



IHS Markit™

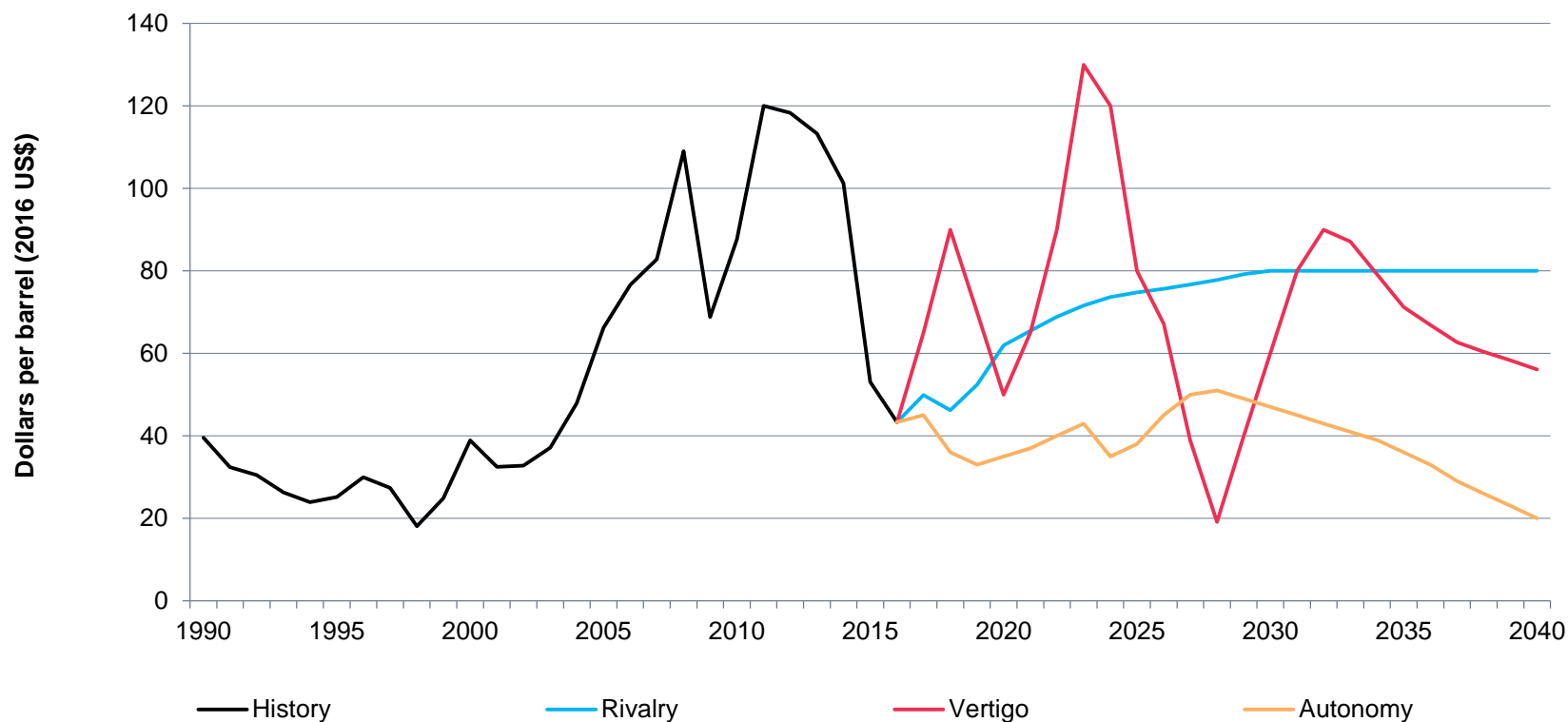
# Worlds in Flux: Energy and Geopolitics

Carlos Pascual, Senior Vice President  
Global Energy & International Affairs  
IHS Markit

October 2017

# Resources, Technology, Policy and Geopolitics will reshape national and commercial realities: How will you invest?

Average annual crude oil prices (real), 1990–2040



Note: Dated Brent.  
Source: IHS Markit

© 2017 IHS Markit

# Introduction: What we will cover



## **Sheiks, Shale and Wall Street**

Unconventional producers, Wall Street and short cycle barrels are upending oil markets and challenging OPEC supply management



## **Competition to Supply Oil**

What barrels will break through?



