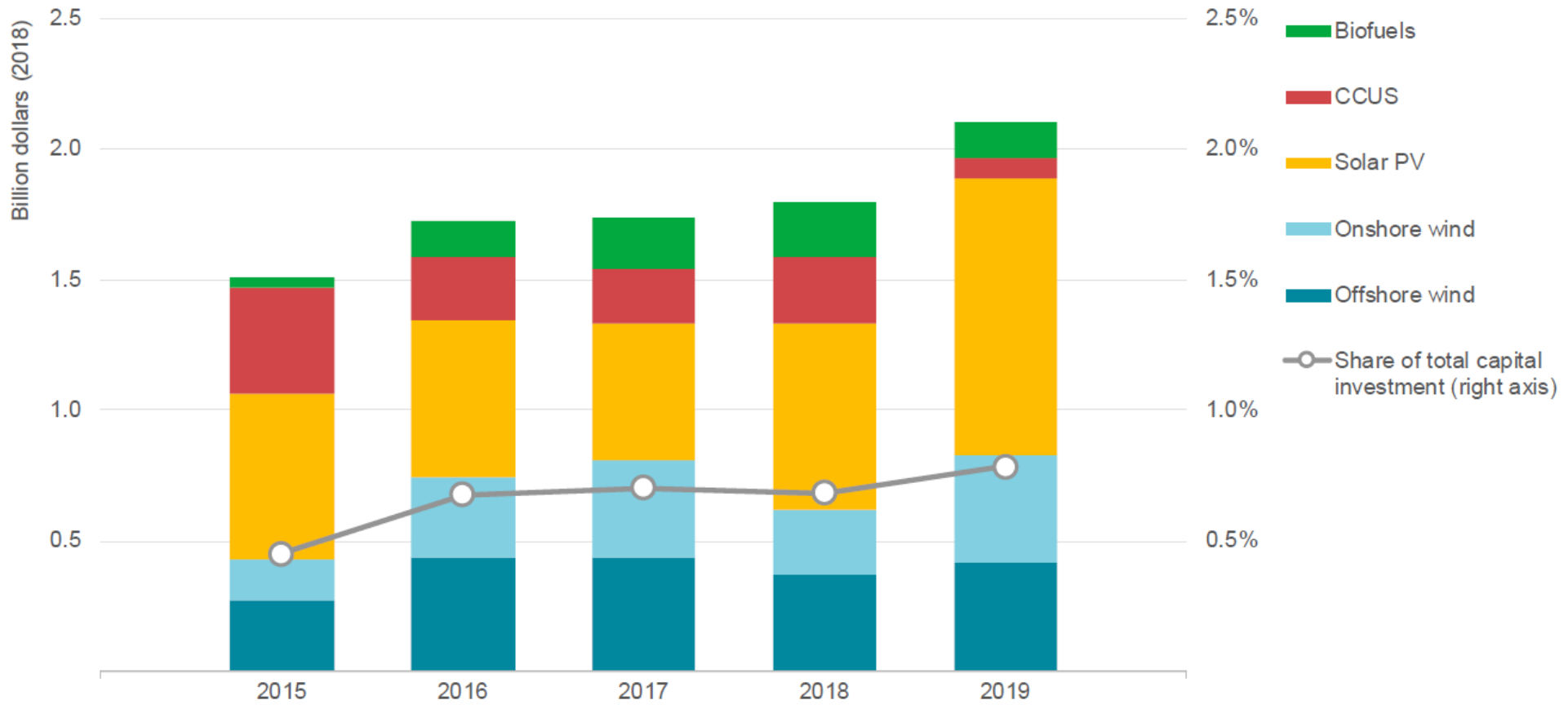


ote: *Oil* includes crude oil, condensate and natural gas liquids (NGLs).

Global Upstream Investment

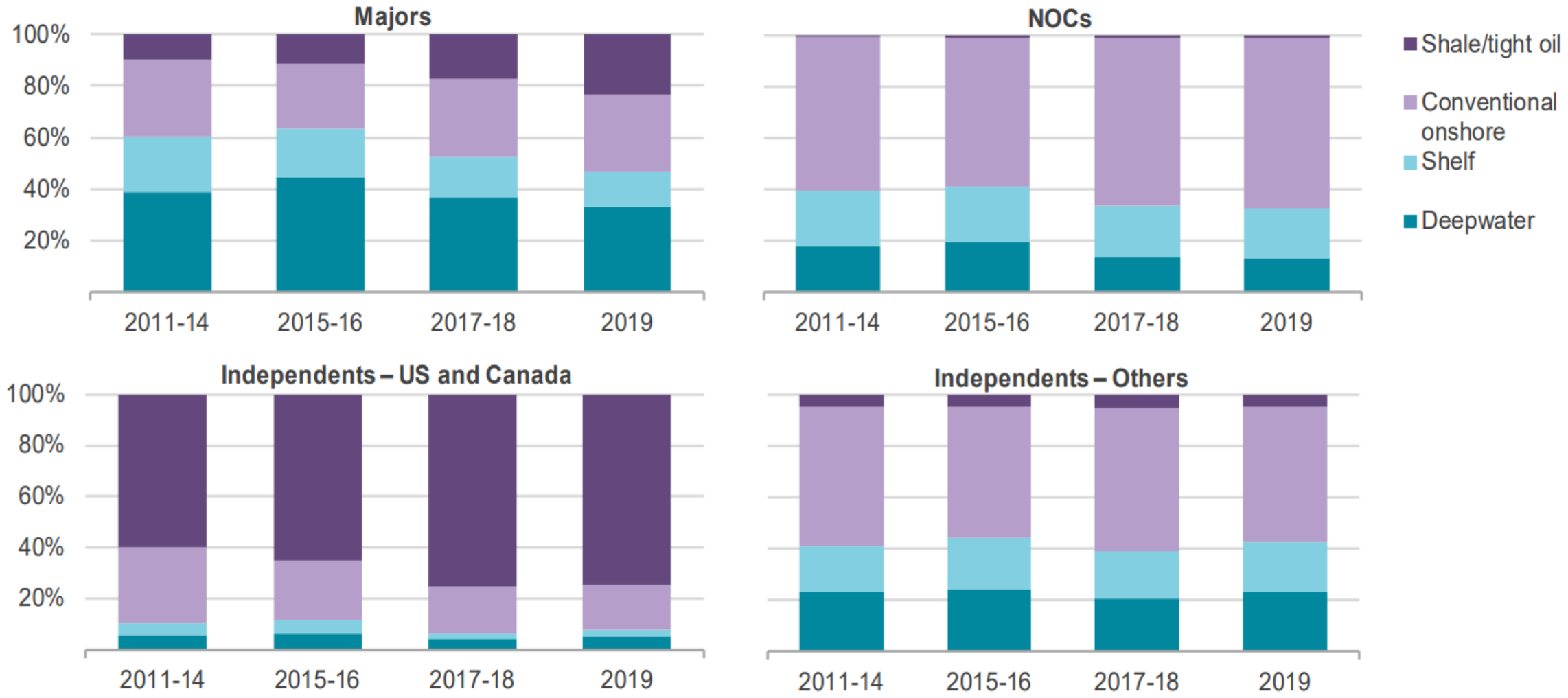


Capital Investment by Large Oil and Gas Companies

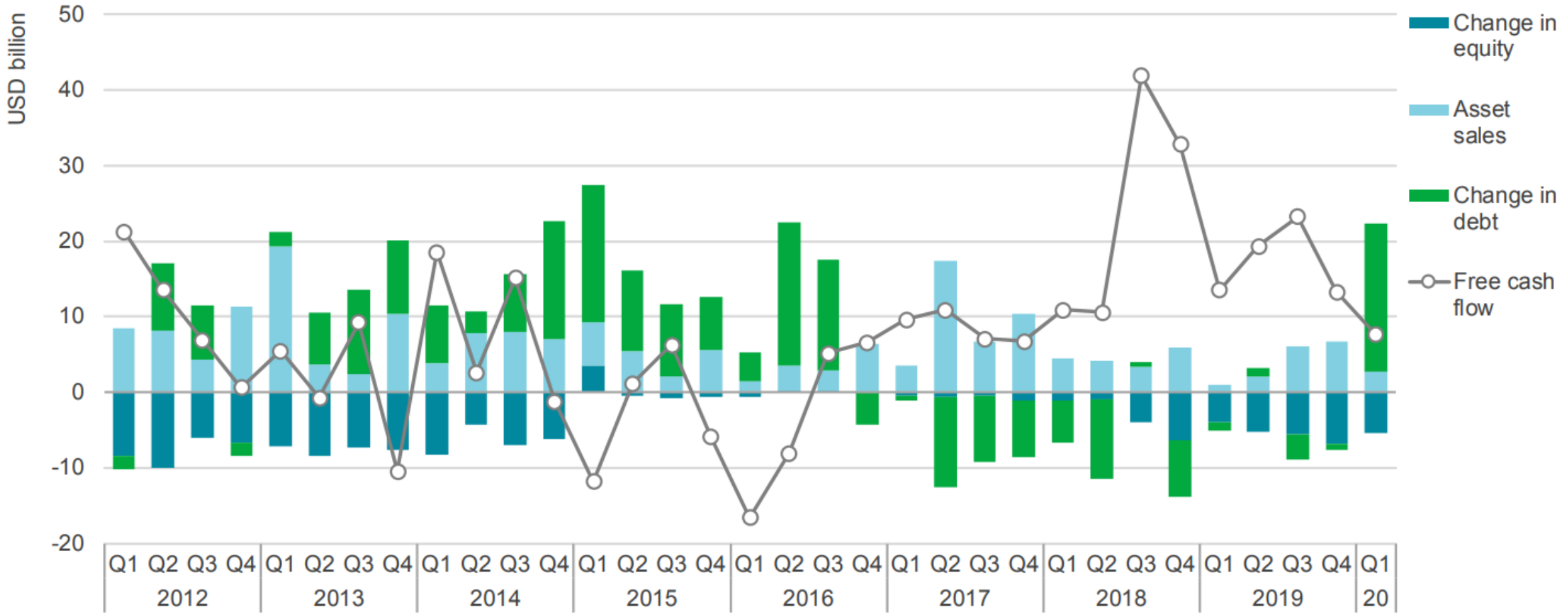


Notes: Capital investment is measured as the ongoing capital spending in new capacity from when projects start construction and are based on the owner's share of the project. Companies include the Majors and selected others (ADNOC, CNPC, CNOOC, Equinor, Gazprom, Kuwait Petroleum Corporation, Lukoil, Petrobras, Repsol, Rosneft, Saudi Aramco, Sinopec, Sonatrach). CCUS investment is in large-scale facilities; it includes developments by independent oil and gas companies in Canada and China and capital spend undertaken with government funds.

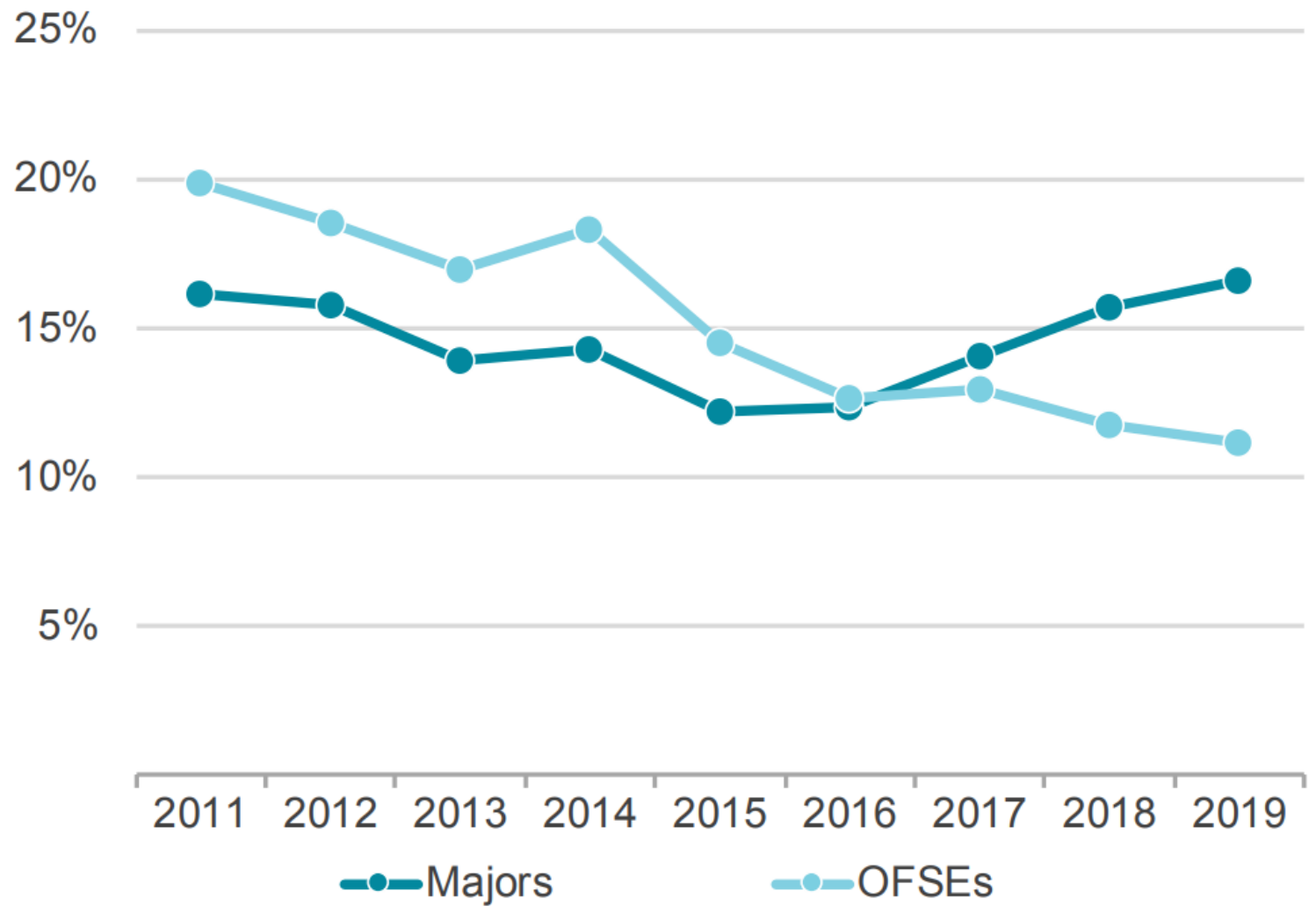
Allocation of Upstream Investment by Resource Type and Company Type



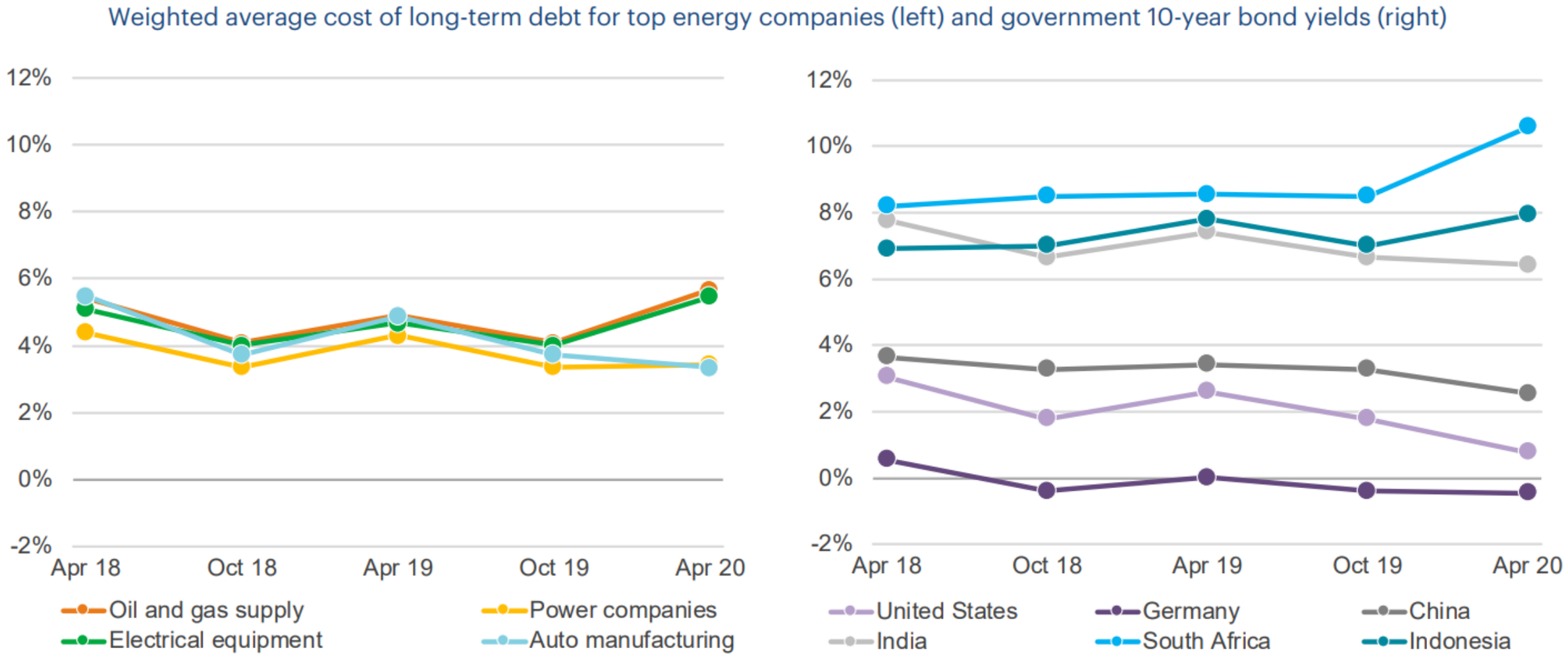
Majors' Indicative Sources of Finance and FCF



EBITDA Margins by Oil and Gas Company Type

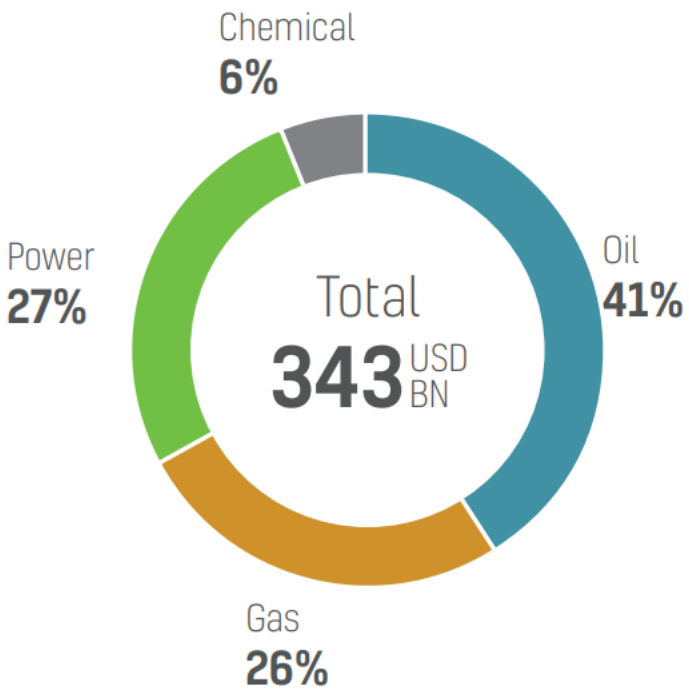


Cost of Debt for Energy Companies

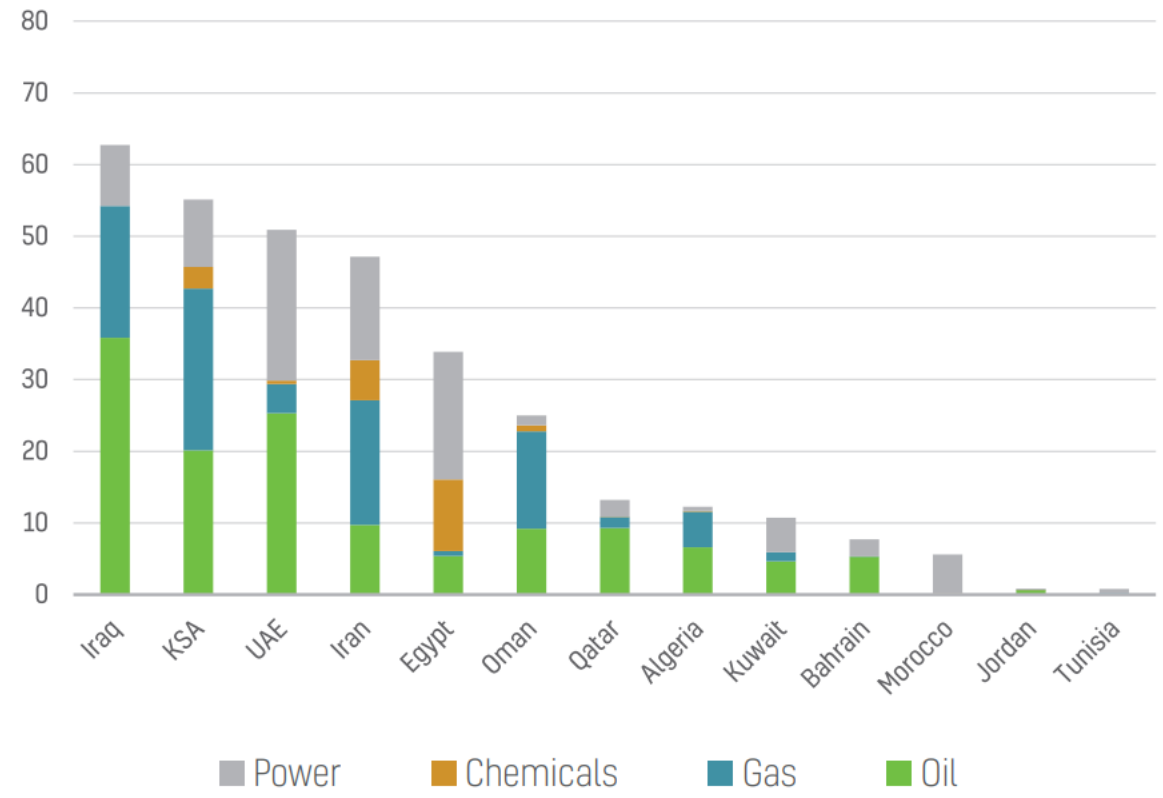


MENA Energy Investment

MENA 2020-24 Committed Projects by Industry



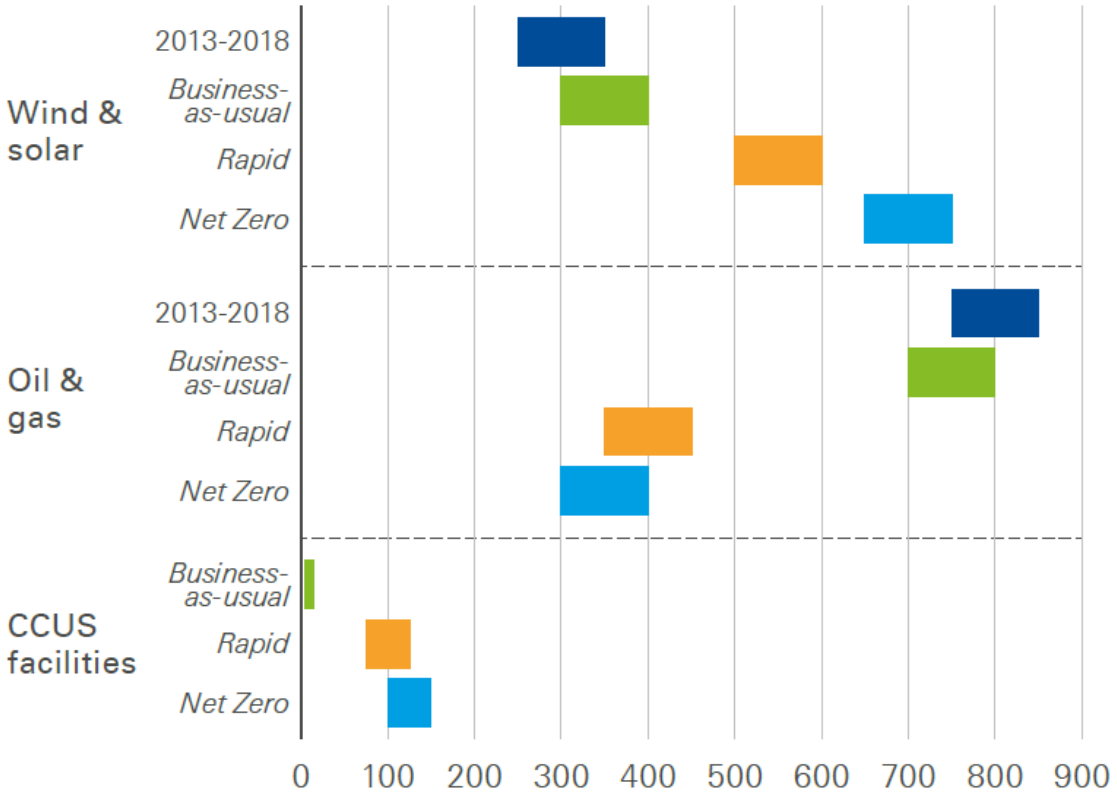
Committed MENA Energy Investment (USD Bn)