## **Paris Agreement**

Global unity but unresolved global challenges



## **Electric Vehicles and Peak Demand**

Peak Demand is in sight, but oil is not dead

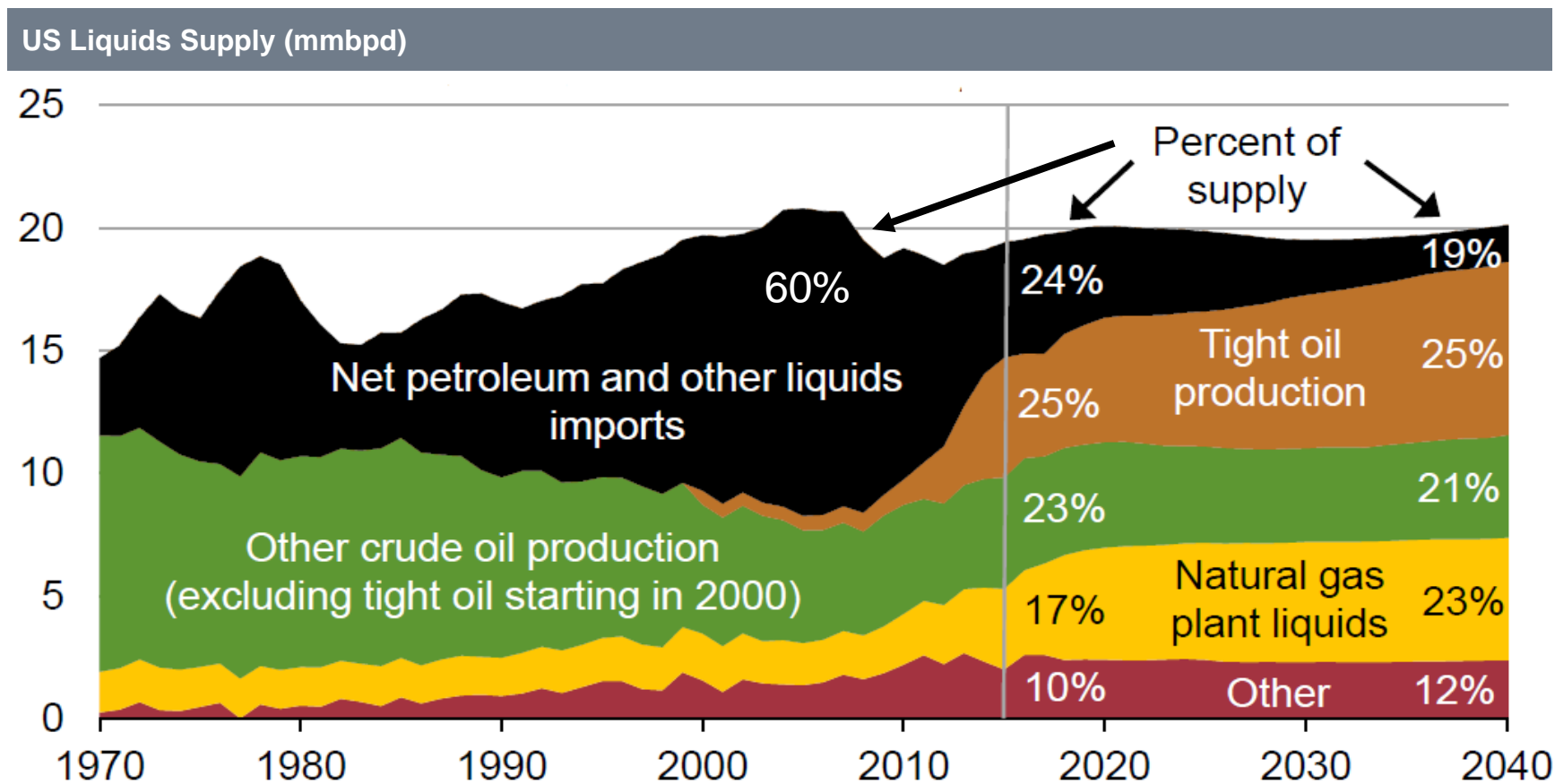


## **U.S.: New Risk Factor in Global Politics**

Russia, Middle East, Iran, China, North Korea

# The Structural Transformation of Oil Markets and its Cyclical Political and Economic Consequences

# Shale oil has made the US more energy secure – but US and global oil markets remain deeply intertwined



Source: EIA Annual Energy Outlook 2016,

# US Shale Adds a Faster Gear to the Capex-to-Supply Conveyor Belt

## Short-Cycle (6-12 mo)

- US Tight Oil
- Global Crude Inventories
- Spare Production Capacity

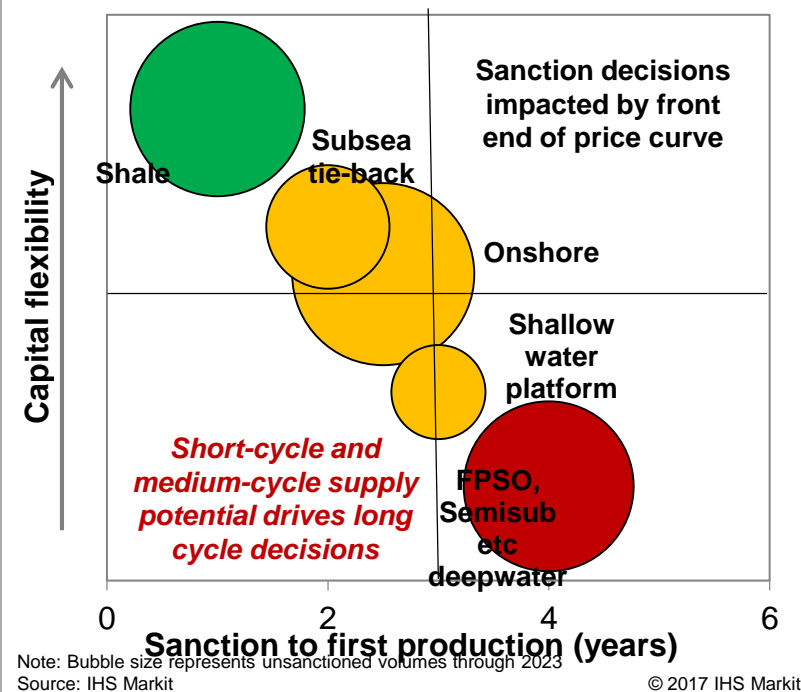
## Medium-Cycle (1-3 yrs)

- High-Potential Gulf Projects (Iraq/Iran/Saudi)
- Sustainable Return of Political Barrels (Libya/Nigeria)
- EOR, Tie-backs, Brownfield Expansions

## Long-Cycle (3-5 yrs)

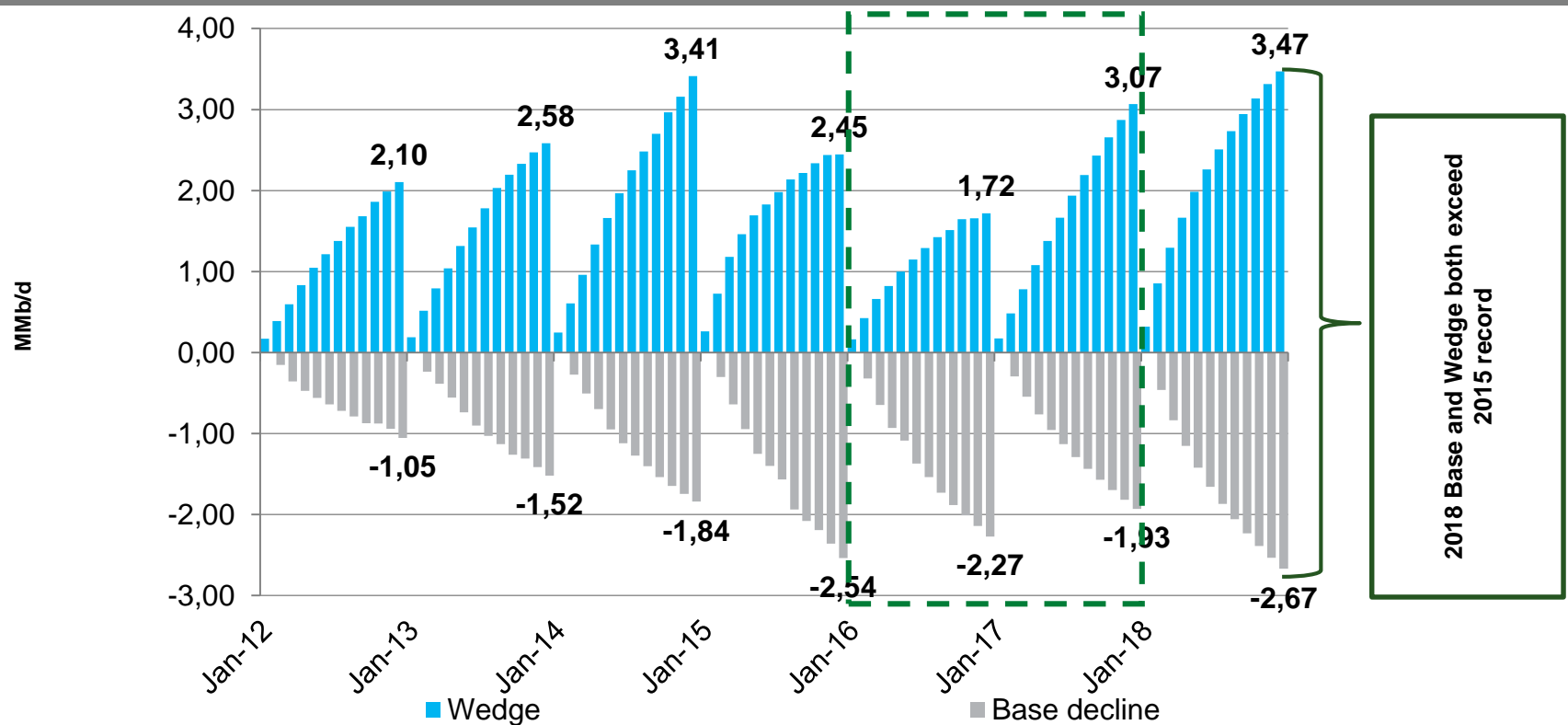
- Greenfield Conventional Onshore
- Oil Sands
- Offshore Development (esp. Deepwater)

## Illustrative capital flexibility and



# Annual wedges of growth and contraction are really a geopolitical drama

Base decline & wedge production in US Onshore



Notes: Due to methodological differences, base decline shown here is understated and must be adjusted to fit with actual growth.  
Source: IHS Markit

© 2017 IHS Markit

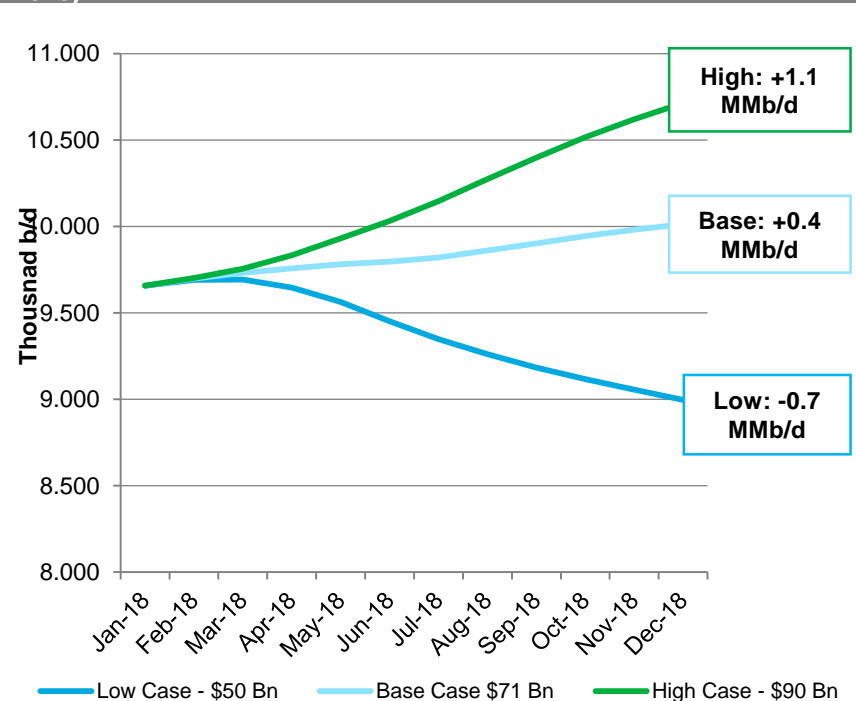
# Wall Street takes center stage: antagonist or protagonist?

2018: dramatic reactive growth depends on capex and price scenarios

	Production as entry (MMb/d)	Production at exit (MMb/d)	Entry-to-exit change (MMb/d)	New Wells	Rigs	Capex in \$ Bn
Low Case 2018 - \$50 Bn	9.7	9.0	-0.7	14,292	562	\$50
Base Case 2018 - \$71 Bn	9.7	10.0	0.4	18,110	901	\$71
High Case 2018 - \$90 Bn	9.7	10.7	1.1	20,487	1,099	\$90

Source: IHS Markit

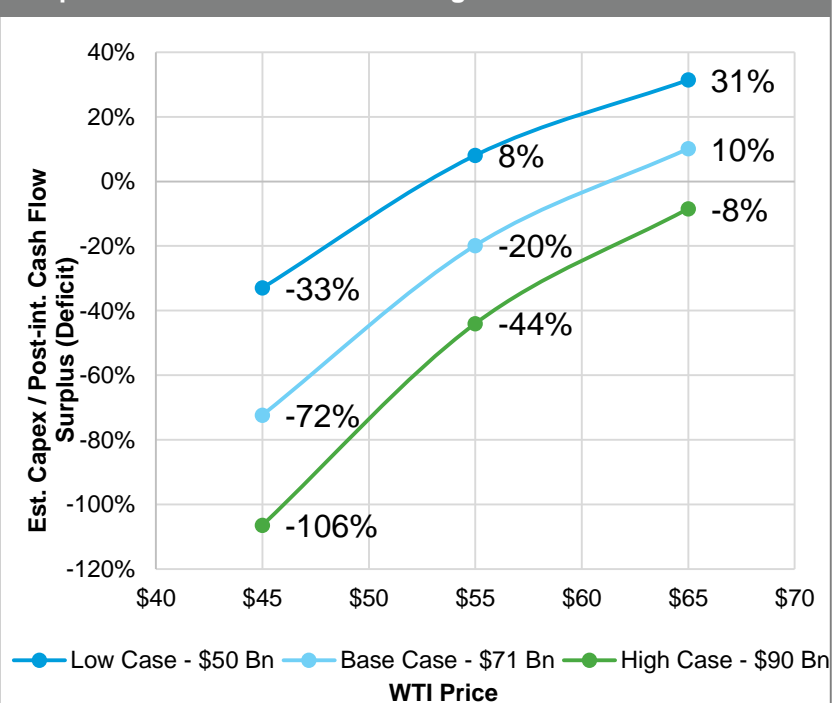
Production growth path under three sensitivity cases (entry-to-exit 2018)