Energy Investment Pattern

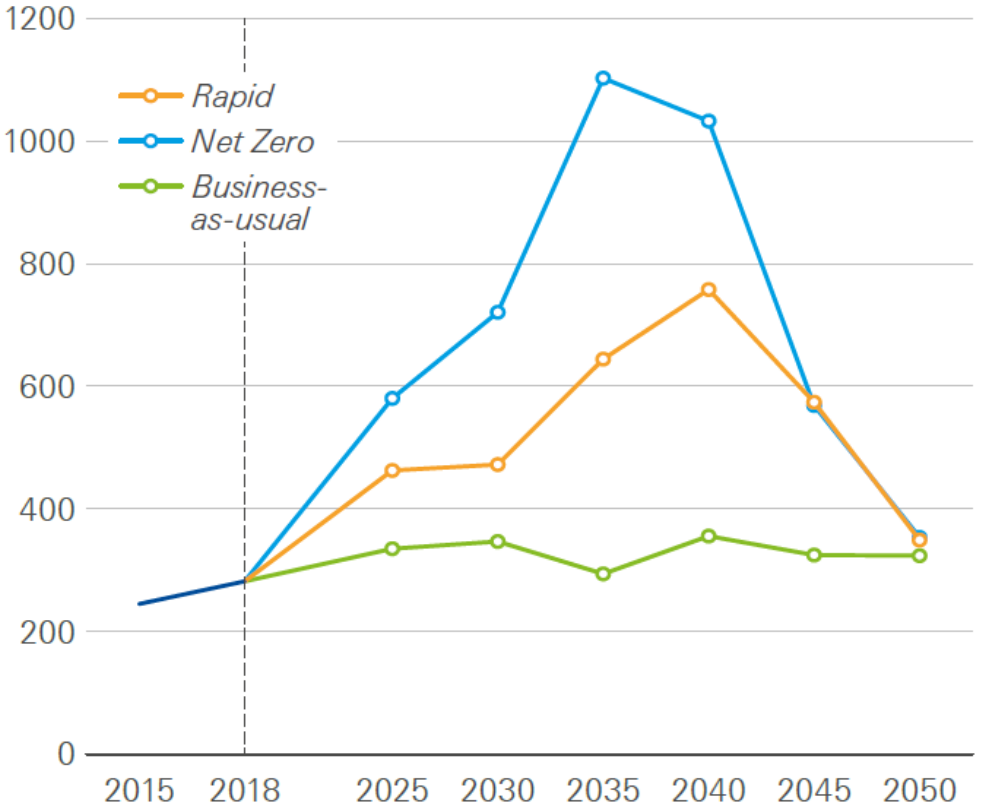
Average annual investment, history and 2020-2050

2018 US$ Billion

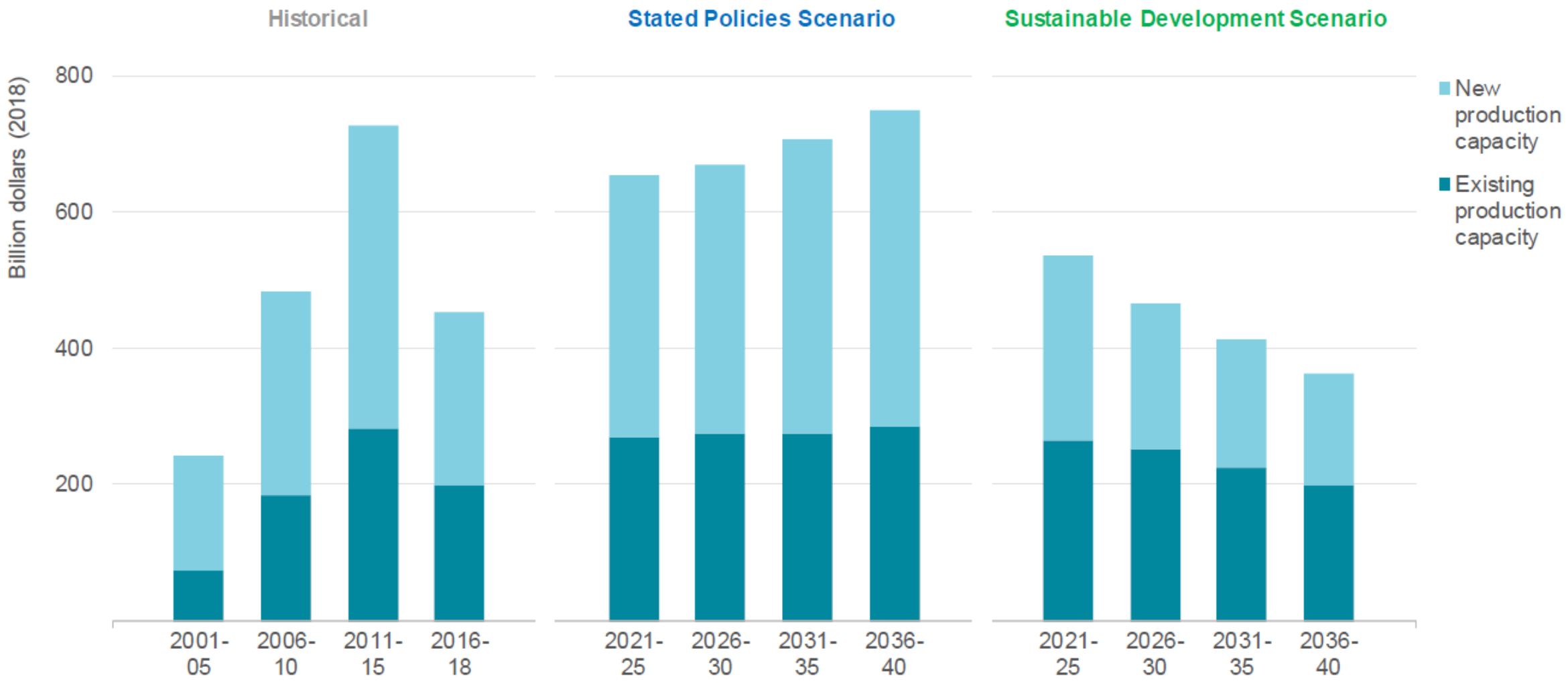


Average annual investment in wind and solar

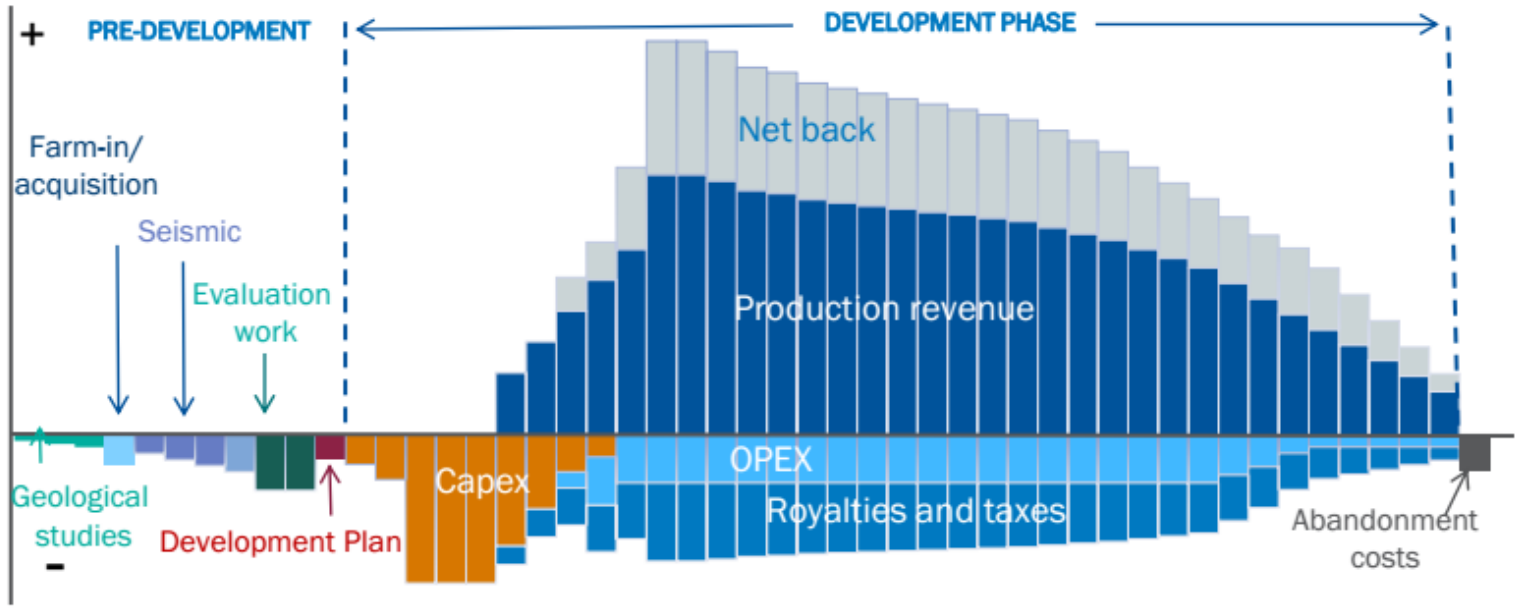
Five-year rolling average, 2018 US$ Billion



Average Annual Upstream Investment

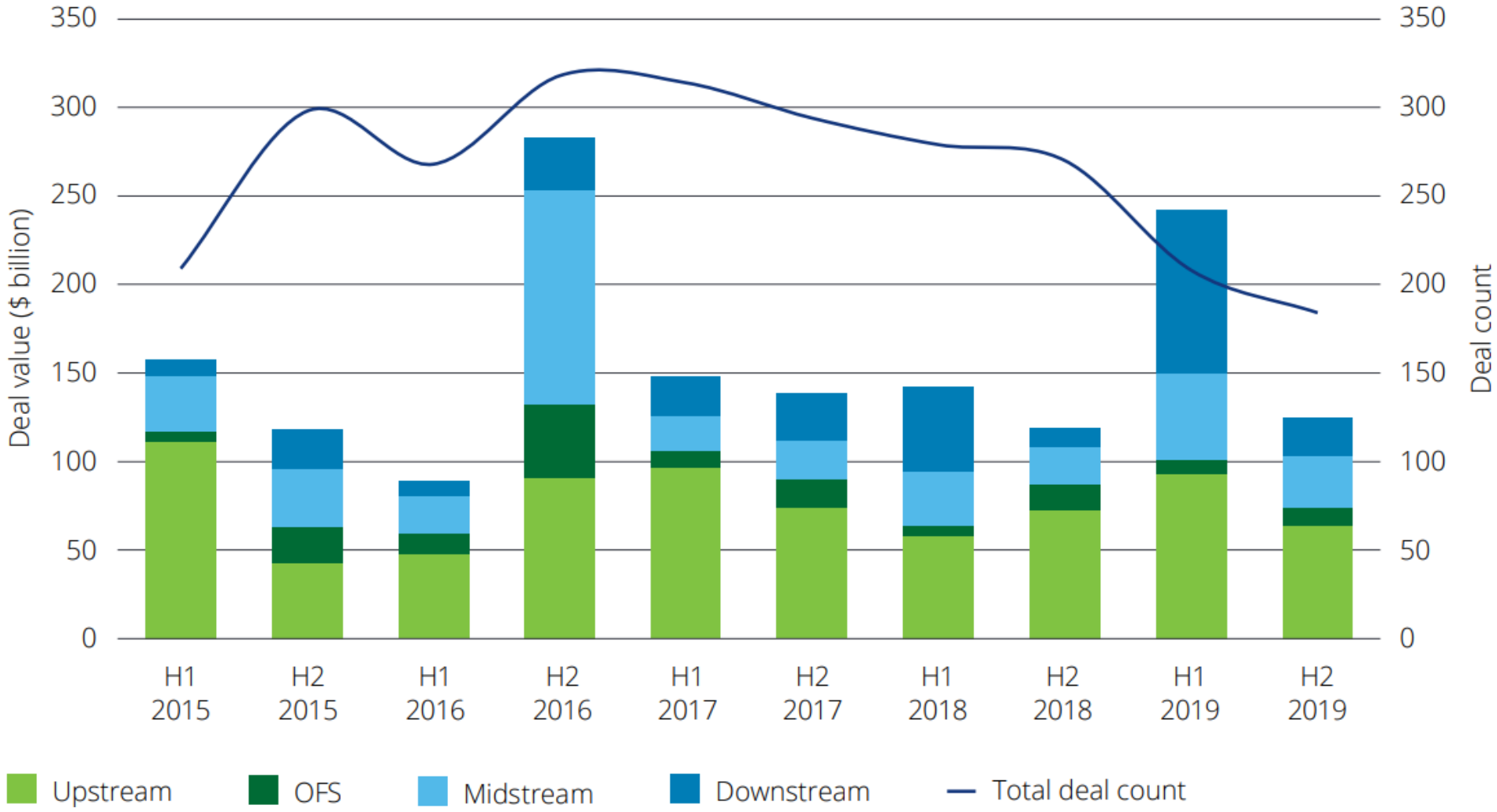


Typical Upstream Project



Project cycle	Exploration	Appraisal and Development	Production	Abandonment
Main risks	Reserves risk	Design risk Engineering risk Construction risk	Operational risk, Supply risk, Offtake risk, Commodity risk, Repayment risk	Environmental risk
Sources of political risk	Exploration licence	Production licence Environmental permit	Expropriation, Currency convertibility, Tax changes (CT, royalties etc), VAT and Export duty exposure, fines	

M&A in Oil and Gas Industry



M&A Drivers in the Upstream Oil & Gas

Upstream

- Economy of scale
- Regional focus
- Product mix
- Focusing on core assets
- Portfolio optimization

OFS

- Economy of scale
- Regional considerations
- Integrated solutions
- Capital restructuring
- Vertical/Horizontal integrations

Peak Oil

Peak Oil

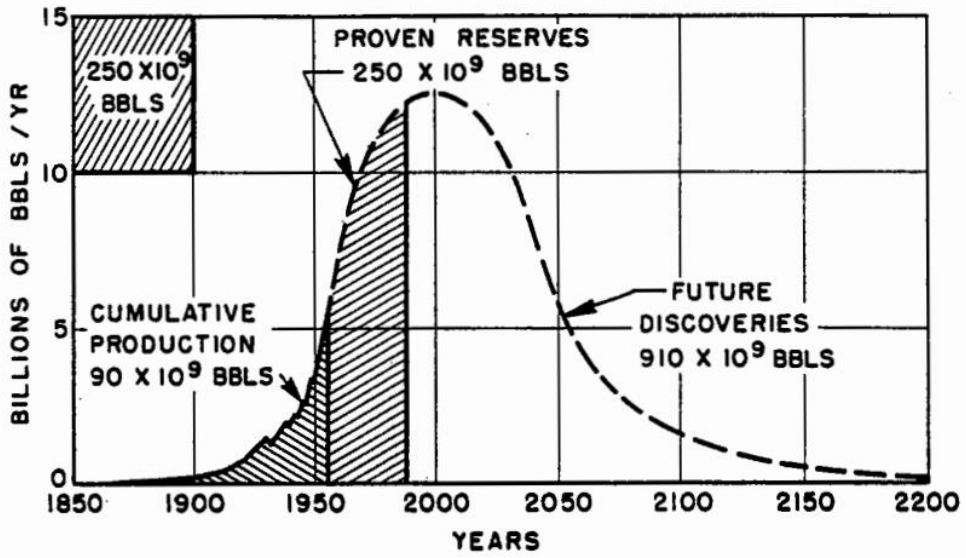


Figure 20 – Ultimate world crude-oil production based upon initial reserves of 1250 billion barrels.

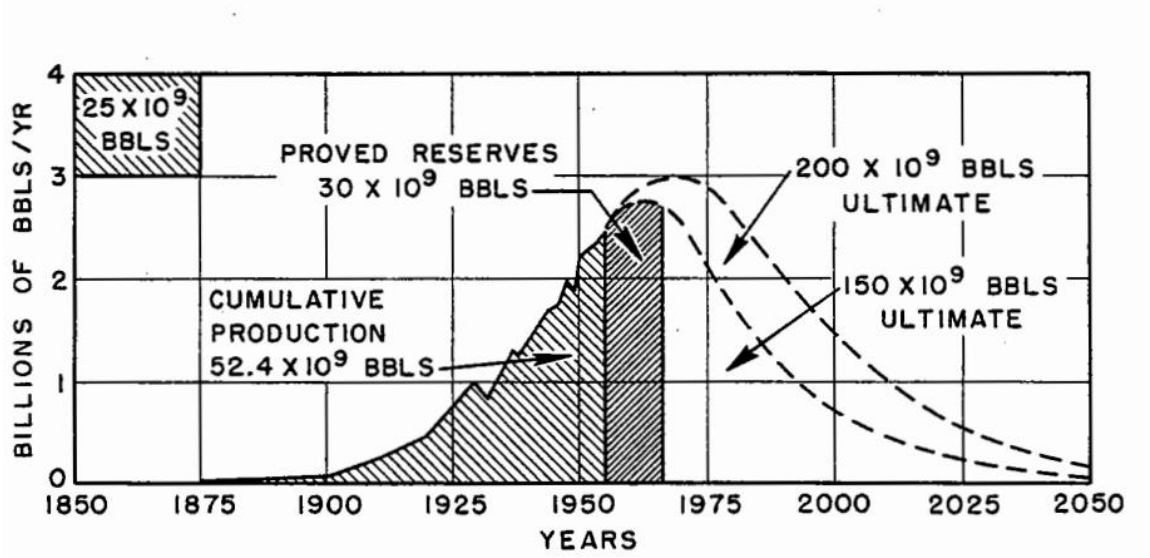


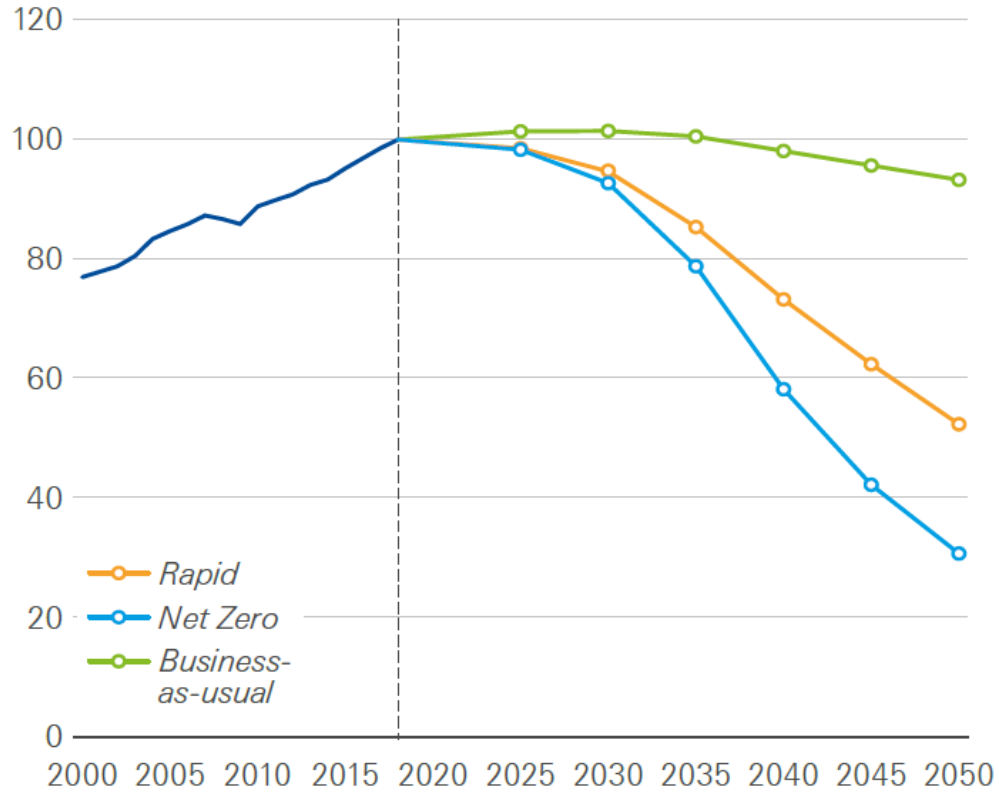
Figure 21 – Ultimate United States crude-oil production based on assumed initial reserves of 150 and 200 billion barrels.

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

Liquid Fuels Demand & Supply

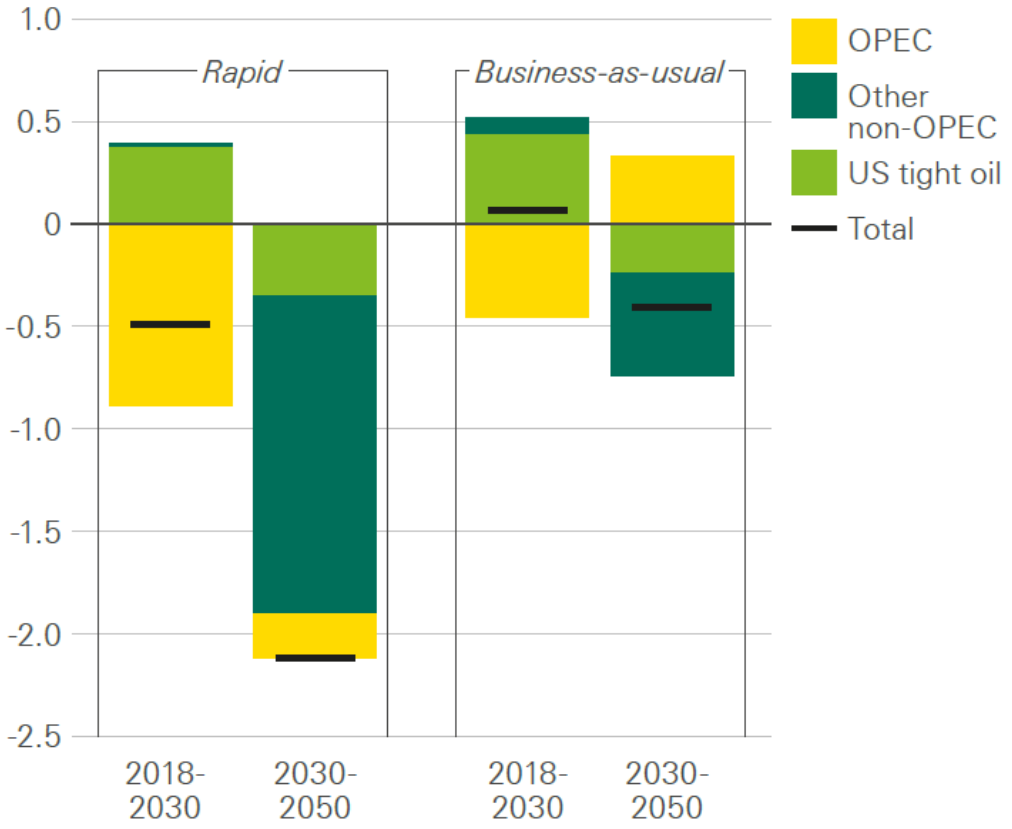
Liquid fuels consumption

Mb/d



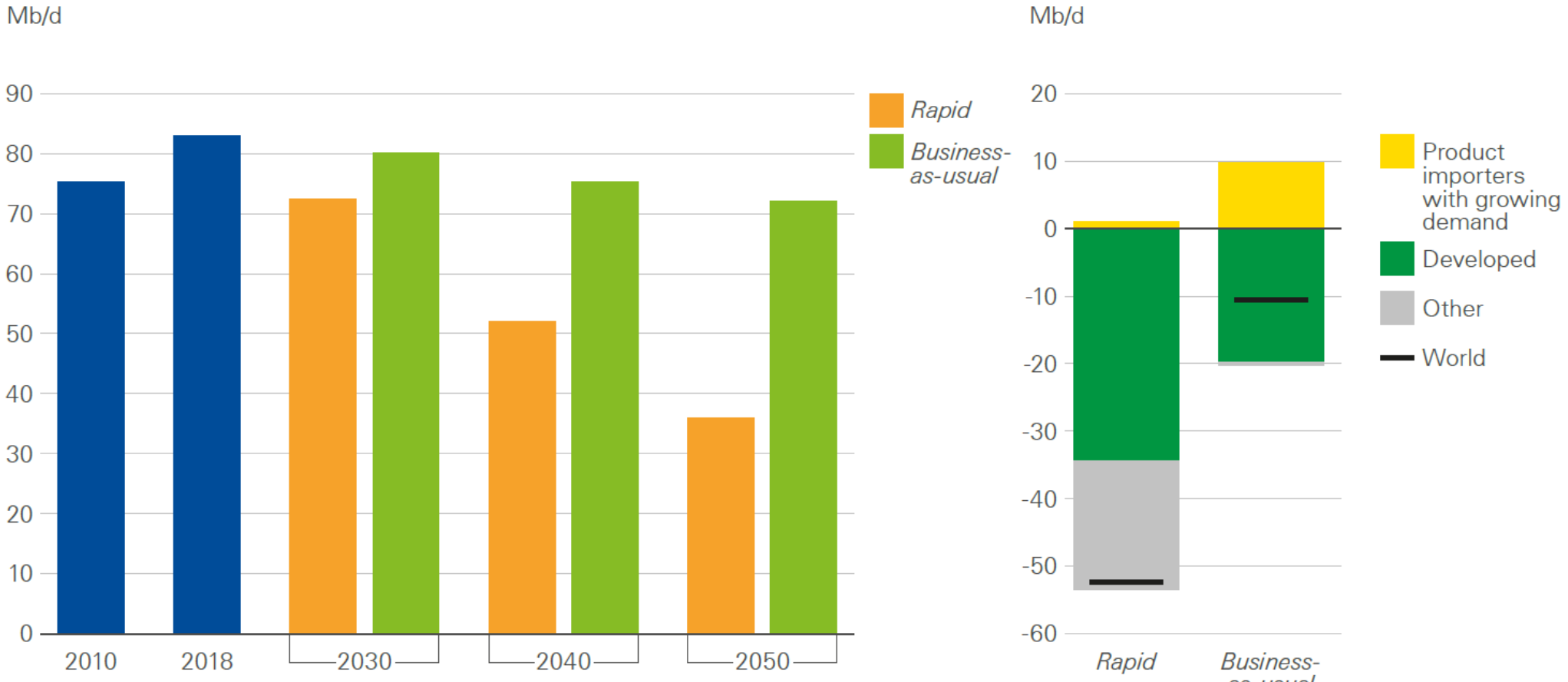
Liquid fuels supply growth

Mb/d, average annual growth



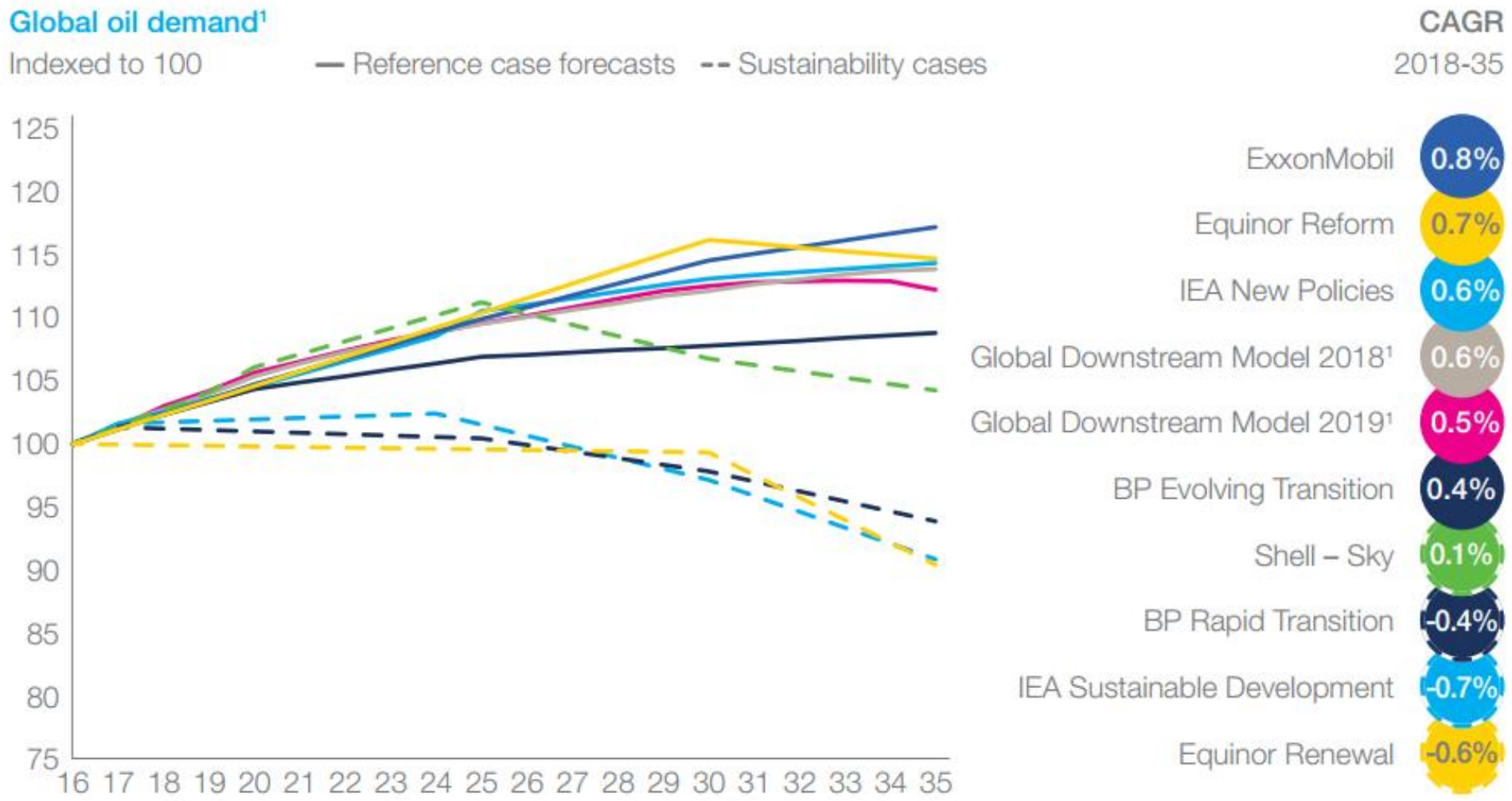
Refining Outlook

Refinery throughput



Refining capacity changes, 2018-2050

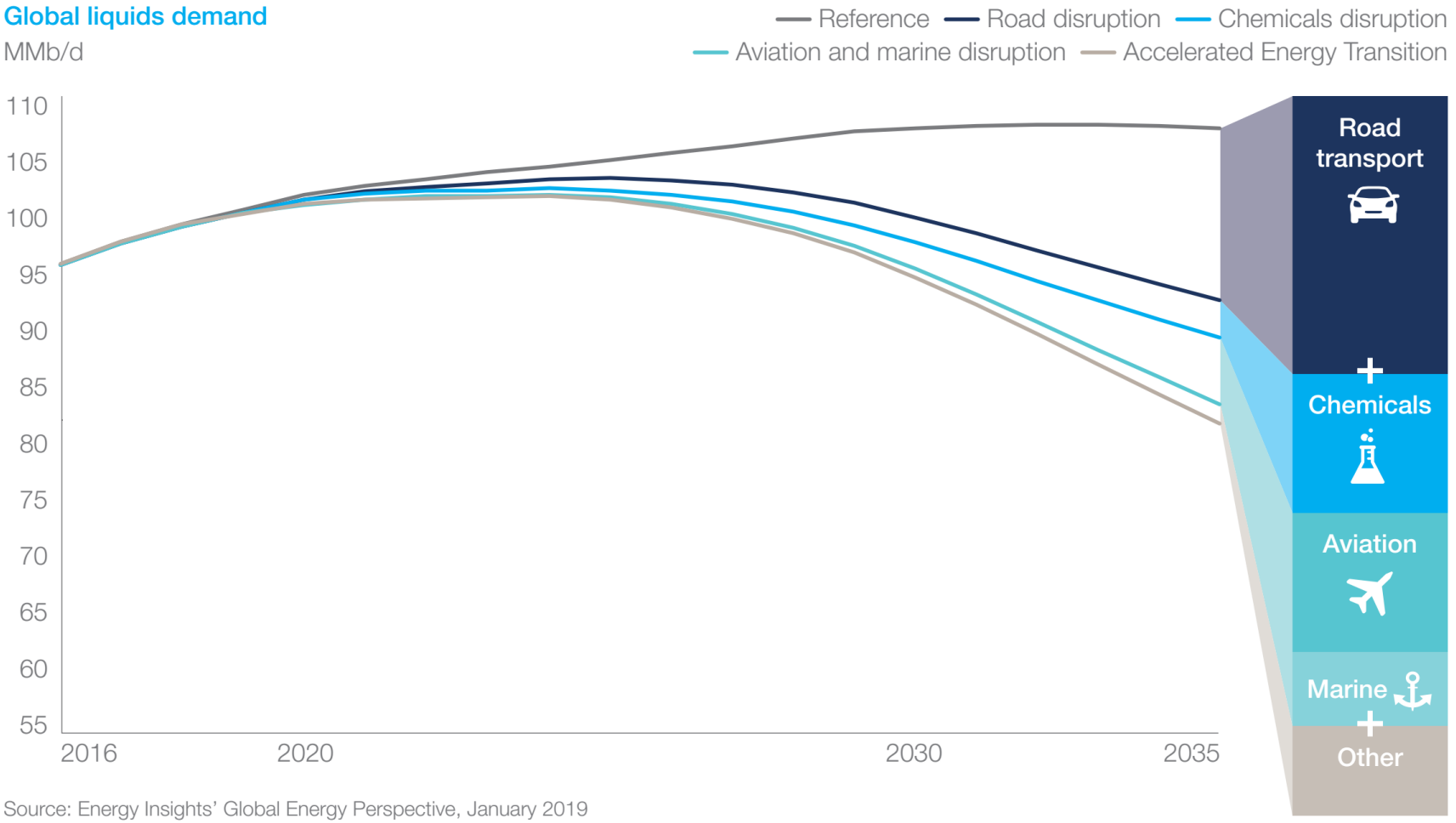
Peak Oil Scenarios



McKinsey & Company

Global liquids demand

MMb/d



Source: Energy Insights' Global Energy Perspective, January 2019

Reference Case
Additional in Accelerated Energy Transition case

EV passenger car penetration

EVs as % of global new passenger car sales

2018	1		
2035	46	33	78

EV commercial vehicle penetration

EVs as % of global new truck car sales

2018	<1		
2035	26	22	49

Plastics recycling

% polyethylene from recycled feedstock

2018	4		
2035	10	13	23

Alternative fuels uptake

% biofuels, natural gas, and electricity in the fuel mix

2018	0		
2035		31	

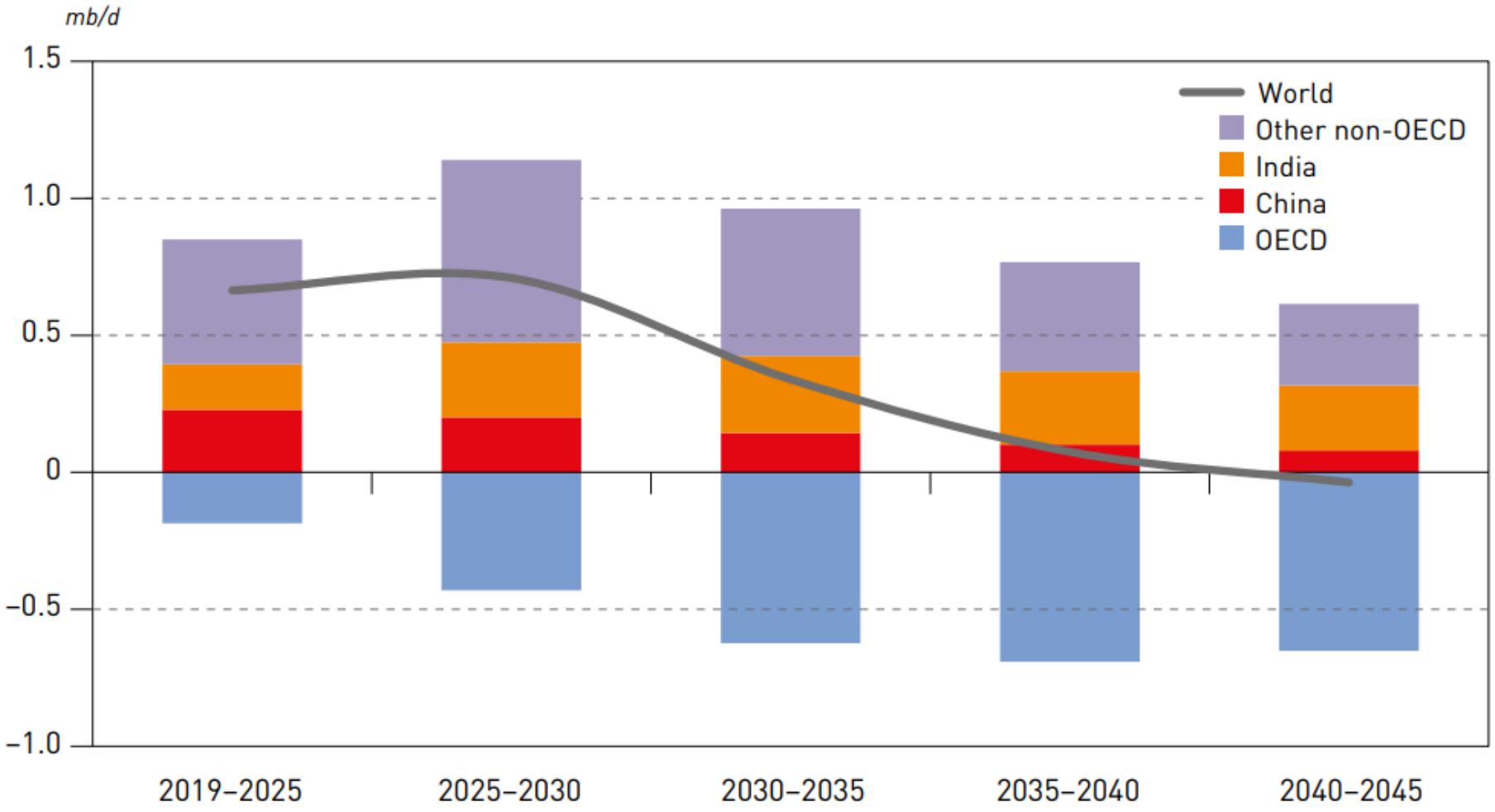
2018	0		
2035	27	14	42

Other

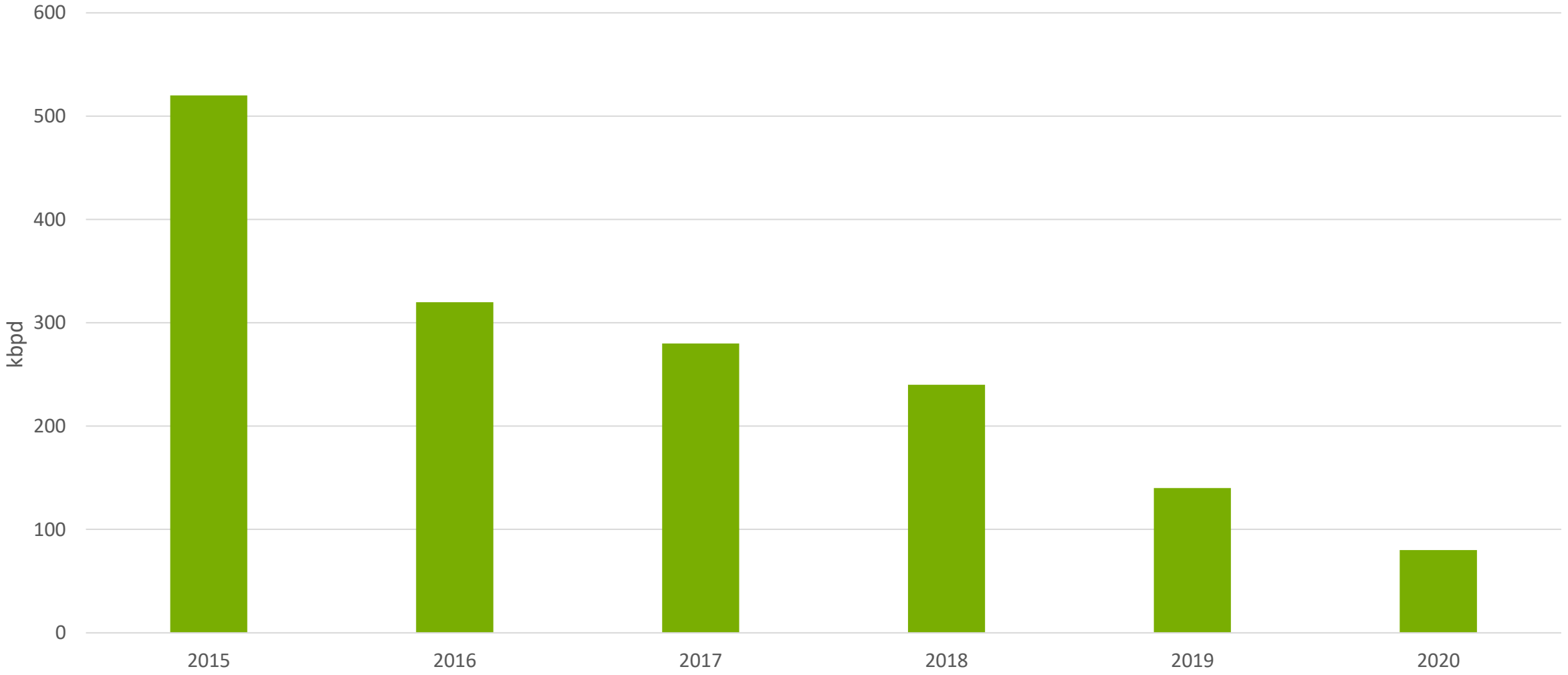
Heat and cooking electrification; industry electrification; and other transport and other energy sectors