Source: IHS Markit

© 2017 IHS Markit

US production cases: Price-funding combinations in 2018

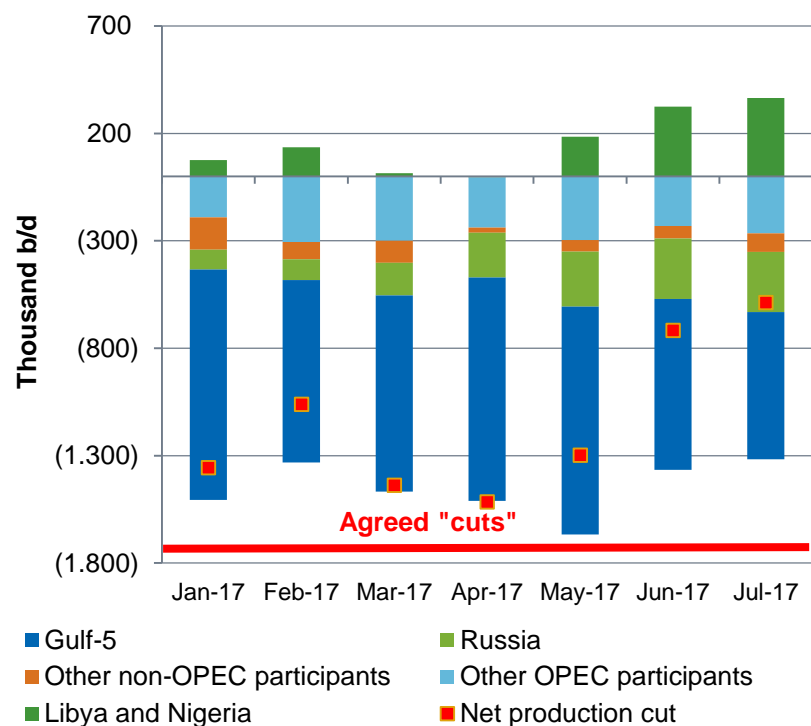


Source: IHS Markit

© 2017 IHS Markit

# OPEC, Russia: bet on supply management to cure accumulated ills

Change in crude supply from October 2016 levels

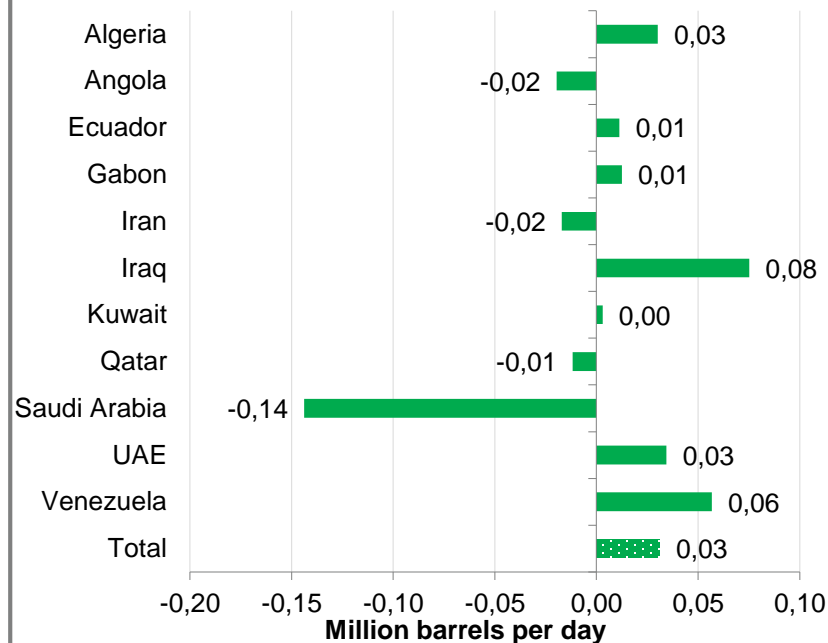


Notes: Angola is taken as change from September 2016 levels as agreed at the OPEC meeting on November 30

Source: IHS

© 2016 IHS

OPEC January-June 2017 average crude production minus agreed target level



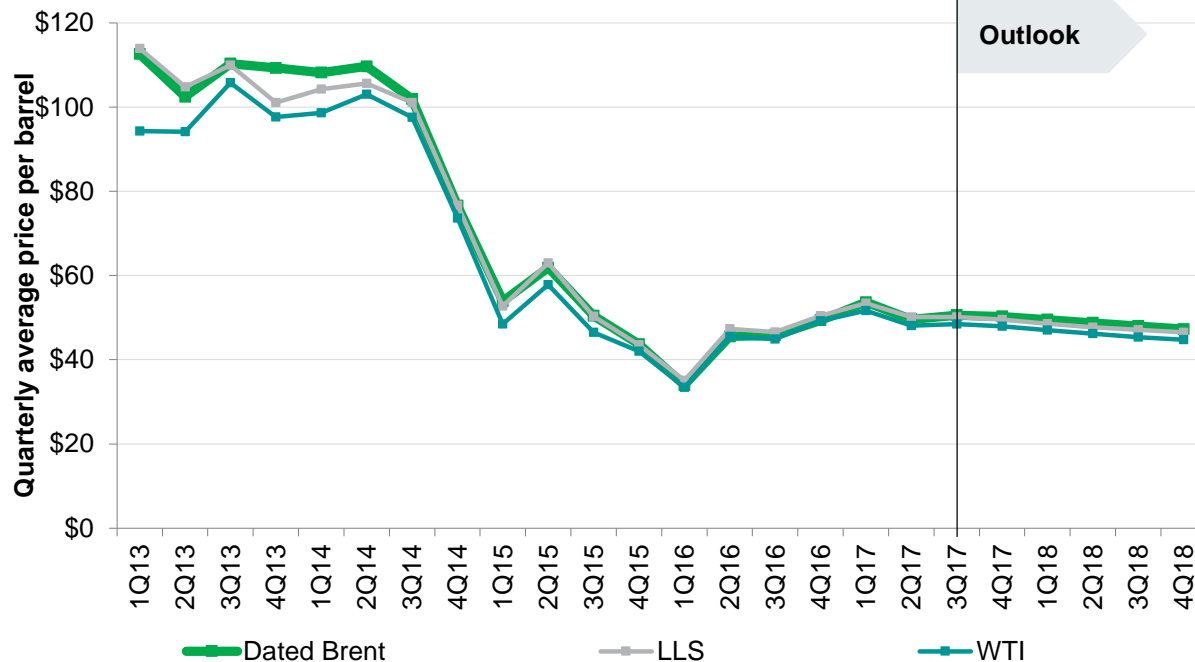
Notes: Libya and Nigeria are not included in this figure because they are exempted from OPEC production targets. Equatorial Guinea, which joined OPEC in May 2017, is also not included in this figure as its output target has not been explicitly stated by OPEC..