McKinsey & Company

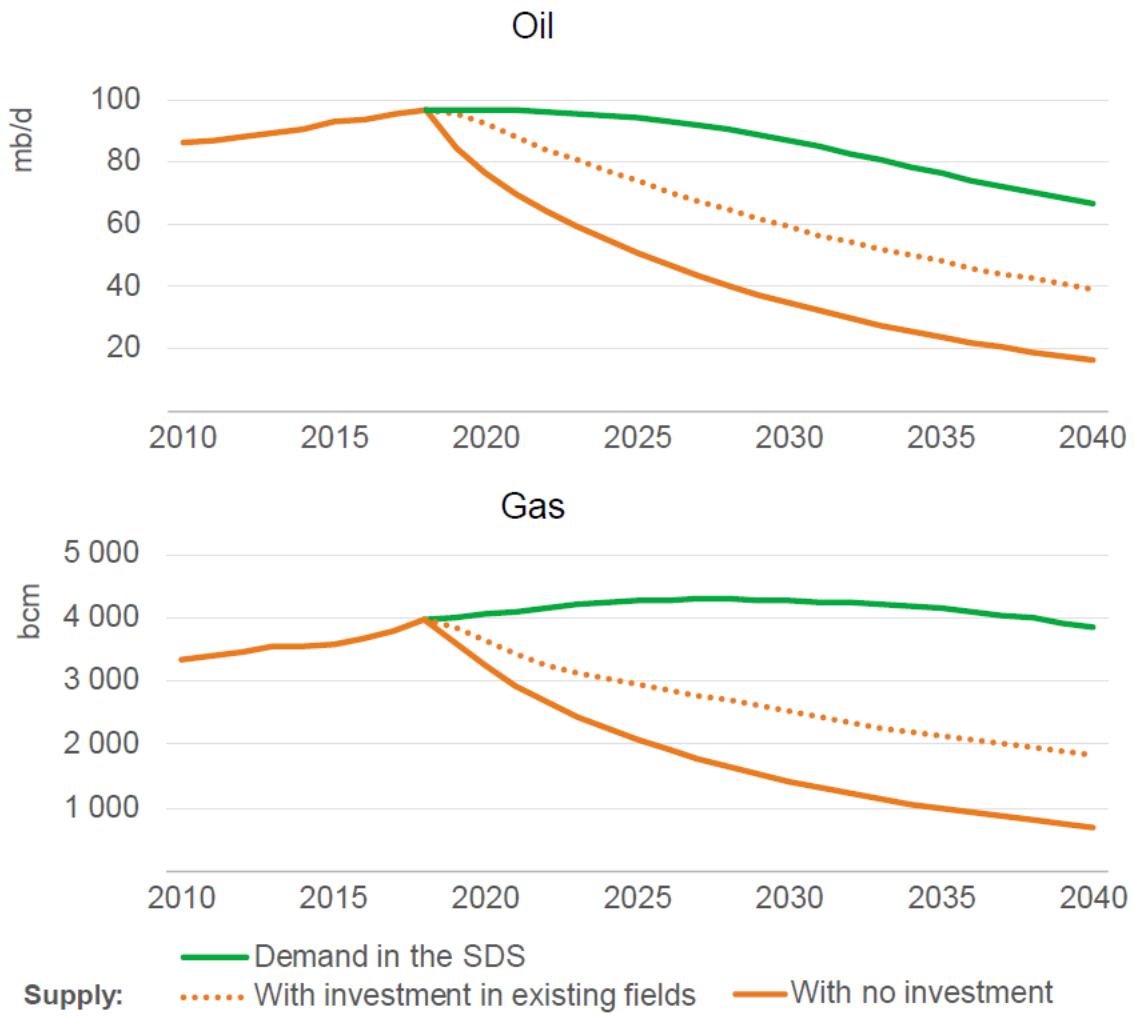
Average Annual Oil Demand Growth



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

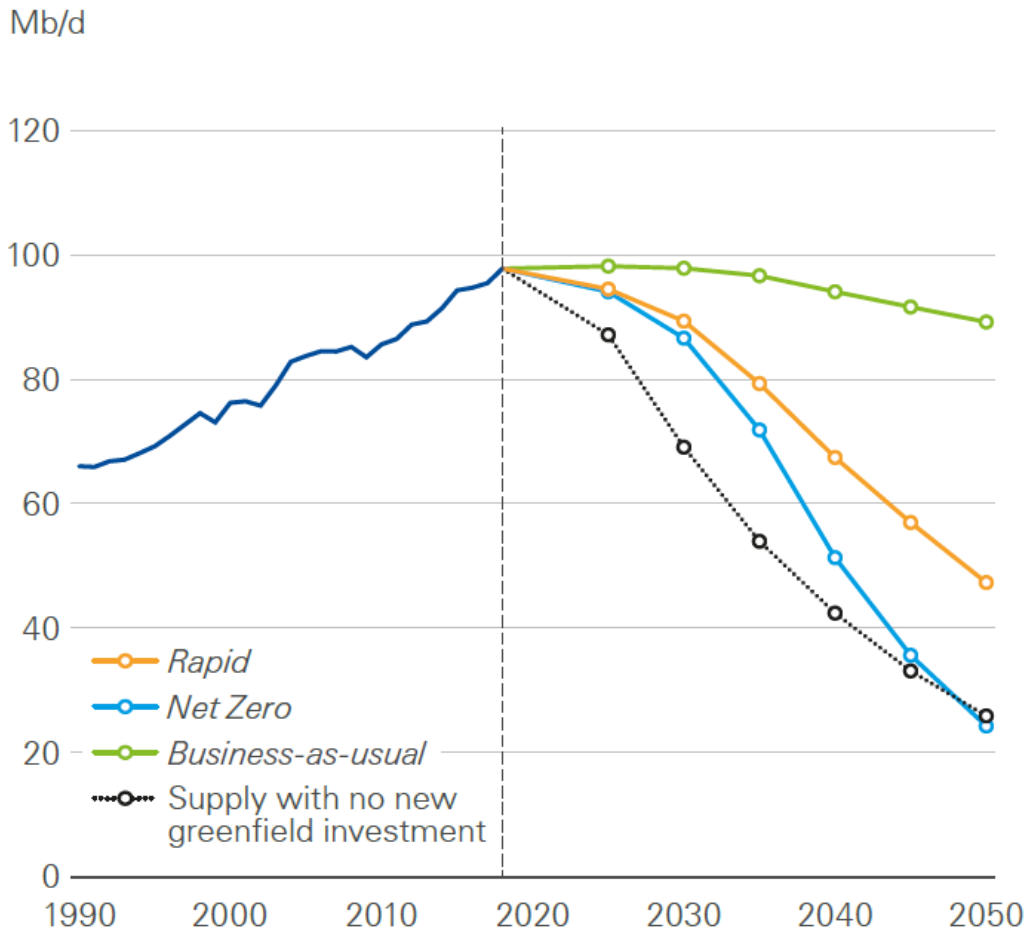


Required Investments

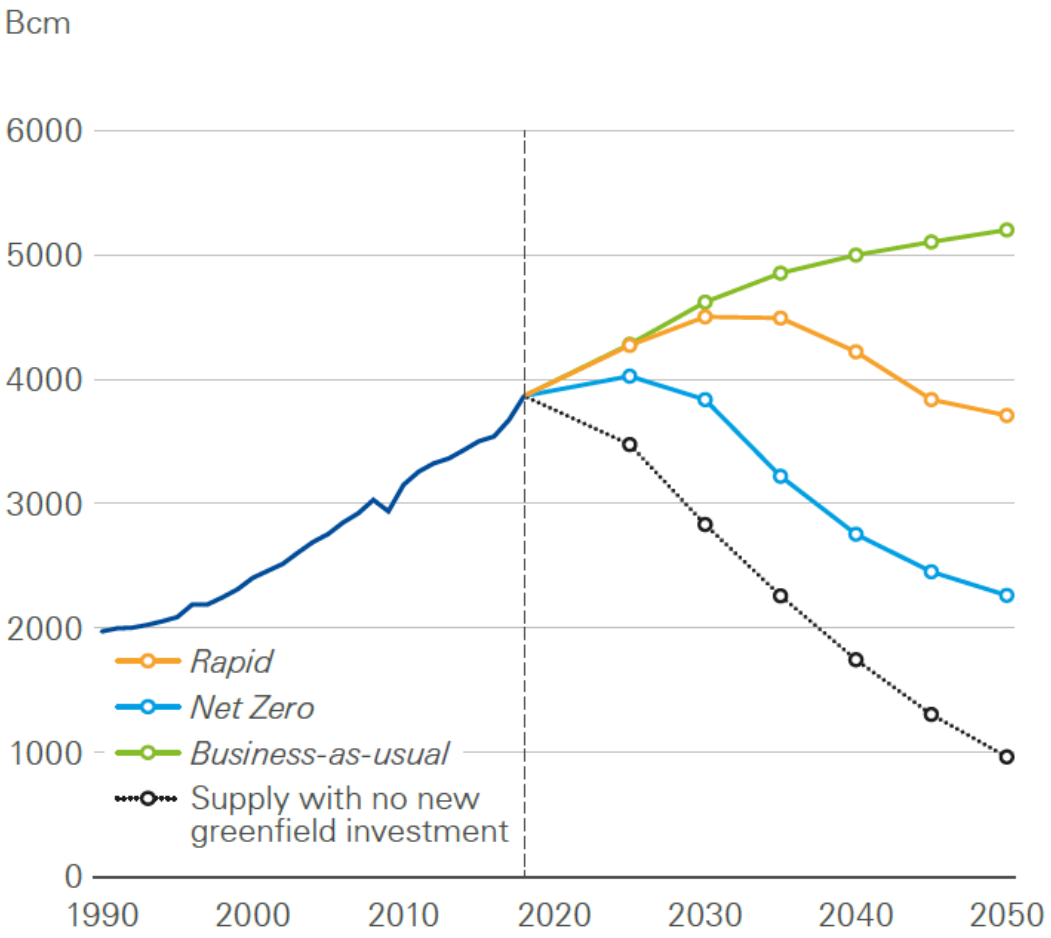


Uncertain Demand

Consumption and production of oil

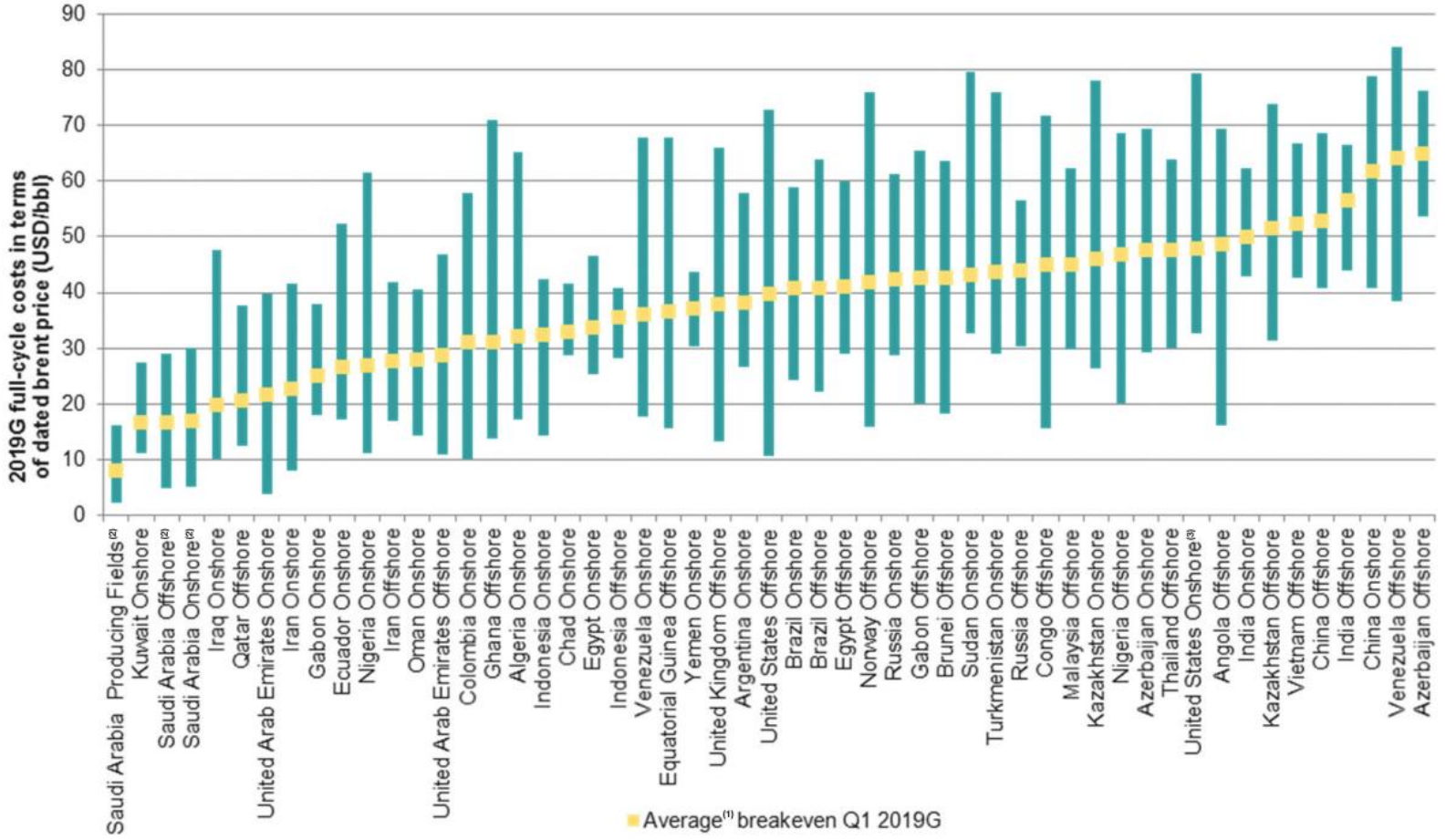


Consumption and production of natural gas

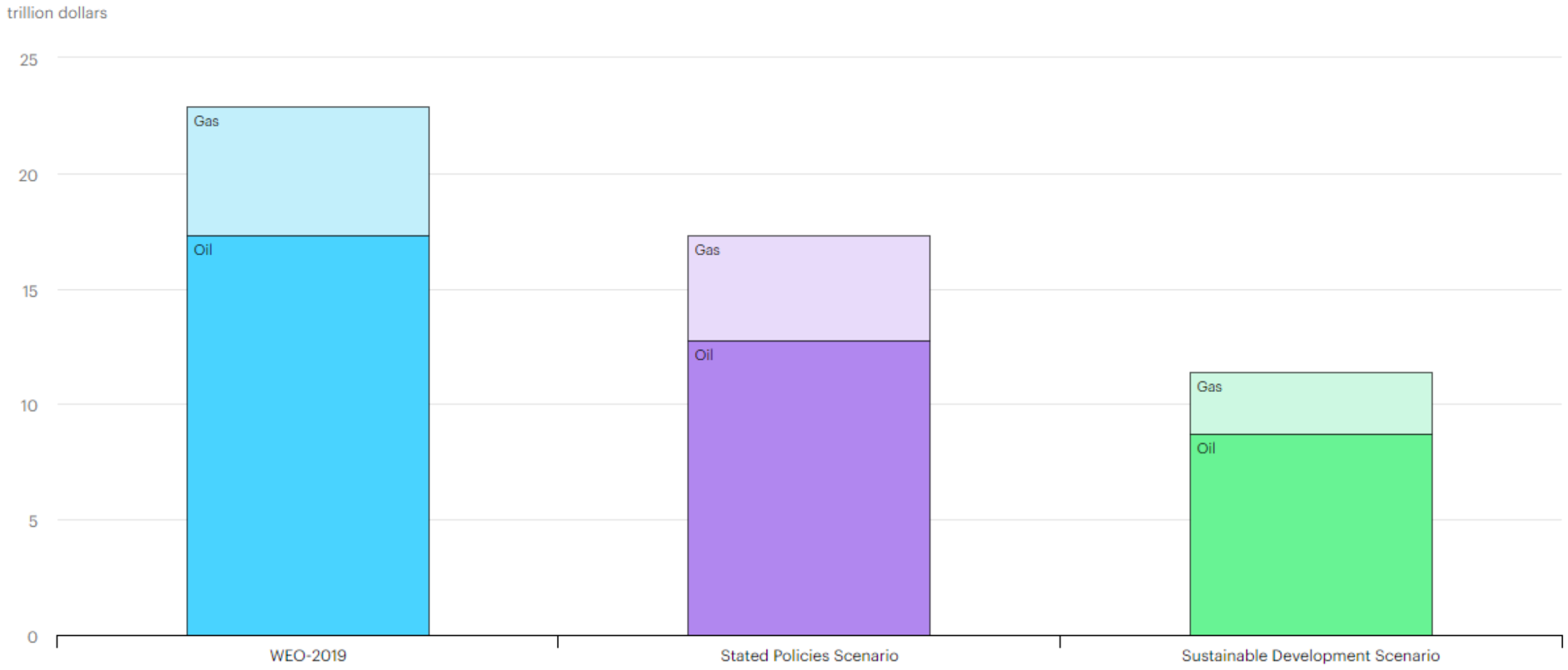


Breakeven Cost for New Oil Projects

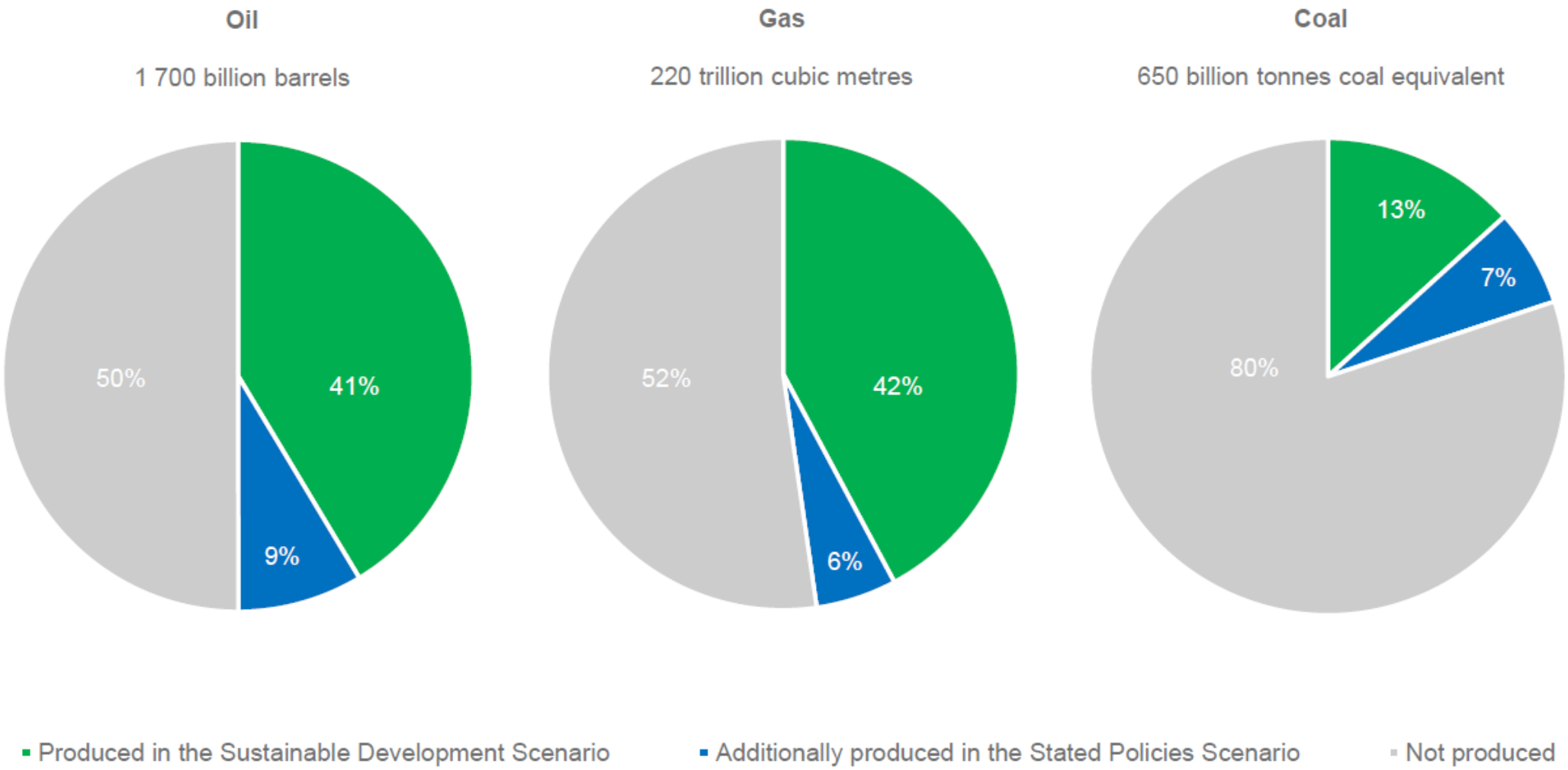
Exhibit 6: Post-tax breakeven costs for new oil projects at a 10% rate of return by country through 2030G



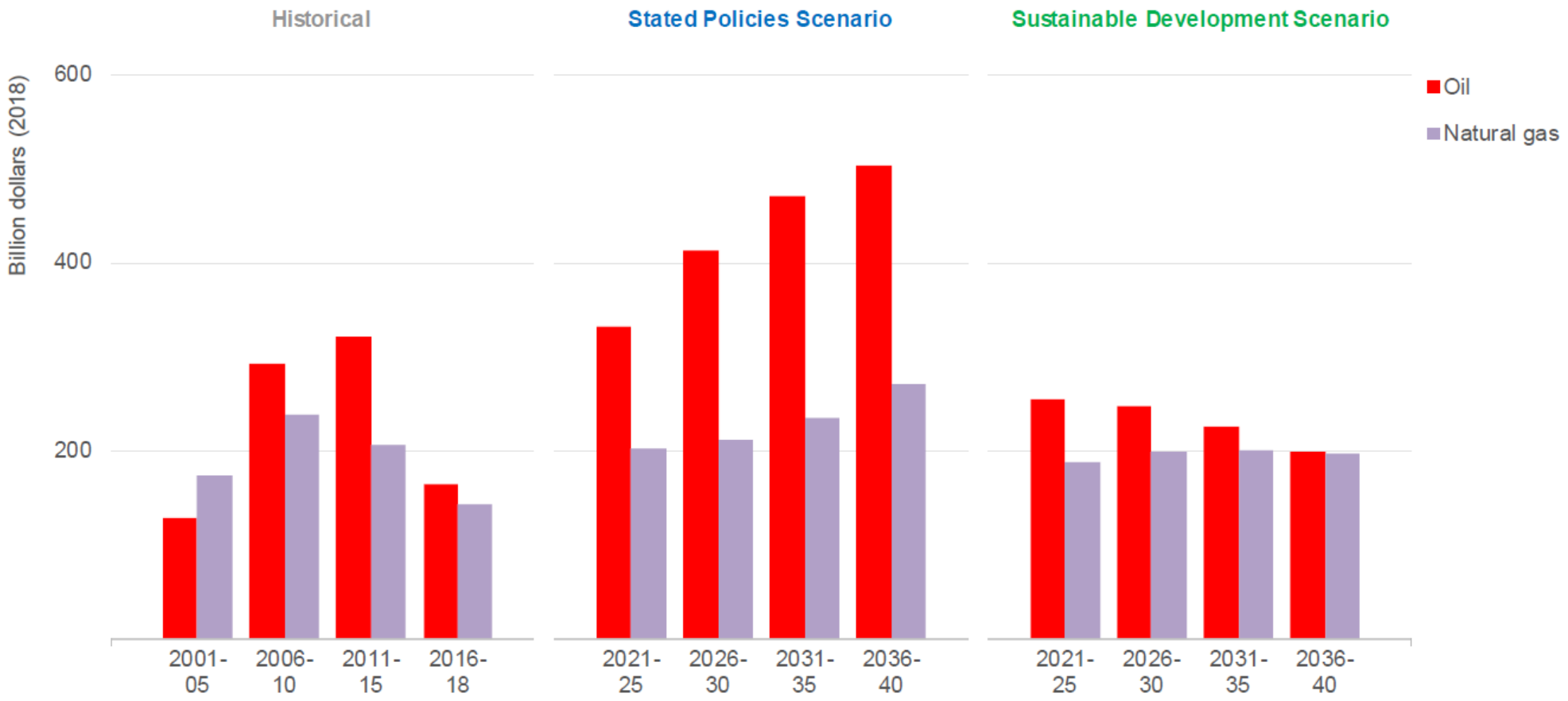
Estimated Present Value of Future Oil and Natural Gas Production to 2040



Stranded Assets

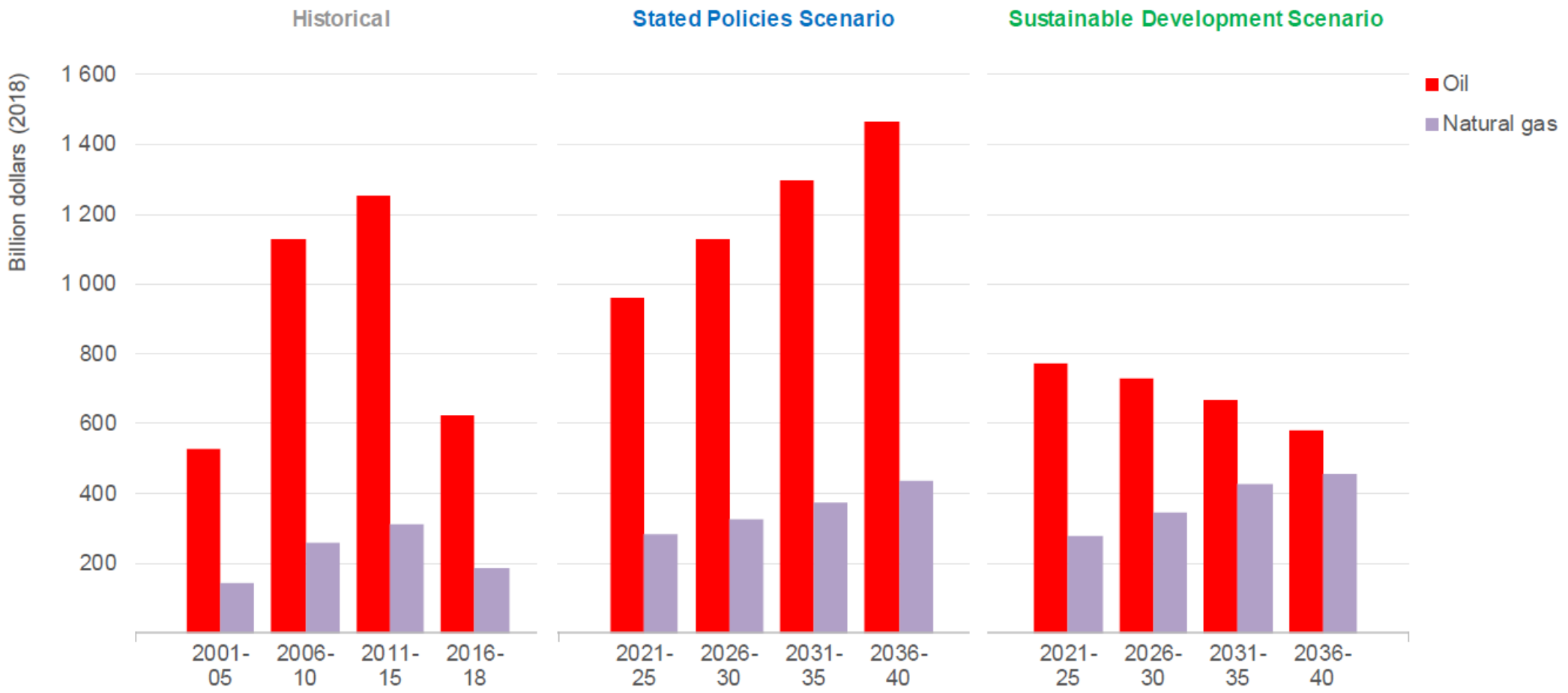


Average Annual Net Income for Private Companies



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.

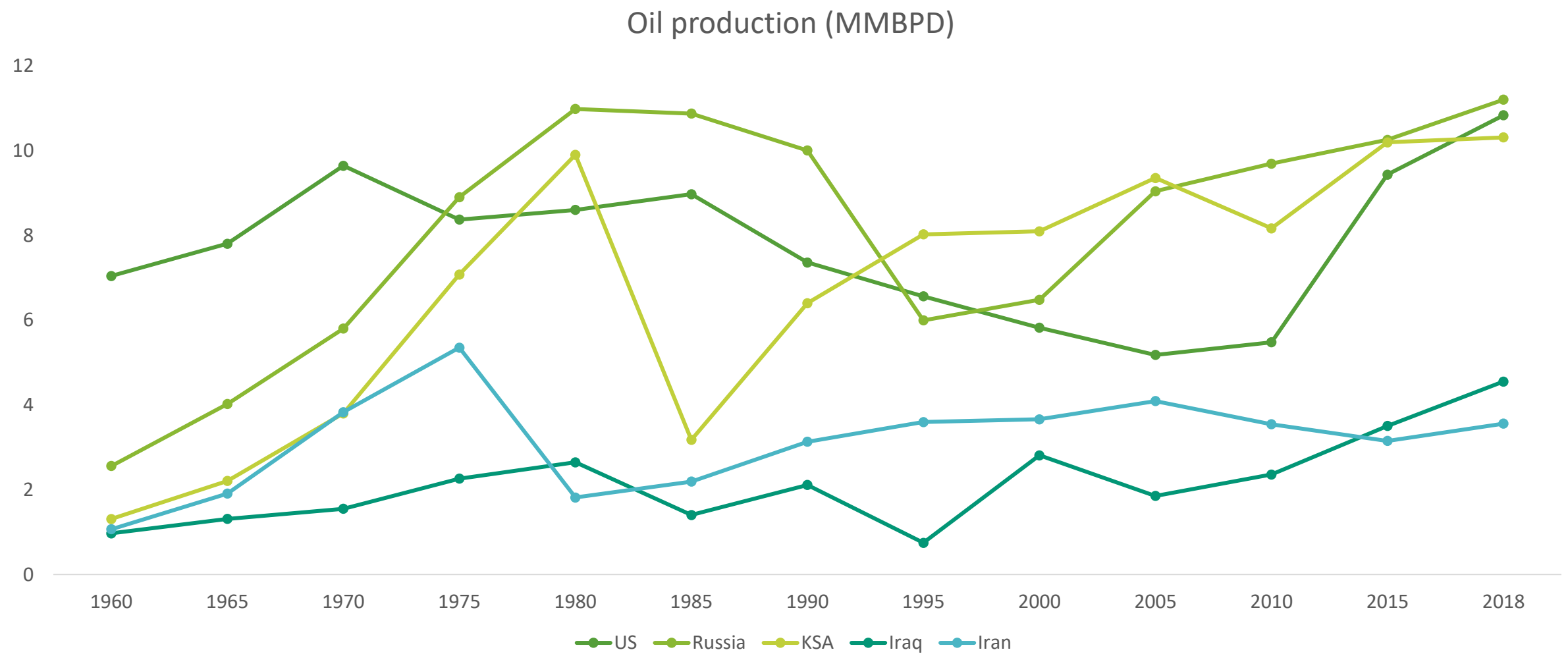
Average Annual Net Oil and Gas Income Before Tax of all NOCs and INOCs



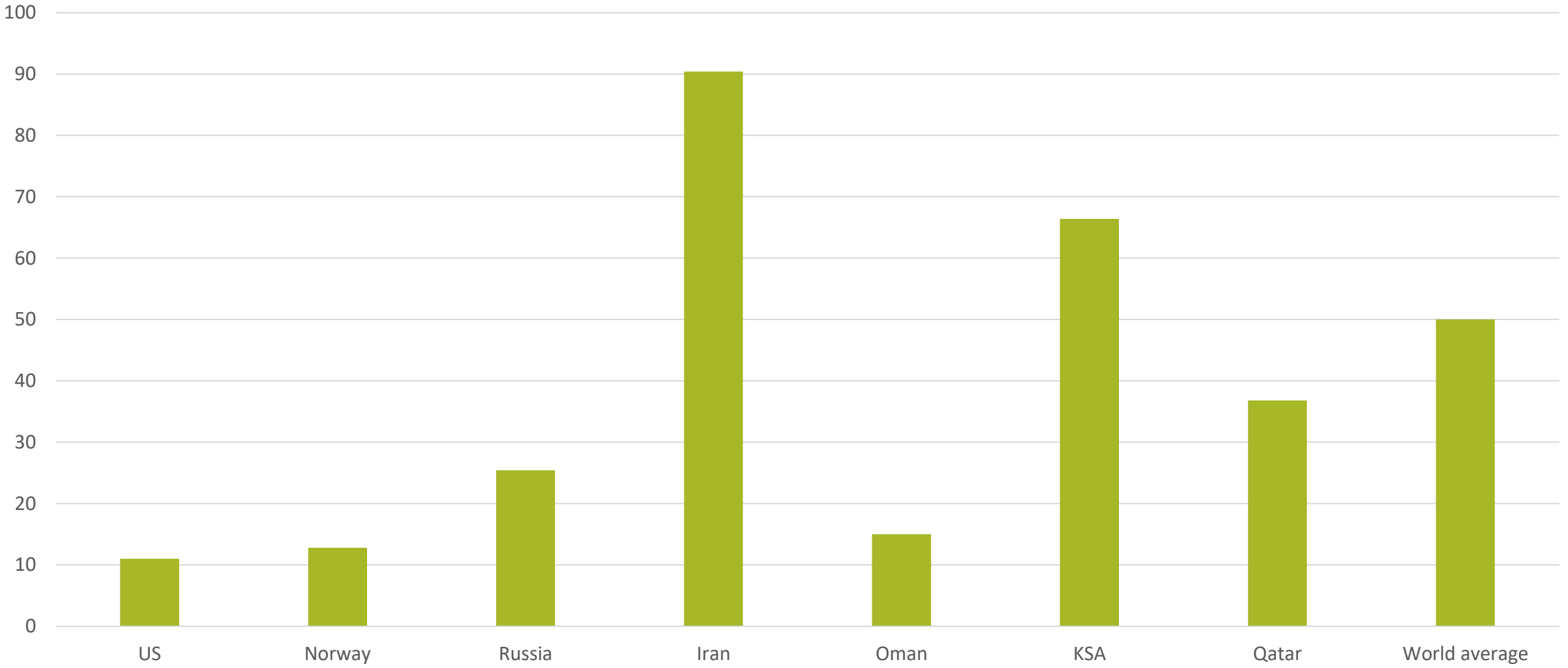
Note: Net income before tax = revenue minus finding and development costs and operating costs.

8 MBPD Agenda

Iran Oil Production vs. Competitors



Reserve to Production Ratio



Iran Upstream Asset Lifecycle Issues

Exploration and Appraisal

- New Exploration Opportunities
- Shale Exploration
- Appraisal of Opportunities

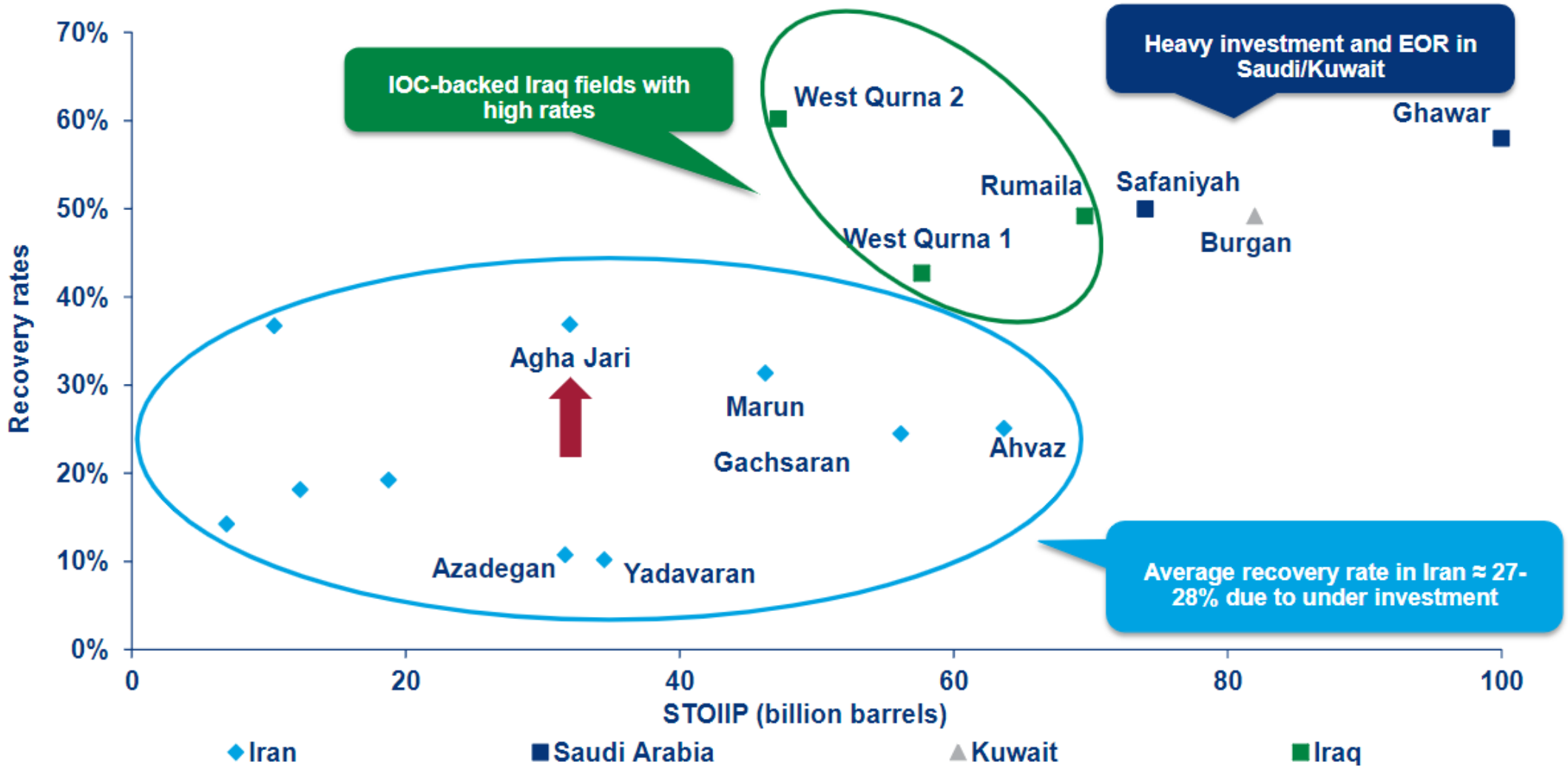
Development and Production

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

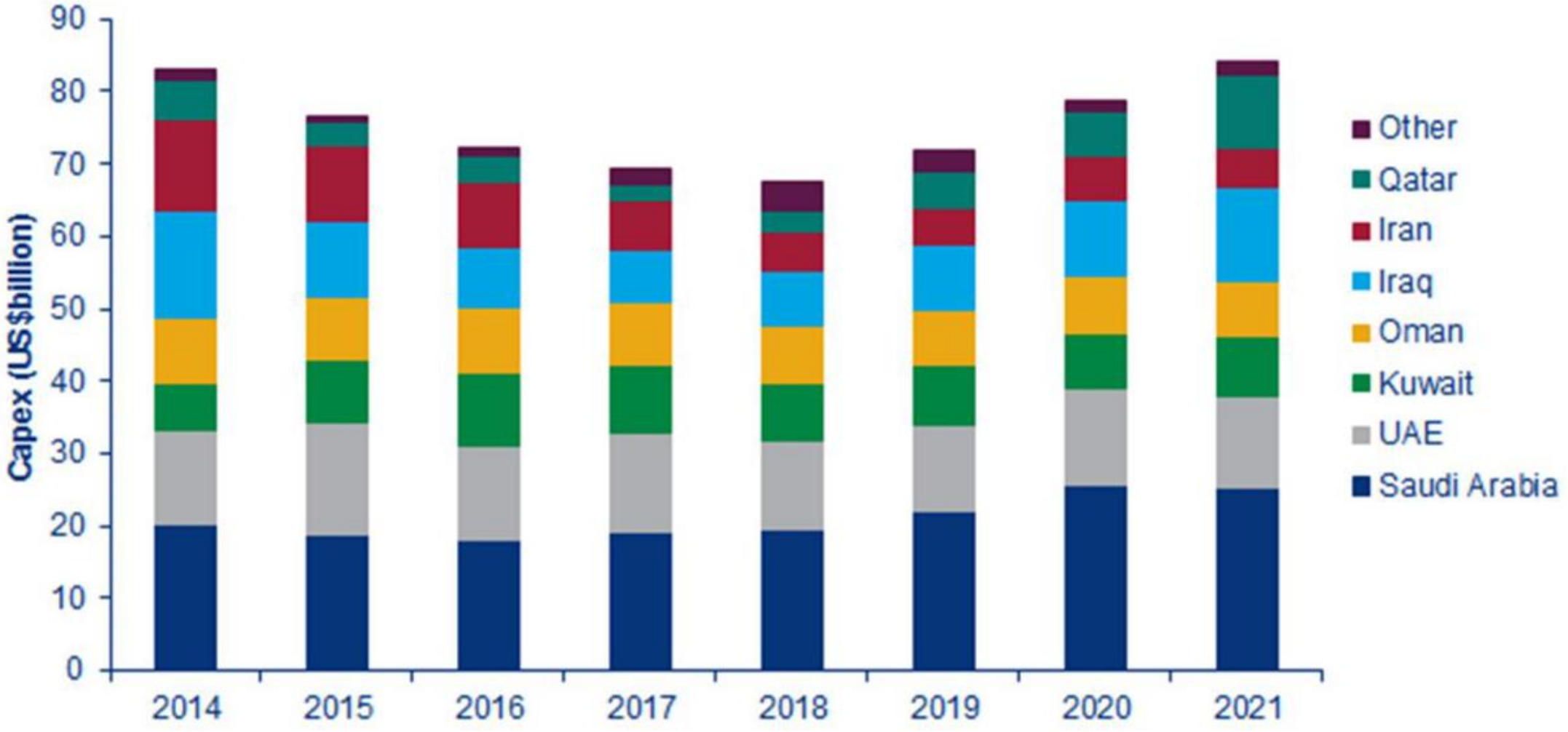
IOR / EOR

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

Recovery Factor



Middle East Upstream Investment



E&P and OFS

BP Business Model

Key Players Classification by IEA

NOC

INOC


Majors


Independents

OFS Co.

Pure Downstream Co.

Trading Co.