Source: IHS Markit

© 2017 IHS  
Markit

# Short-cycle price dynamic: hard work to stay in place

Dated Brent and other benchmark crude price outlook to 2018



Notes: LLS = Louisiana Light Sweet. WTI = West Texas Intermediate.  
Source: IHS Markit, Argus Media Limited (historical)

© 2017 IHS Markit

## Assumptions

OPEC and Russia maintain some degree of production restraint through 2018, as producers are cautious about the price repercussions of raising output too quickly.

US and Canadian annual crude production rises a combined 0.8 MMb/d in 2017 and 1.1 MMb/d in 2018. US production posts such growth despite WTI prices in the mid-to-high \$40s, owing to ample capital, hedging, and attractive well economics.

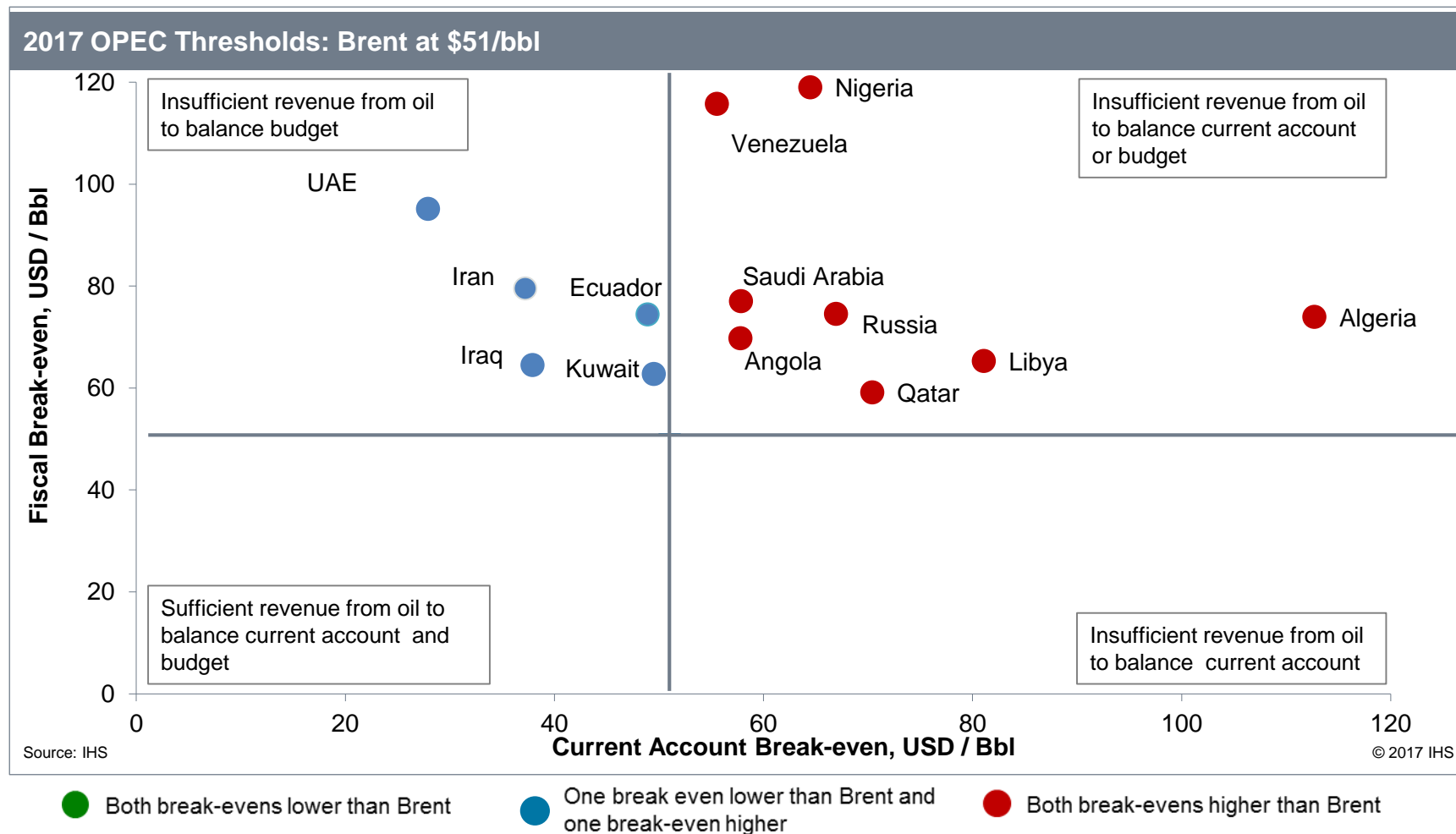
World liquids demand remains robust, posting annual average growth of 1.7 MMb/d in 2017-18, fueled by gains in China, India, and other emerging market economies in Asia.

Benchmark crude price outlook (dollars per barrel)

	3Q 2015	4Q 2015	1Q 2016	2Q 2016	3Q 2016	4Q 2016	1Q 2017	2Q 2017	3Q 2017	4Q 2017	1Q 2018	2Q 2018	3Q 2018	4Q 2018
<b>Dated Brent</b>	\$50.44	\$43.71	\$33.95	\$45.51	\$45.80	\$49.35	\$53.66	\$49.58	\$50.56	\$50.26	\$49.50	\$48.75	\$48.00	\$47.26
<b>LLS</b>	\$50.32	\$43.56	\$35.12	\$47.33	\$46.53	\$50.42	\$53.43	\$50.12	\$50.10	\$49.50	\$48.53	\$47.69	\$47.07	\$46.46
<b>WTI</b>	\$46.47	\$42.03	\$33.41	\$45.50	\$44.88	\$49.23	\$51.68	\$48.11	\$48.49	\$47.94	\$47.00	\$46.17	\$45.39	\$44.74

Source: IHS Markit, Argus Media Limited (historical)