The Old and New Seven Sisters

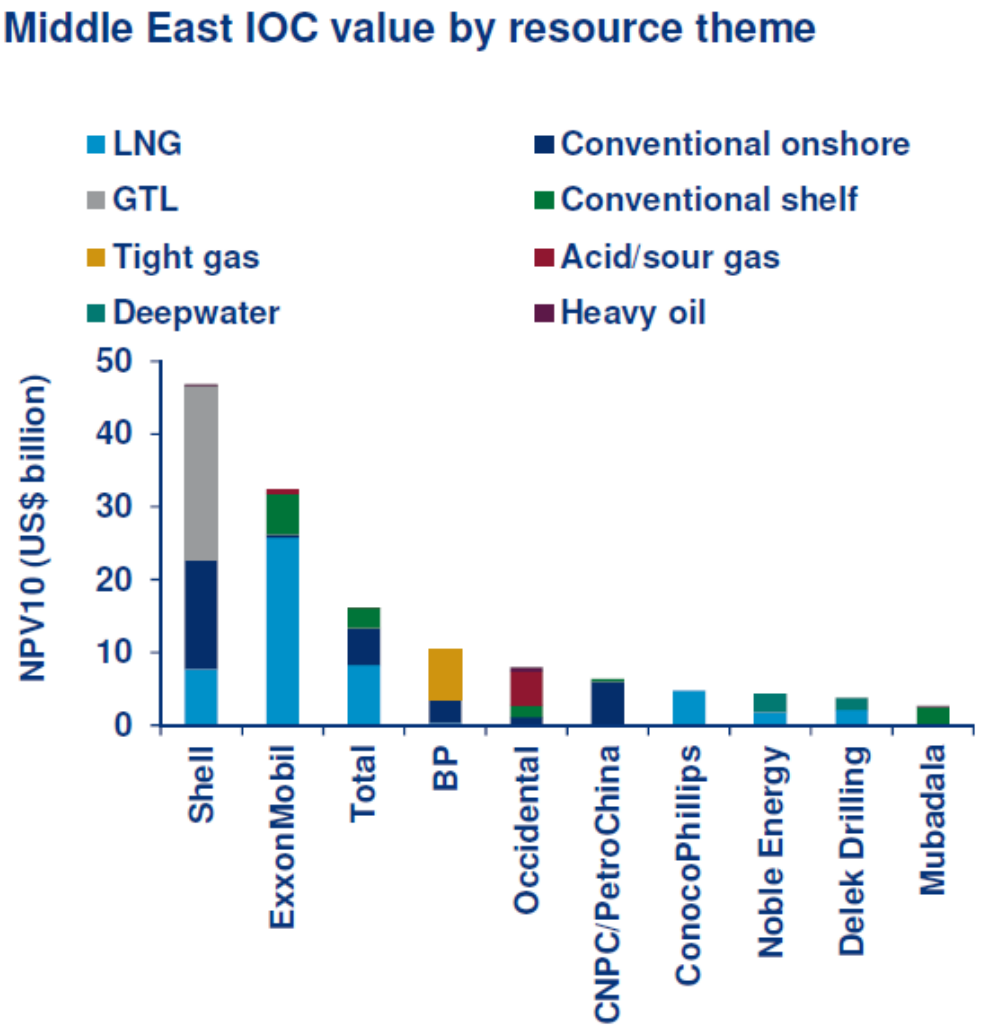
The Old Seven Sisters

The New Seven Sisters

Key Success Factors for Internationalization of NOCs

1. Compelling value proposition
2. Clear and focused strategy
3. Unequivocal shareholder commitment
4. Robust international business development capabilities
5. Rigorous screening and portfolio management
6. Agile decision-making
7. Leveraging cultural and geopolitical advantages
8. Organizational effectiveness

Middle East IOC value



Post JCPOA E&P Players in Iran

European majors

Favoured by NIOC for their technology and know-how

European mid-caps

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

Asians

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

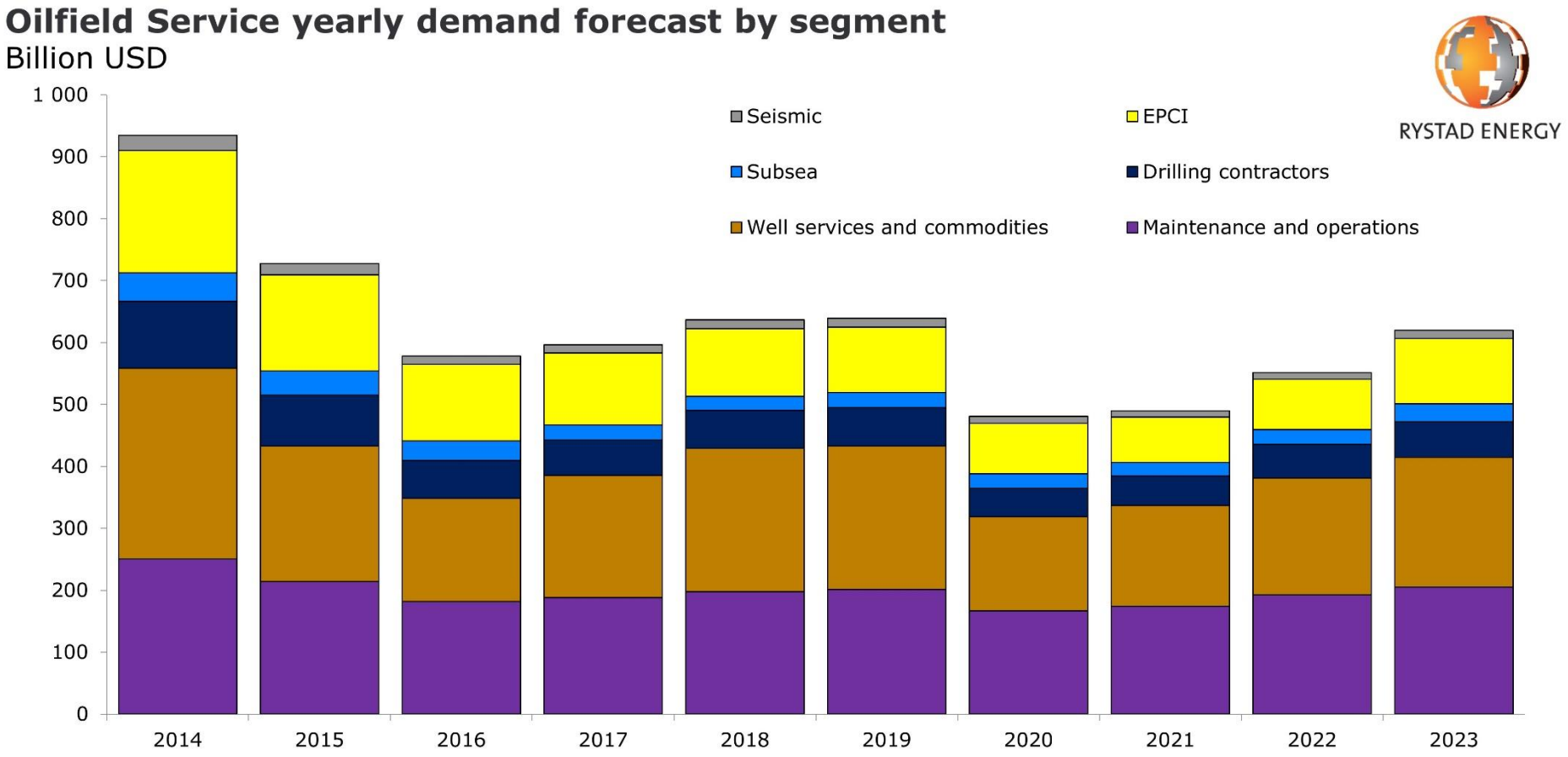
Russians

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

Iranian E&Ps

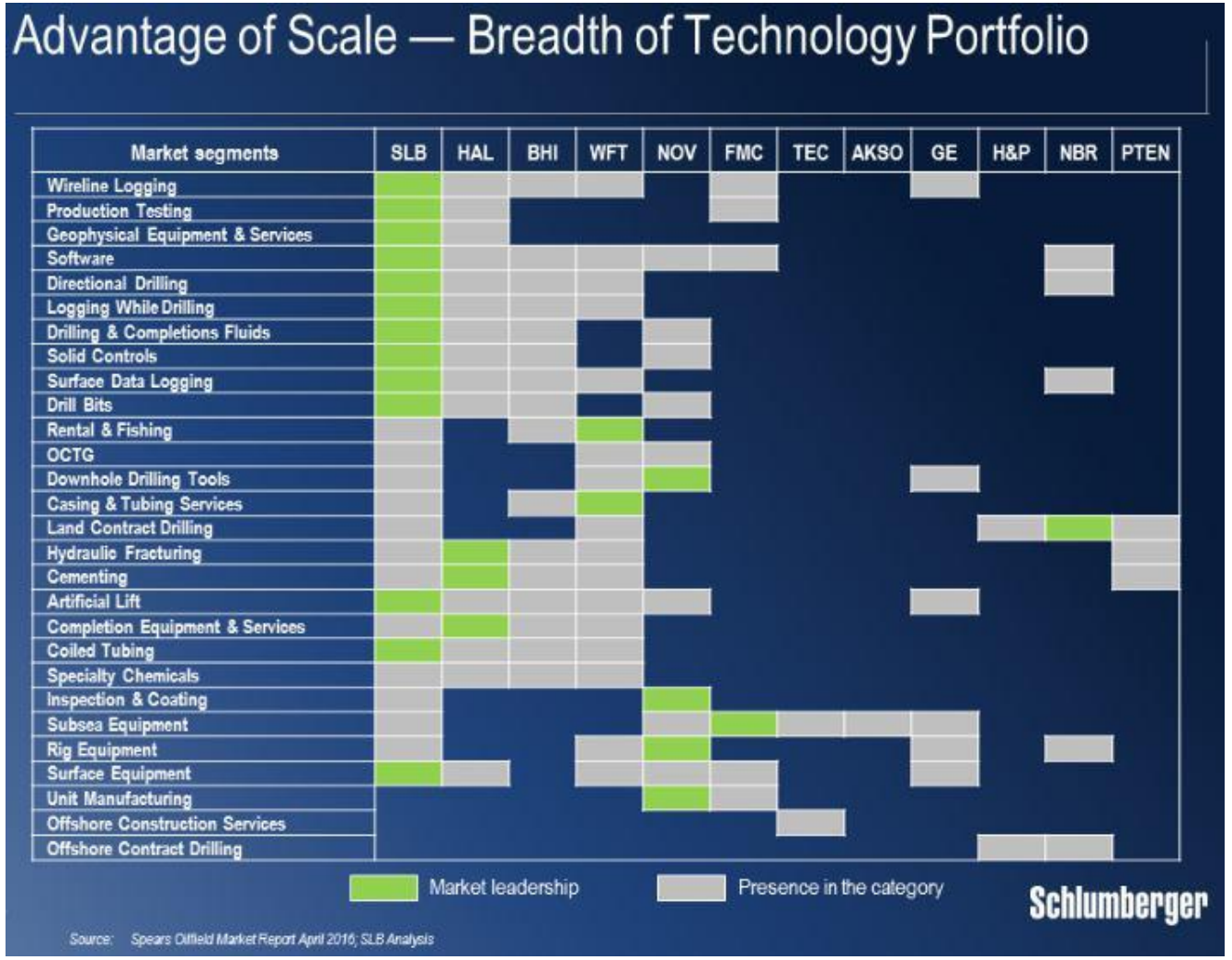
Name	Major shareholder	Name	Major shareholder
Petro Pars	Government	PEDC	Private sector
OIEC	Public sector	PGFK	Government
Dana Energy	Private sector	IOEC	Public sector
PEDCO	Government	Kayson	Private sector
MAPNA	Government	Iran Ofogh	Private sector
Khatam-ol-Anbia	Government	Pars Petro Zagros	Private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

Oilfield Services Market



Source: Rystad Energy ServiceCube

Players Portfolio



Rig market

Land

Drilling

Workover

Offshore

Jackup

Semisubmersible

Drillship

TOP Offshore Rig Contractors

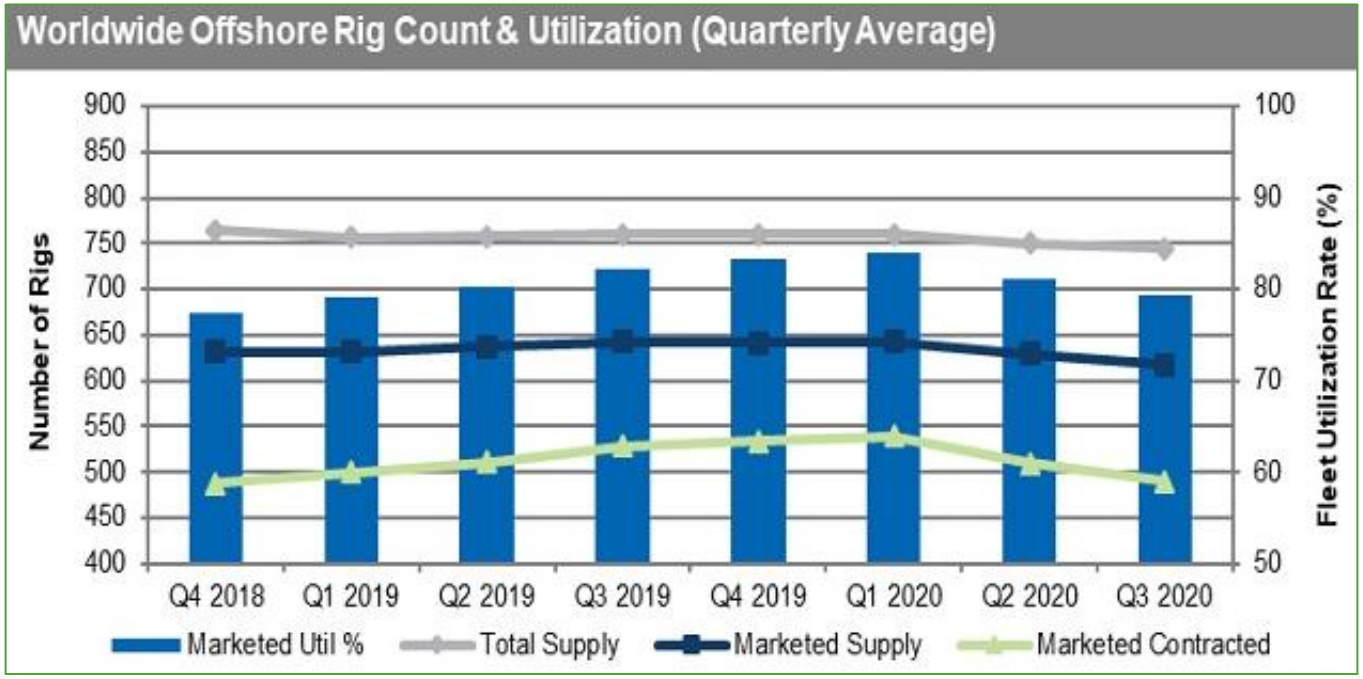
TOP 10 OFFSHORE DRILLING CONTRACTORS BY NUMBER OF RIGS MANAGED
(TOTAL RIGS INCLUDES RIGS UNDER CONSTRUCTION)

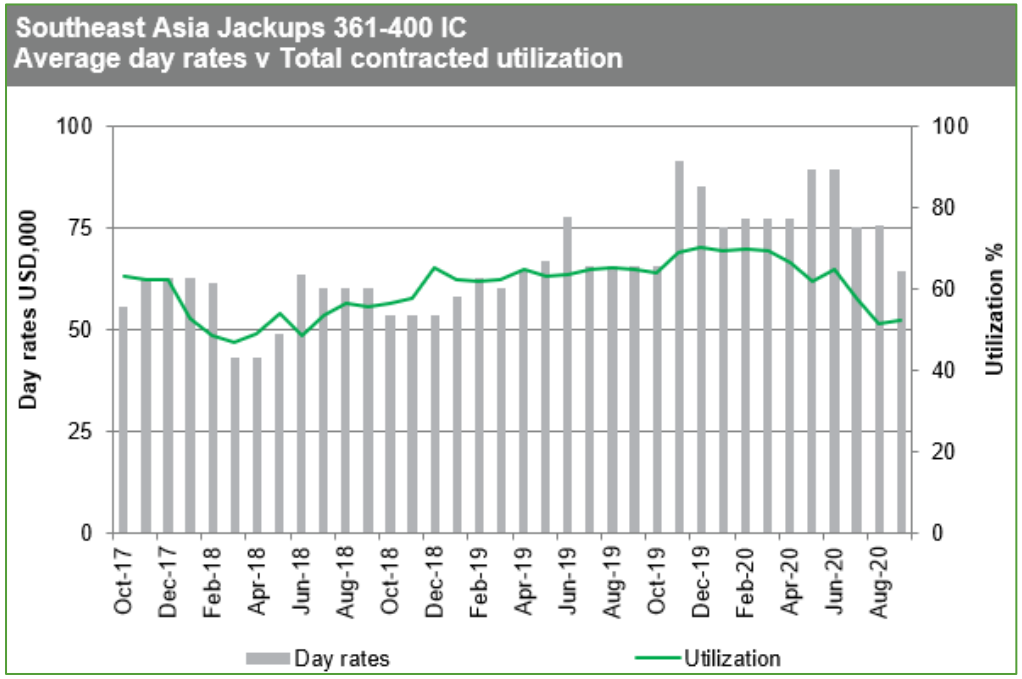
Company	Total Rigs	Working	Under Construction	US GOM	Latin Am	NW Europe	W Africa	Middle East	Asia/ Pacific	Rest of World
Valaris	70	35	2	13	7	15	10	9	12	4
COSL	55	45	0	0	3	3	1	3	45	0
Seadrill	51	19	3	6	5	12	5	6	16	1
Transocean	47	25	2	8	3	15	3	0	7	11
Shelf Drilling	36	29	0	0	0	0	5	16	12	3
Borr Drilling	34	15	7	0	5	5	6	3	15	0
Noble	25	18	0	5	5	5	0	6	3	1
PDVSA	23	4	0	0	23	0	0	0	0	0
Maersk Drilling	22	13	0	1	1	12	2	0	4	2
ADNOC Drilling	20	18	0	0	0	0	0	20	0	0
Top Ten Total	**383**	**221**	**14**	**33**	**52**	**67**	**32**	**63**	**114**	**22**
Entire Fleet	**914**	**466**	**80**	**72**	**147**	**90**	**61**	**172**	**309**	**63**
Top Ten % of Total	**41.9%**	**47.4%**	**17.5%**	**45.8%**	**35.4%**	**74.4%**	**52.5%**	**36.6%**	**36.9%**	**34.9%**

Notes: Rig Types: Arctic, drill barges (but not inland barges), drillships, jackups, semisubmersibles, submersibles, and tender-assists.
Rigs en route between regions are shown in the destination region.
Latin America includes all South America, Central America, Caribbean, and Mexico.
Seadrill numbers do not include rigs owned and managed by North Atlantic Drilling.
Data courtesy of IHS Markit. All data as of December 31, 2019.

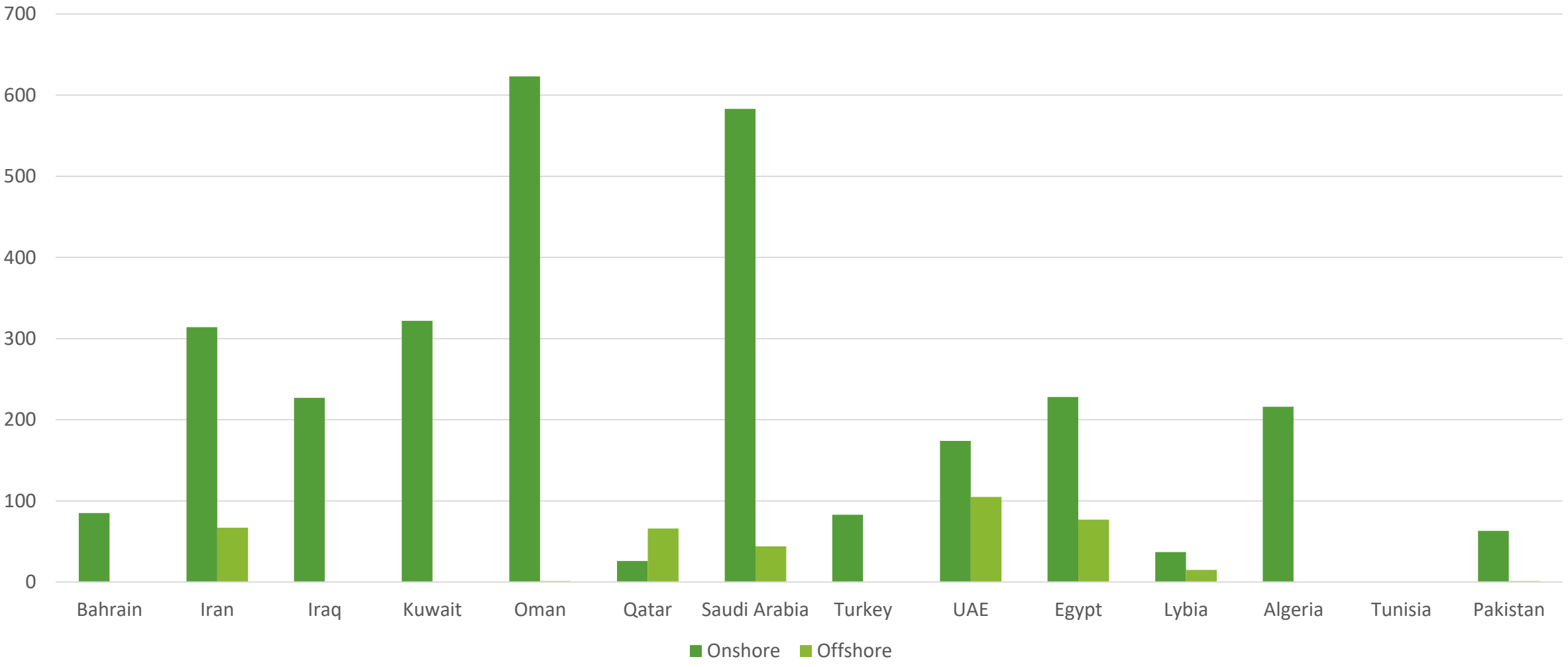
Offshore

Offshore Rig Market

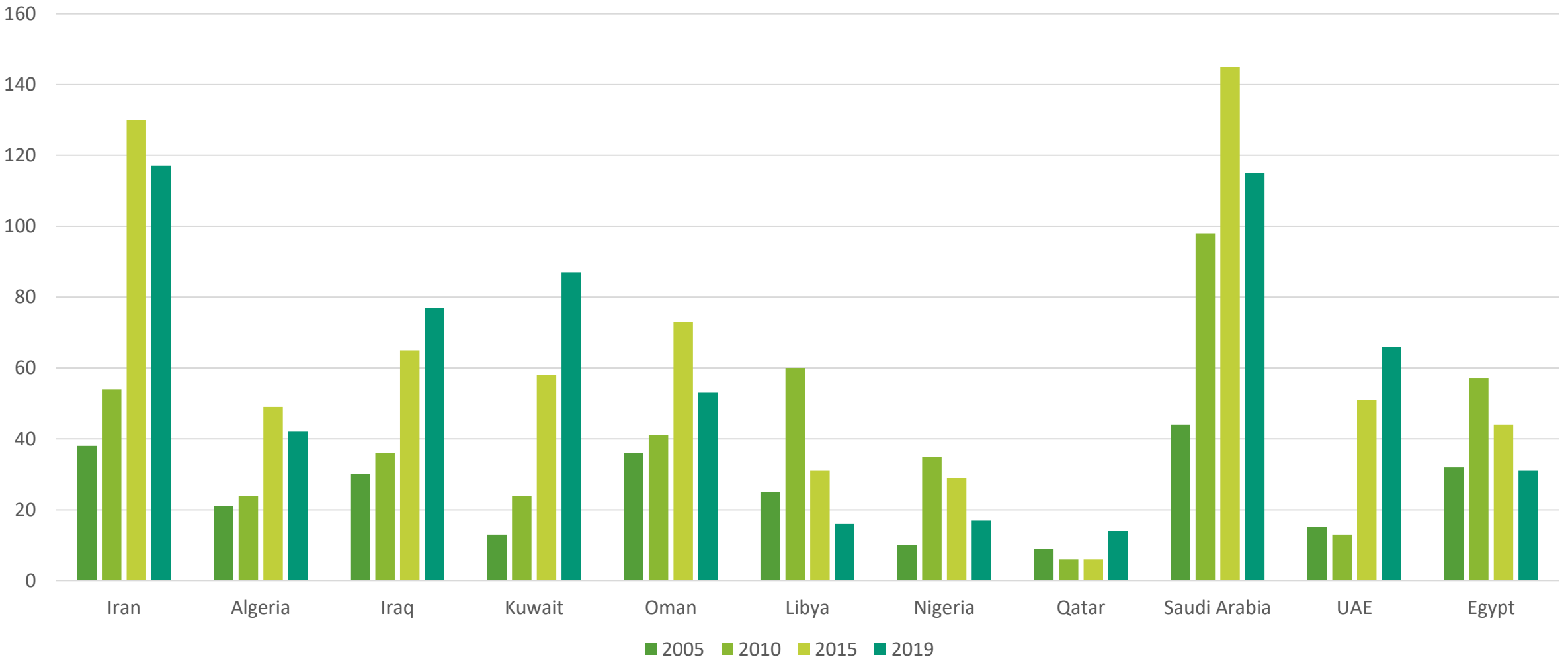




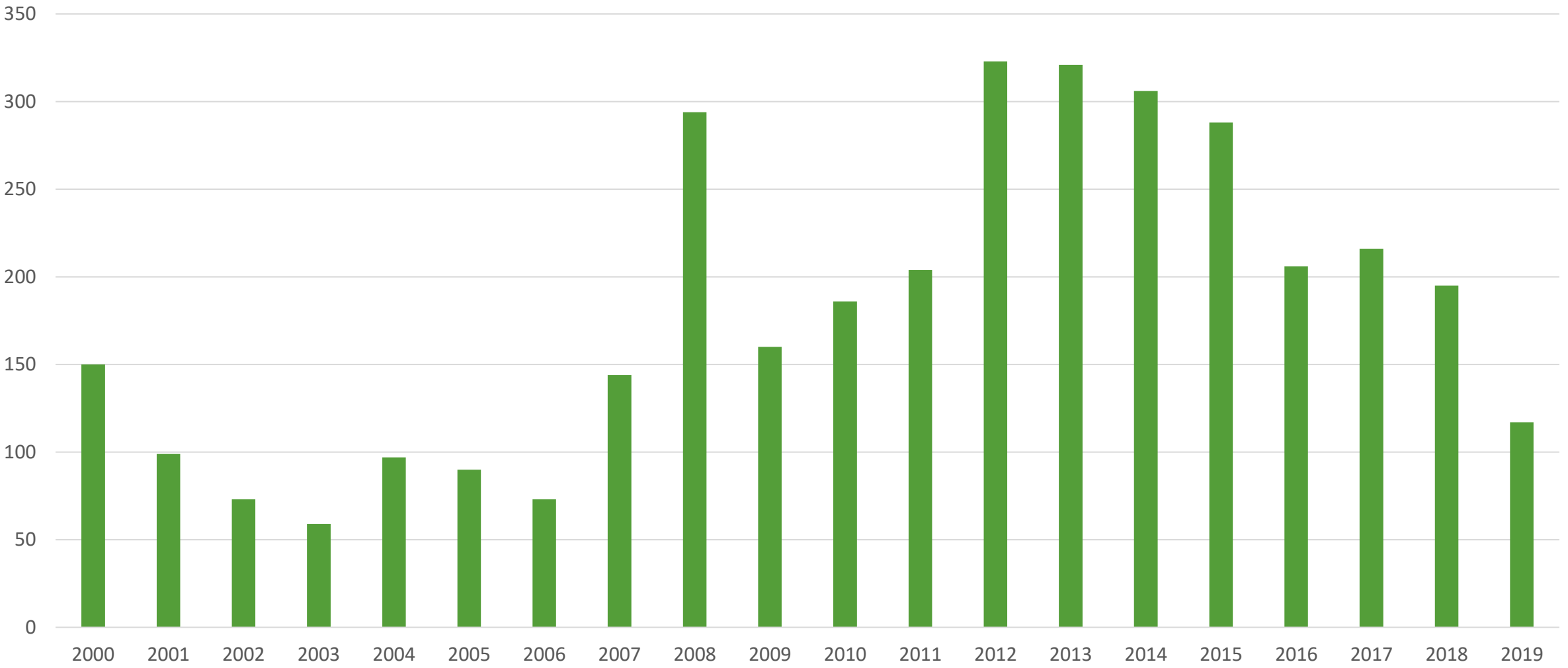
Number of Wells Drilled in MENAP (2016)



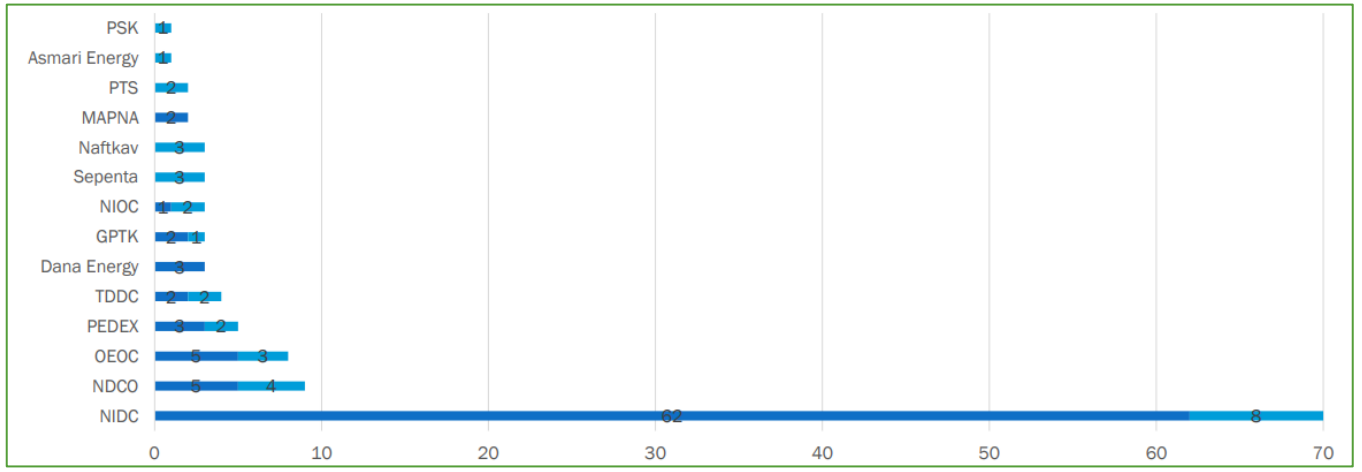
Active Rigs in MENA

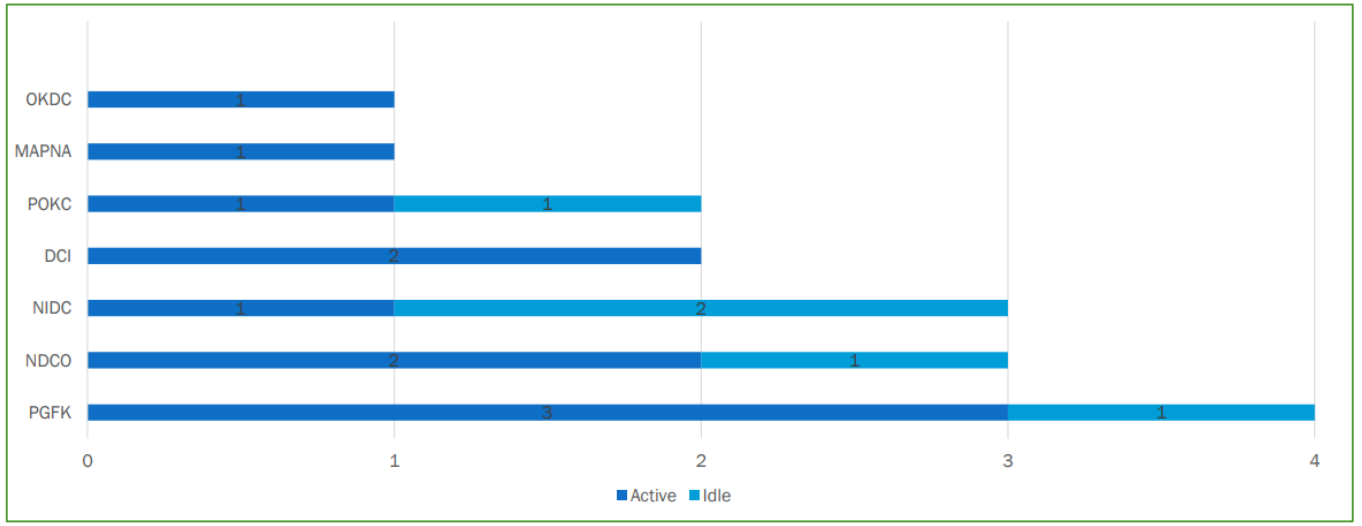


Completed Wells in Iran



Iran Drilling Players





Free Discussion

Strategic View

Changes to Follow

Resource abundance and importance of costumer preference

More competitive and productive landscape for the industry

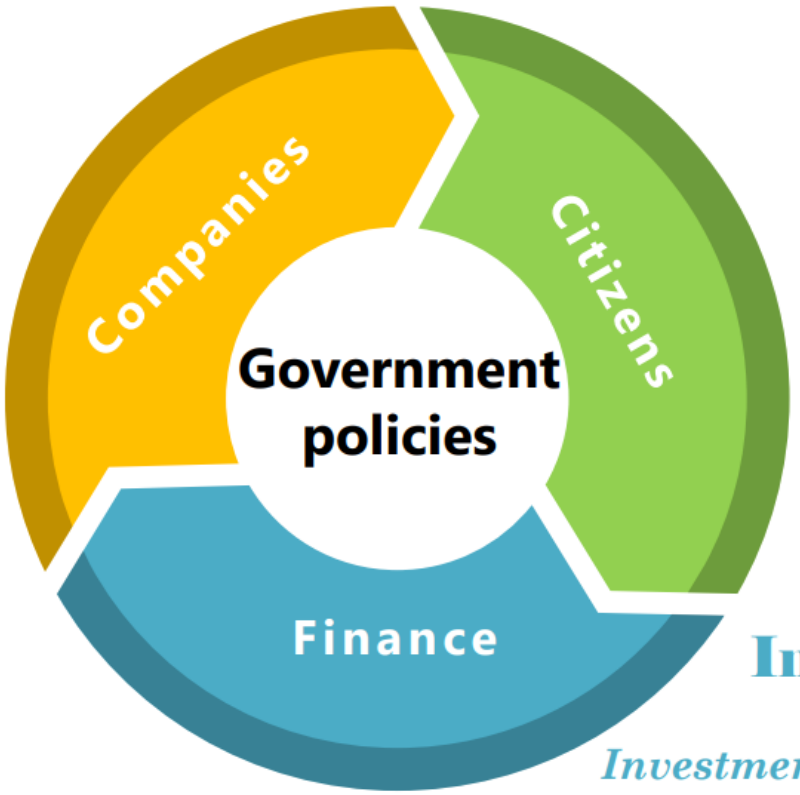
Major changes in global economy shape and living standards

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

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

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?

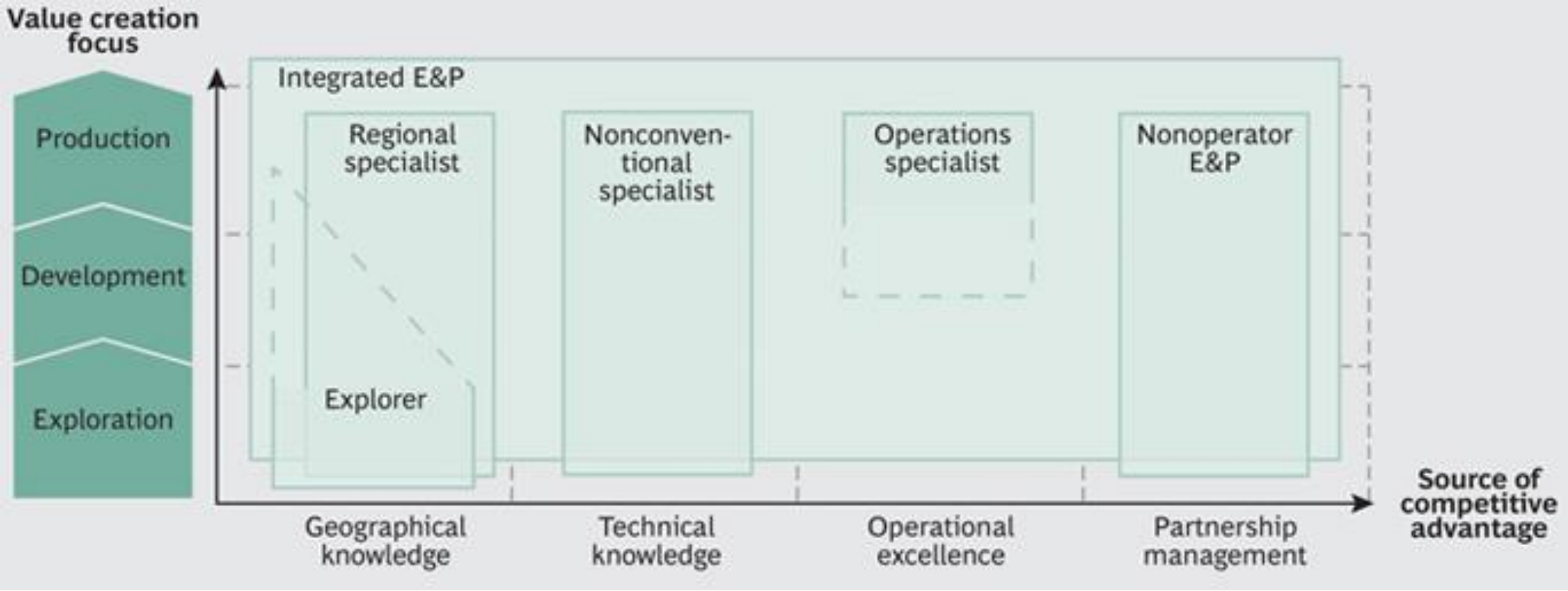
Risk appetite

- What is our appetite for risk?

Financing approach

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

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):

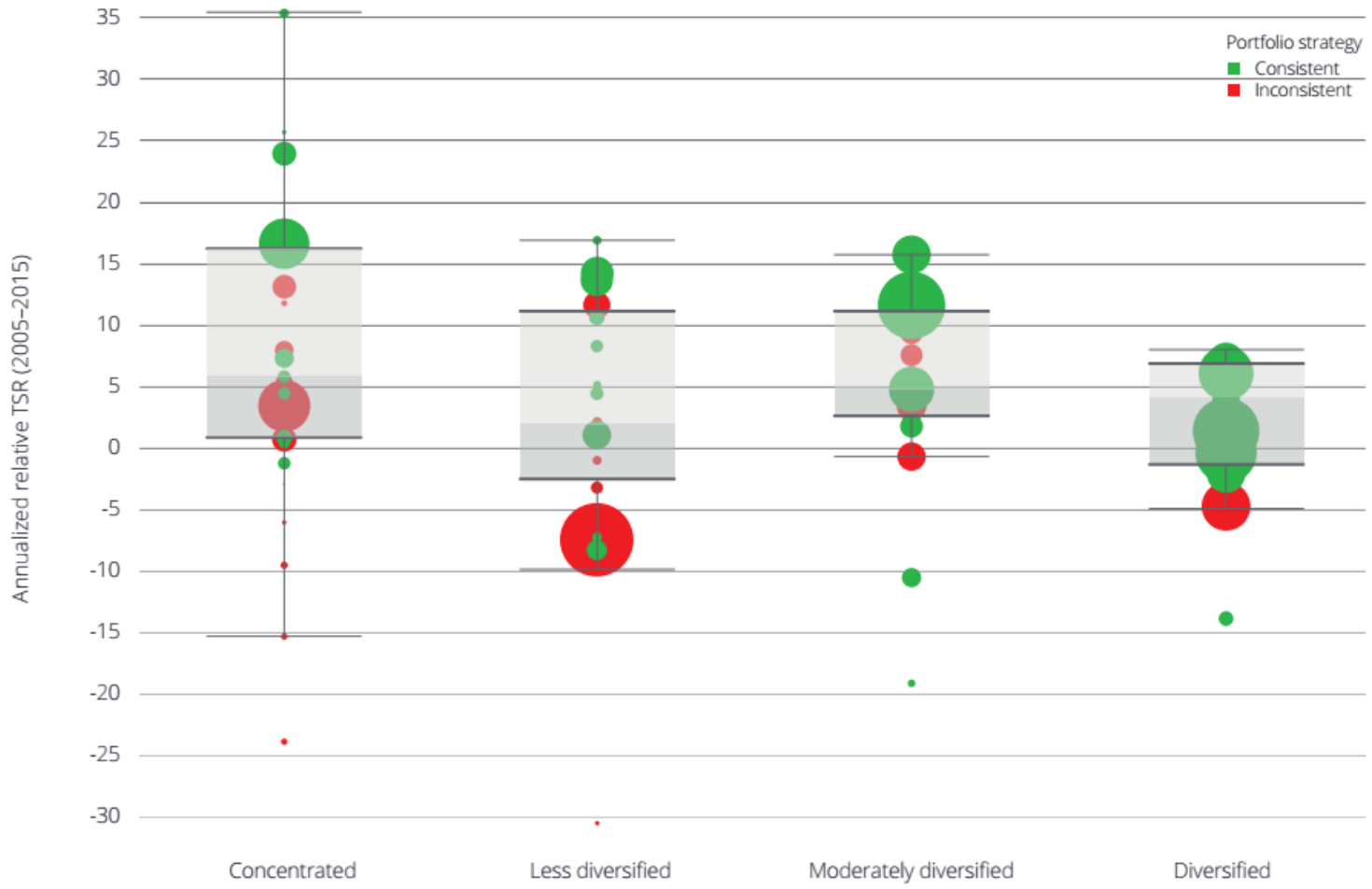
- Efficient extraction from existing fields.

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

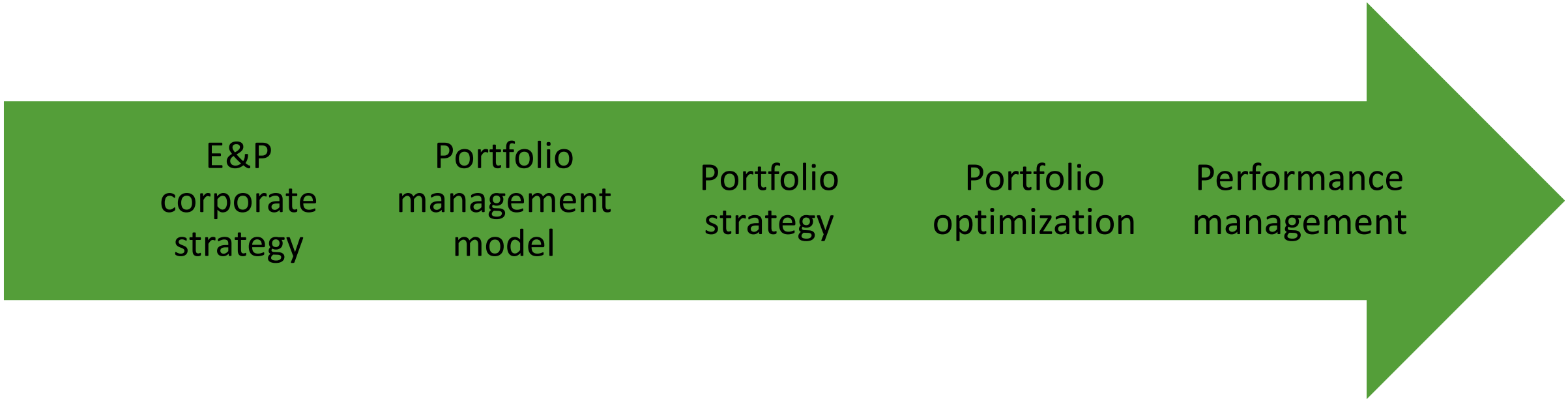


Deloitte.

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

Portfolio Management Components



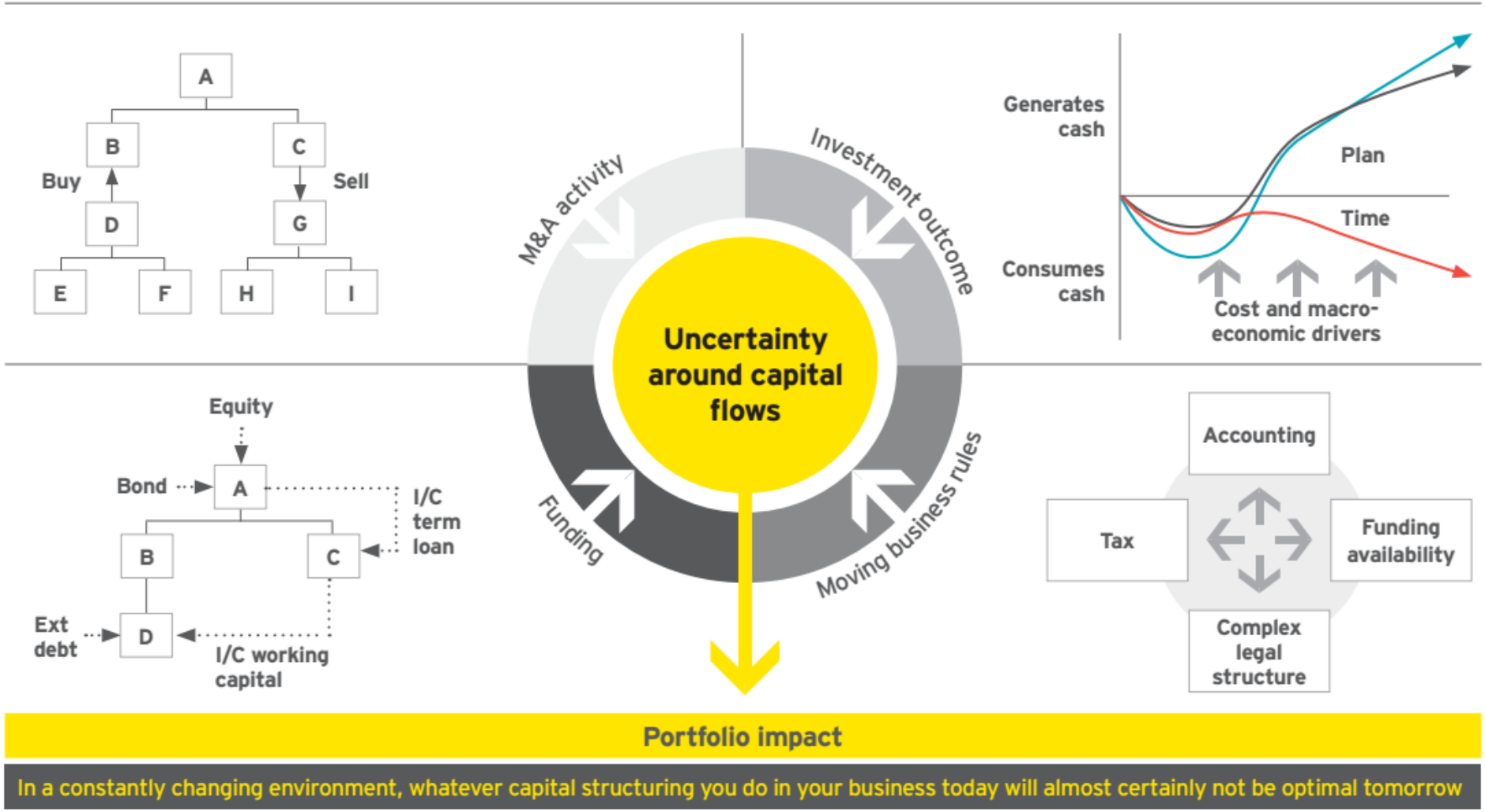
Optionality

- 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:

1. Proactively identify potential changes in its operating environment and review the impact of these changes on its project and portfolio
2. Rapidly decide on a suitable course of action that would at the very least preserve, but ideally enhance, the value of its portfolio
3. Act in a timely, cost-efficient and effective manner

Optionality at the corporate level



Shifts in Business Strategy

Company	Enhancing traditional oil and gas operations			Deploying CCUS		Supplying liquids and gases for energy transitions		Transitioning from fuel to "energy companies"			
	Reducing methane emissions	Reducing CO_2 emissions	Sourcing renewable power	For centralised emissions	For EOR	Low-carbon gases	Advanced biofuels	Solar PV and wind generation	Other power generation	Electricity distribution/retail	Electrified services / efficiency
BP	●	●	◐	◐	◐	●	◐	●	◐	◐	●
Chevron	●	◐	●	●	◐	◐	◐	◐	○	○	◐
Eni	●	◐	●	◐	◐	◐	●	●	●	●	◐
ExxonMobil	●	◐	●	●	◐	◐	◐	○	○	○	○
Shell	●	●	●	●	◐	●	◐	●	●	●	●
Total	●	●	●	◐	◐	●	●	●	●	●	●
CNPC	◐	○	◐	◐	●	◐	◐	●	○	○	○
Equinor	●	●	●	●	◐	◐	◐	●	○	◐	◐
Petrobras	◐	◐	●	●	●	●	◐	◐	●	◐	○
Repsol	●	●	◐	◐	◐	◐	◐	●	●	●	◐

Notes: PV = photovoltaic. **Full circle** = growth area supported by observed strategic investments (e.g. M&A) and/or capital/operational expenditures in commercial-scale activities; **half circle** = announced strategy and/or minor investments, venture capital and/or research and development (R&D) spending; **empty circle**= limited evidence of investment activity. **For methane and CO_2 emissions**, which are not based on project and spending data, assessments reflect the presence and strength of methane reduction and emissions intensity targets, as well as evidence of their implementation, the emissions intensity trend of new investment, transparent reporting of absolute emissions and sources, and linking of executive and staff compensation to achieving goals. Power generation and efficiency investments in the Transitioning category pertain to projects destined for commercial sales (not own use). Electrified services include battery storage and EV charging. Low-carbon gases include low-carbon hydrogen and biomethane.