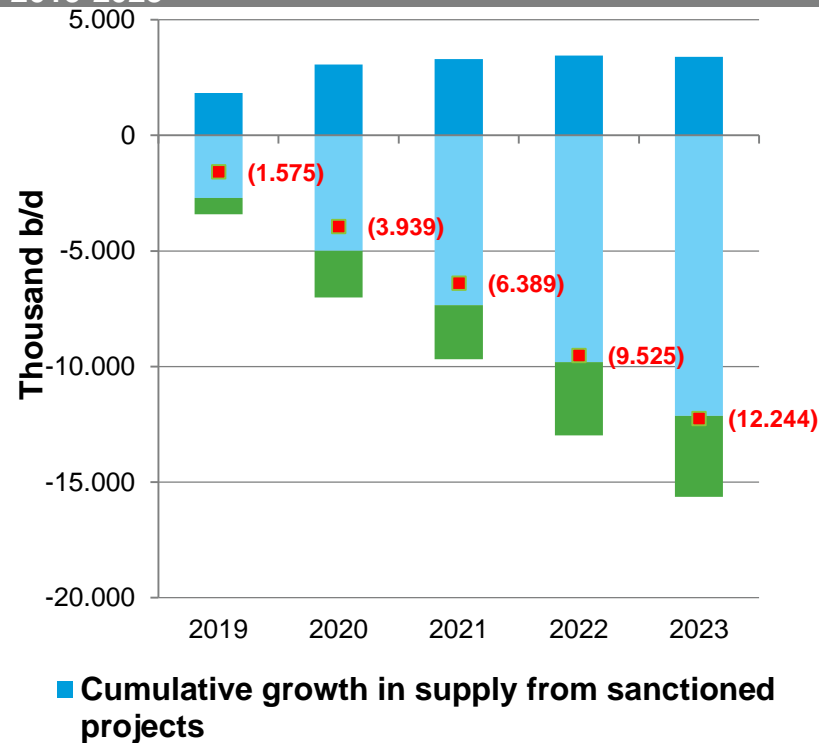
# Today's geopolitical drama: prices profoundly shape economic and political choices of producer economies



Who will in the competition to  
supply the market?

# Reactivity of American unconvensionals defines the pace for future FID and who supplies future barrels

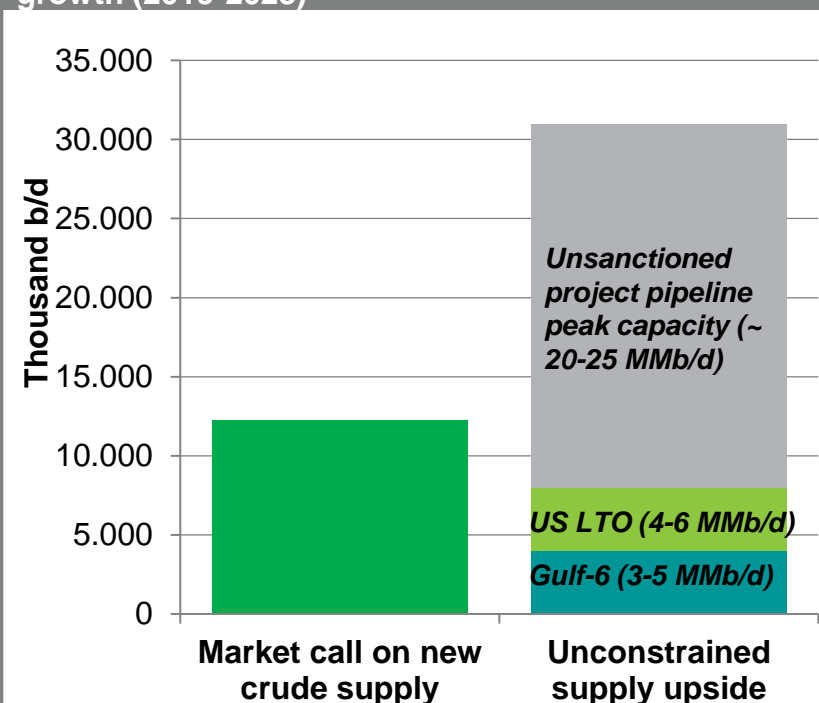
Global crude and condensate call on new supply 2019-2023



Source: IHS Markit

© 2017 IHS Markit

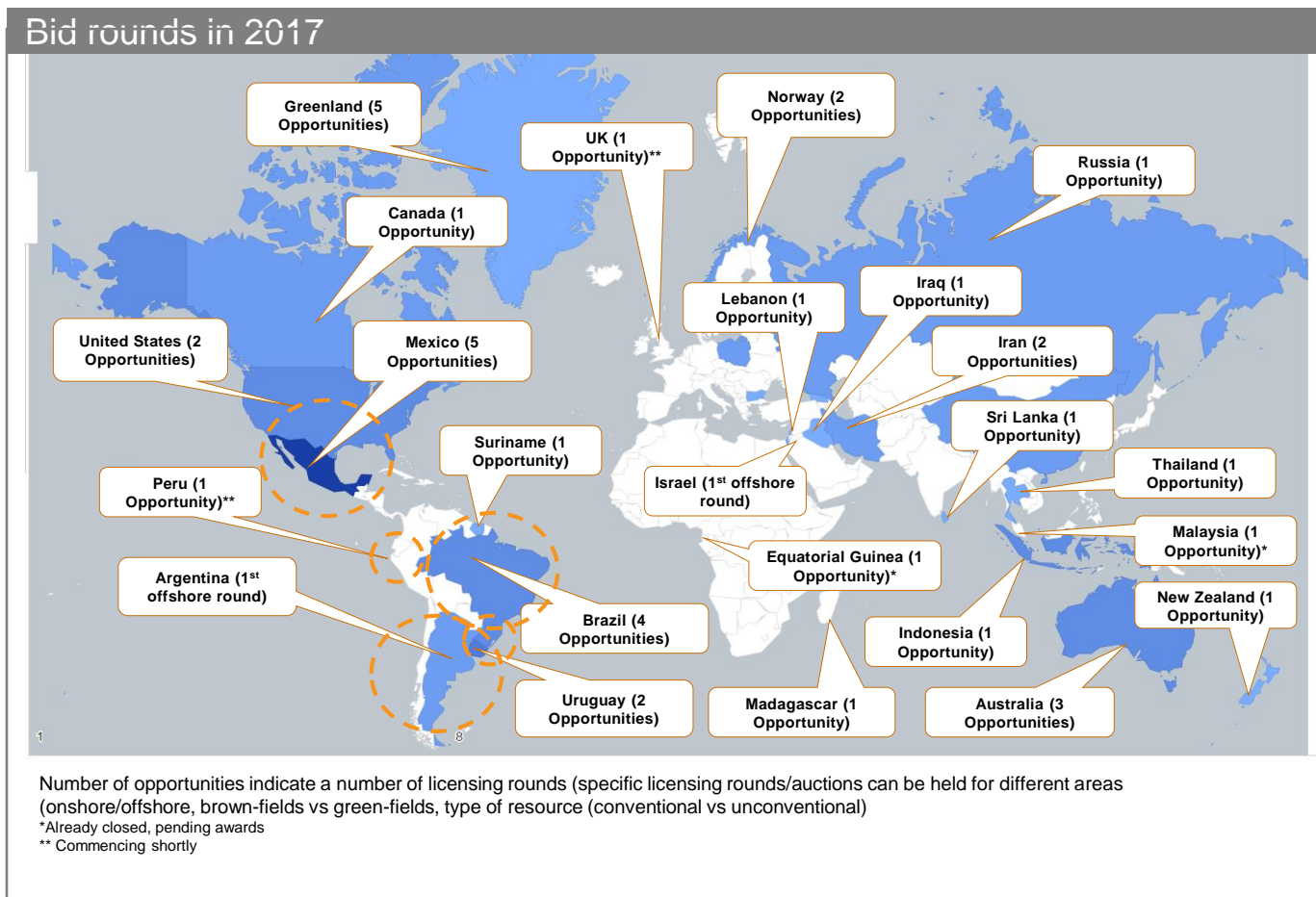
Global market call on new supply vs. potential growth (2019-2023)