Strategic Decisions

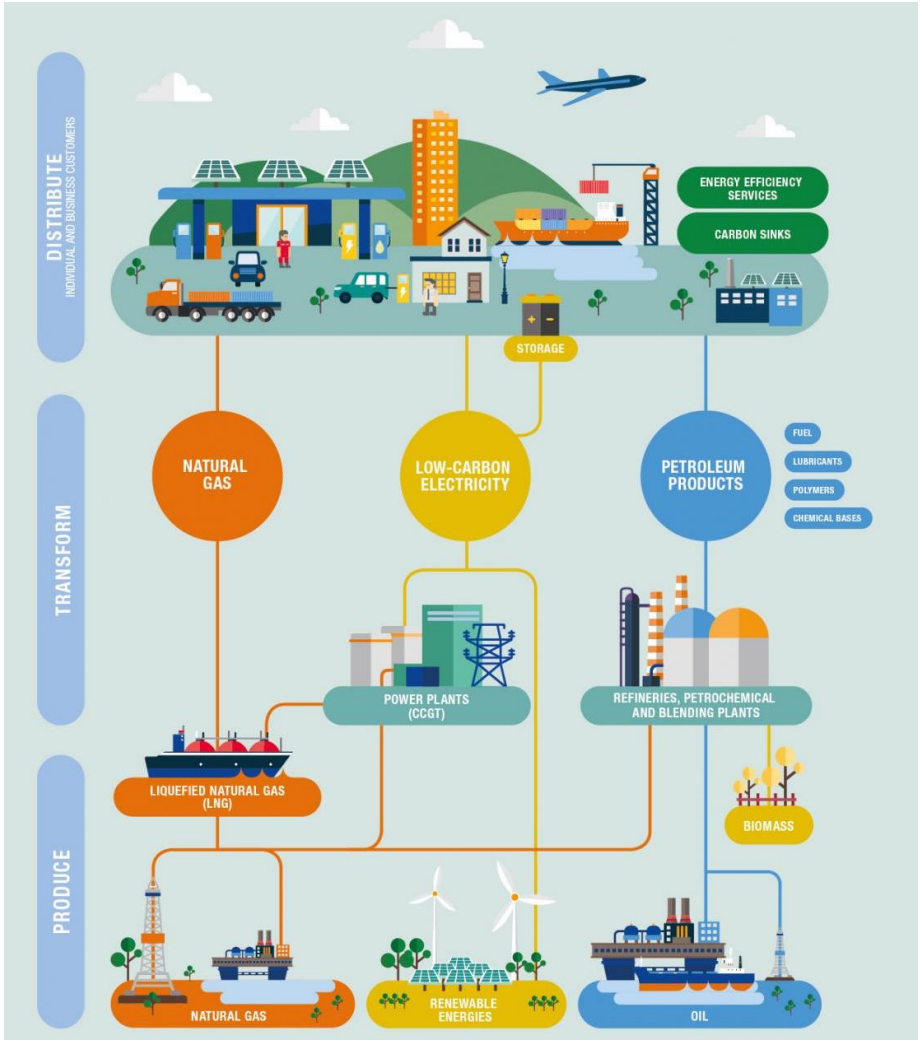
Focus on Core Competencies	Deploying key internal capabilities and divesting non-core assets through bold M&A action (DNO, BP, Perenco)
Diversification and Internationalization	Developing into other geographies and investment in new opportunities (QP)
Low-carbon Investment	Investment in gas and renewables with a focus on carbon capture and hydrogen (BP)
Integration and Consolidation	Mergers of several assets and building integrated companies (Aramco, OQ, ADNOC)
Partnership	Leveraging technical and financial capabilities and securing supply chain from sourcing to sales (ADNOC)

Case Study: Total

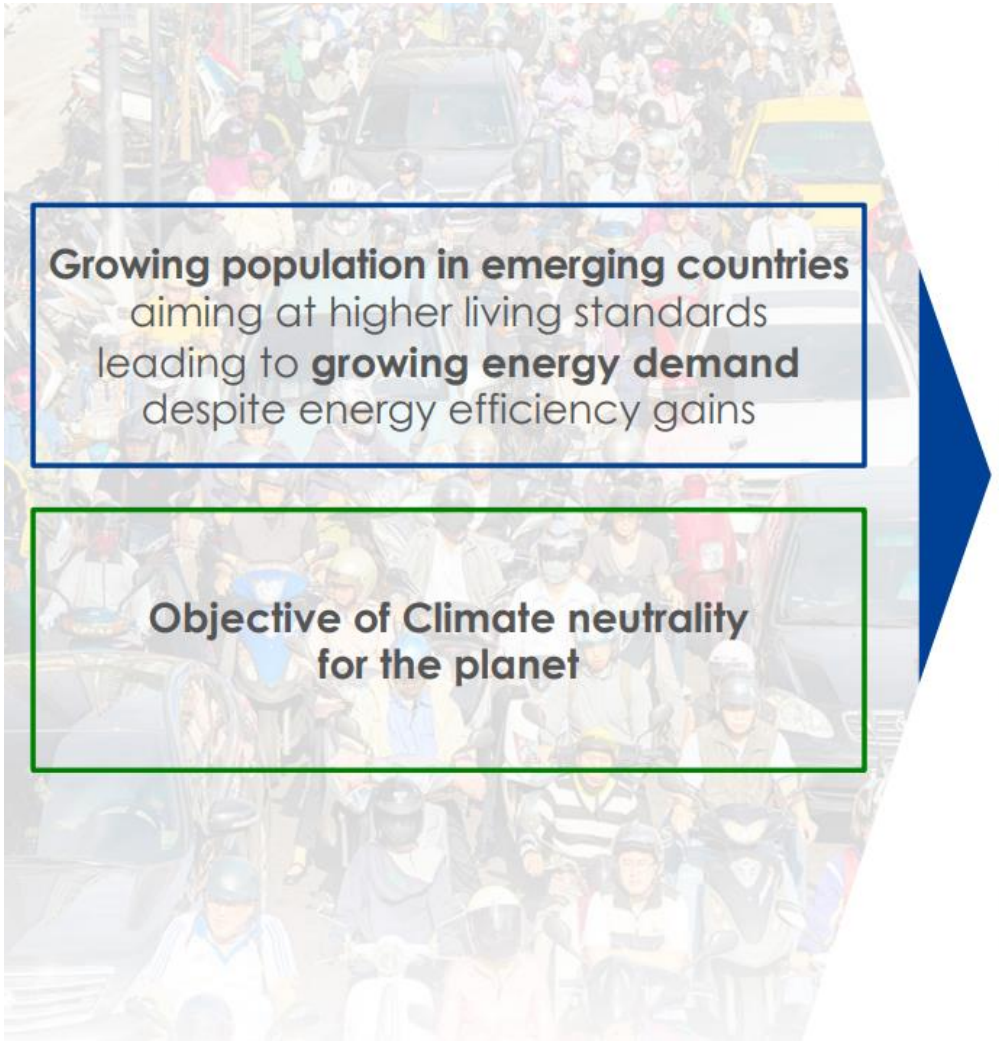
History

- Integrated oil and gas company founded in 1924
- One of current 5 majors and previously seven sisters
- Market Capitalization: 91.4 Billion Euros
- Number of Employees: 107,776
- Sales: $ 200 B
- Net Income: $ 11.2 B

Integrated Business Model



Energy Evolution



Growing population in emerging countries aiming at higher living standards leading to **growing energy demand** despite energy efficiency gains

Objective of Climate neutrality for the planet

Natural Gas

- Key in energy transition, available, affordable and complement to renewables
- LNG driving growth
- Will get greener with biogas and H_2

Electricity

- Growing demand further increased by Net Zero policies
- Renewables will decarbonize power generation

Oil

- Acceleration of innovation to substitute oil use
- Oil demand plateau 2030+ then decline with impact on long-term prices

Carbon Sinks

- Required to achieve Net Zero

Transforming the Company

Natural Gas

- Grow LNG (#2 player) and develop biogas / clean H_2
- Promote natural gas for power and mobility

Electricity

- Accelerate investments in low carbon electricity primarily from renewables
- Integrate along the electricity value chain (production, storage, trading, supply)

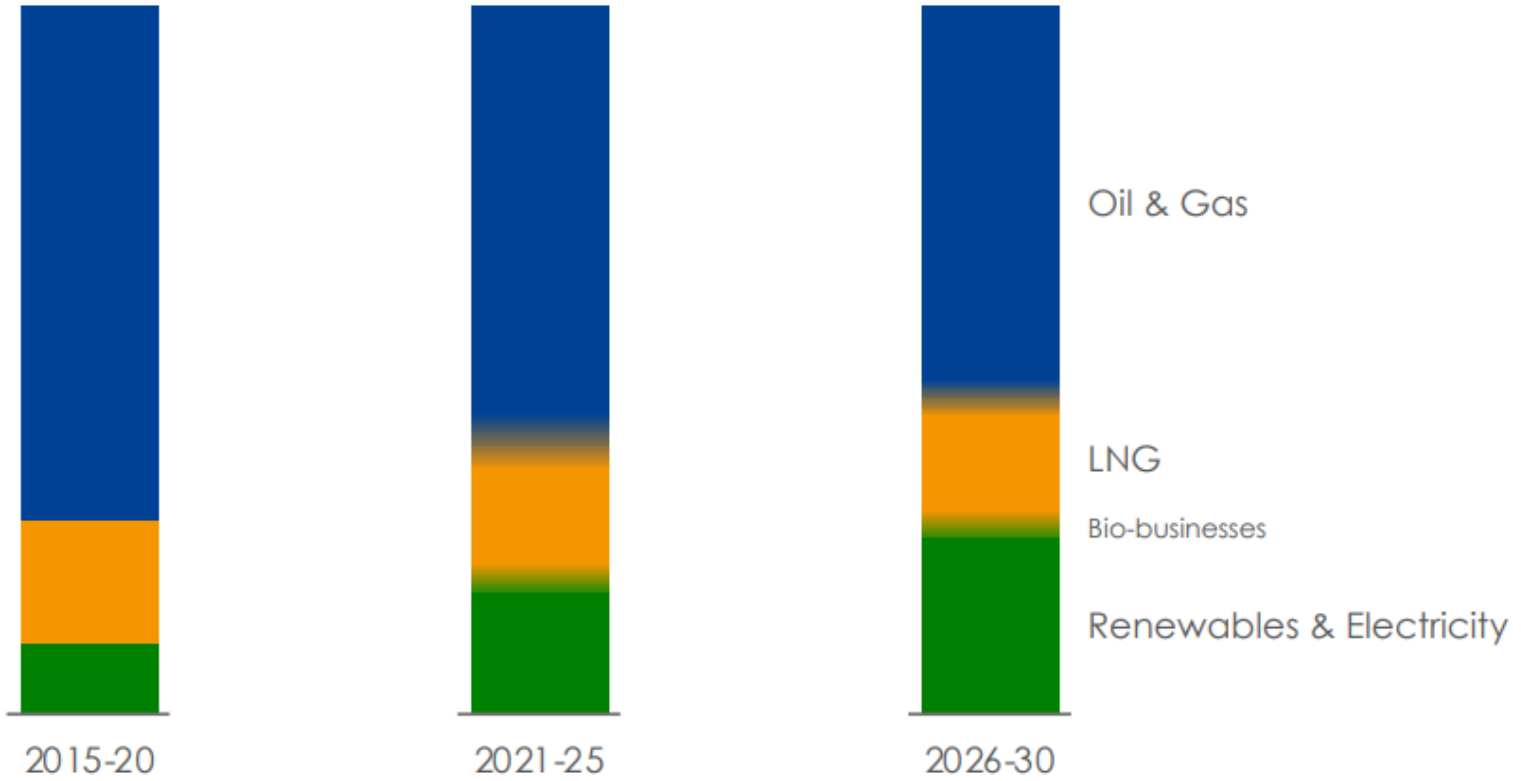
Oil

- Focus investments on low cost oil and biofuels
- Adapt refining capacity and sales to demand in Europe

Carbon Sinks

- Invest in carbon sinks (NBS and CCUS)

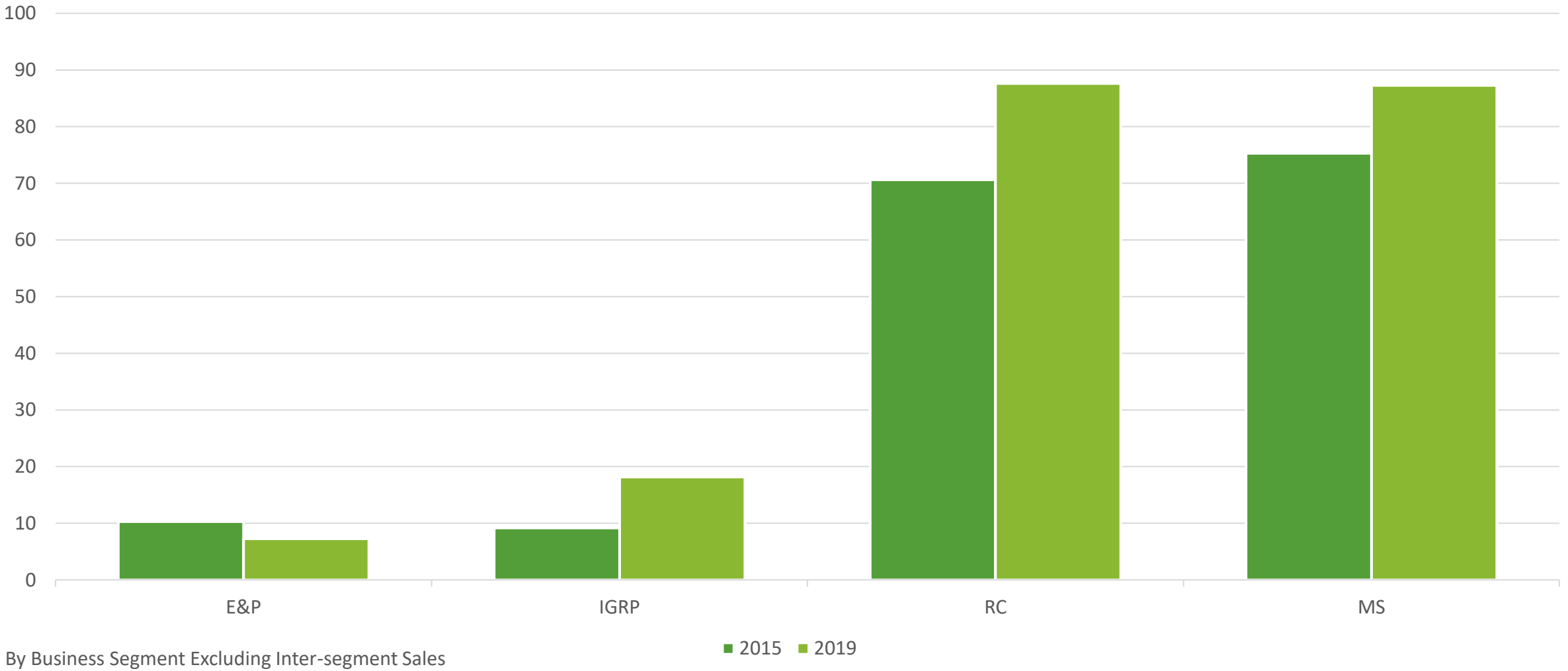
Aligning Investments



	2015-20	2021-25	2026-30
Renewables & Electricity (B$/y)	1.5	**> 2**	**> 3**
% of Group Capex	10%	> 15%	> 20%

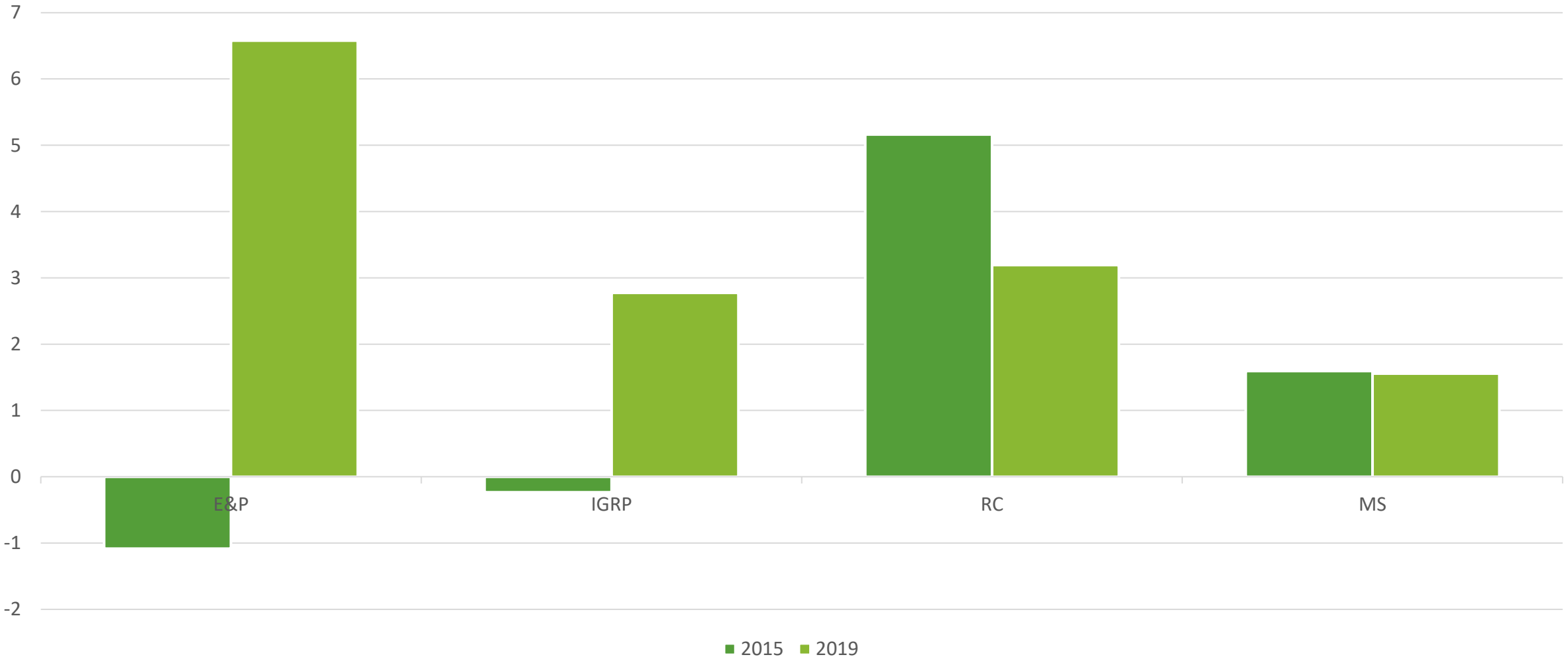
ESG Ambitions

Sales ($ B)



By Business Segment Excluding Inter-segment Sales

Net Operating Income ($ B)



Total 2016

Integrating climate into strategy and Cost reduction

1. Creation of the Gas, Renewables & Power Segment

   - The new Gas, Renewables & Power segment will spearhead Total's ambitions in the electricity value chain by expanding in downstream gas, renewable energies and energy efficiency.

2. Creation of a new Total Global Services segment

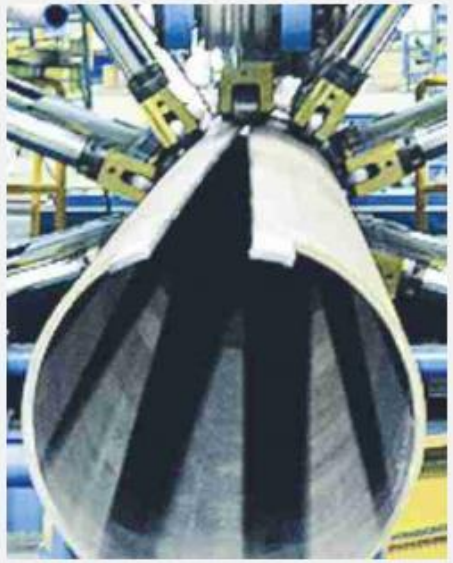
   - This new segment is being created to sustainably improve efficiency across all businesses by globally pooling support services (Accounting, Purchasing, Information Systems, Training, Human Resources Administration and Facilities Management).

3. Corporate headquarters refocused on strategic functions

   - People & Social Responsibility
   - Strategy & Innovation

ONE Total

Total Global Services generating results



- **~400 M$ savings in 2017** (Opex + Capex), targeting **1 B$ by 2020**
- **40% of procurement negotiated globally**
- **Bundling contracts** with major vendors to create economies of scale

ONE TOTAL

ONE TOTAL
BE SIMPLE

- **One Total Chair** per country
- **Cross-segment** support functions
- Group-wide **simplification program**

Cost Reduction