Source: IHS Markit

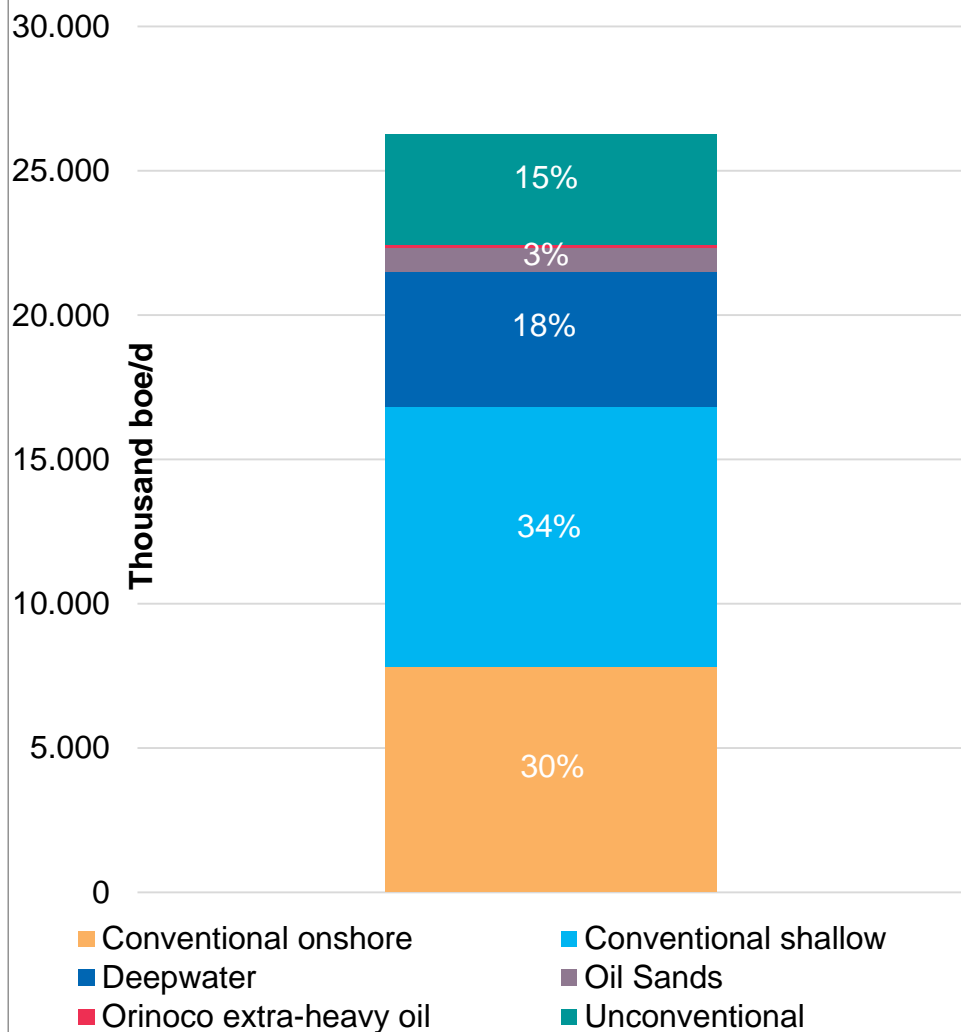
© 2017 IHS Markit

# Countries entering global hydrocarbons markets need fiscal terms and resource quality to compete: 2017 bid rounds

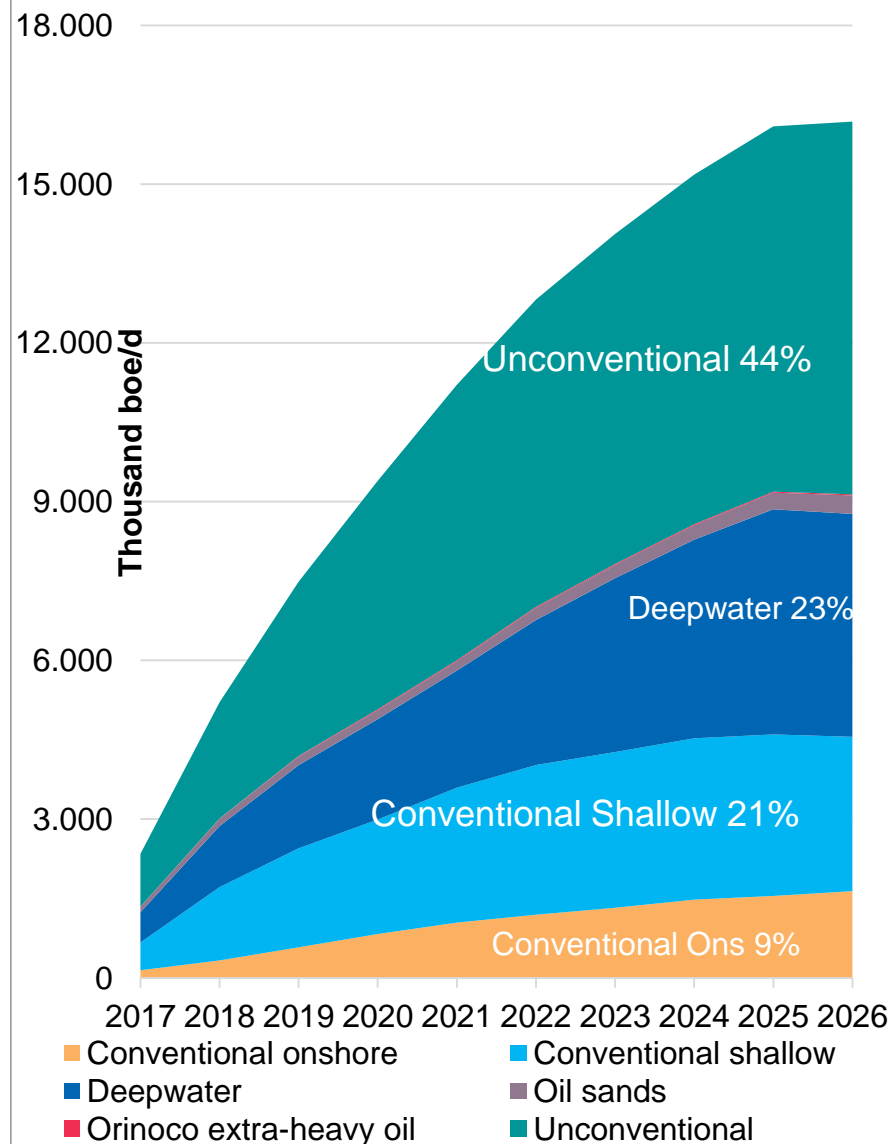


# The deepwater is still important

2017 estimated total production by asset type for 21 largest IOCs

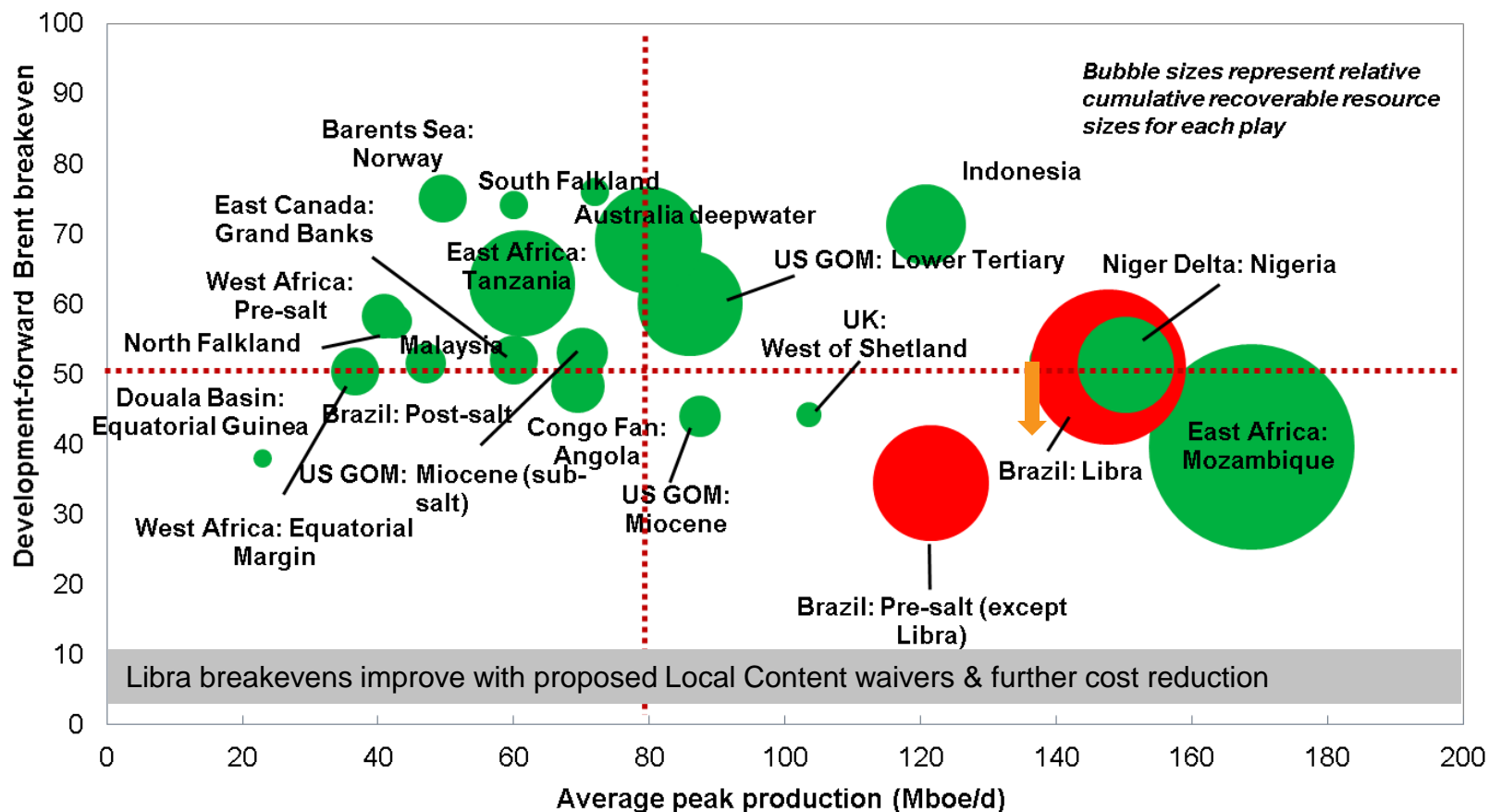


2017-2026 forecast new source incremental growth by asset type



## Reductions in project cost continue to make global Deepwater competitive in lower oil price environment

Average development-forward Brent breakeven prices for new projects in selected plays



Source: IHS Global Deepwater and Growth Plays Service

© 2015 IHS

# Paris Accord: Will it reshape global energy markets and geopolitics?

# PARIS AGREEMENT: Revolutionized climate negotiations. From seeking the “ideal” to what countries can do.

Entry into force: 4 November 2016

## Countries that joined the Paris Climate Agreement

**Ratified  
(160)**

**Signatories  
(195)**

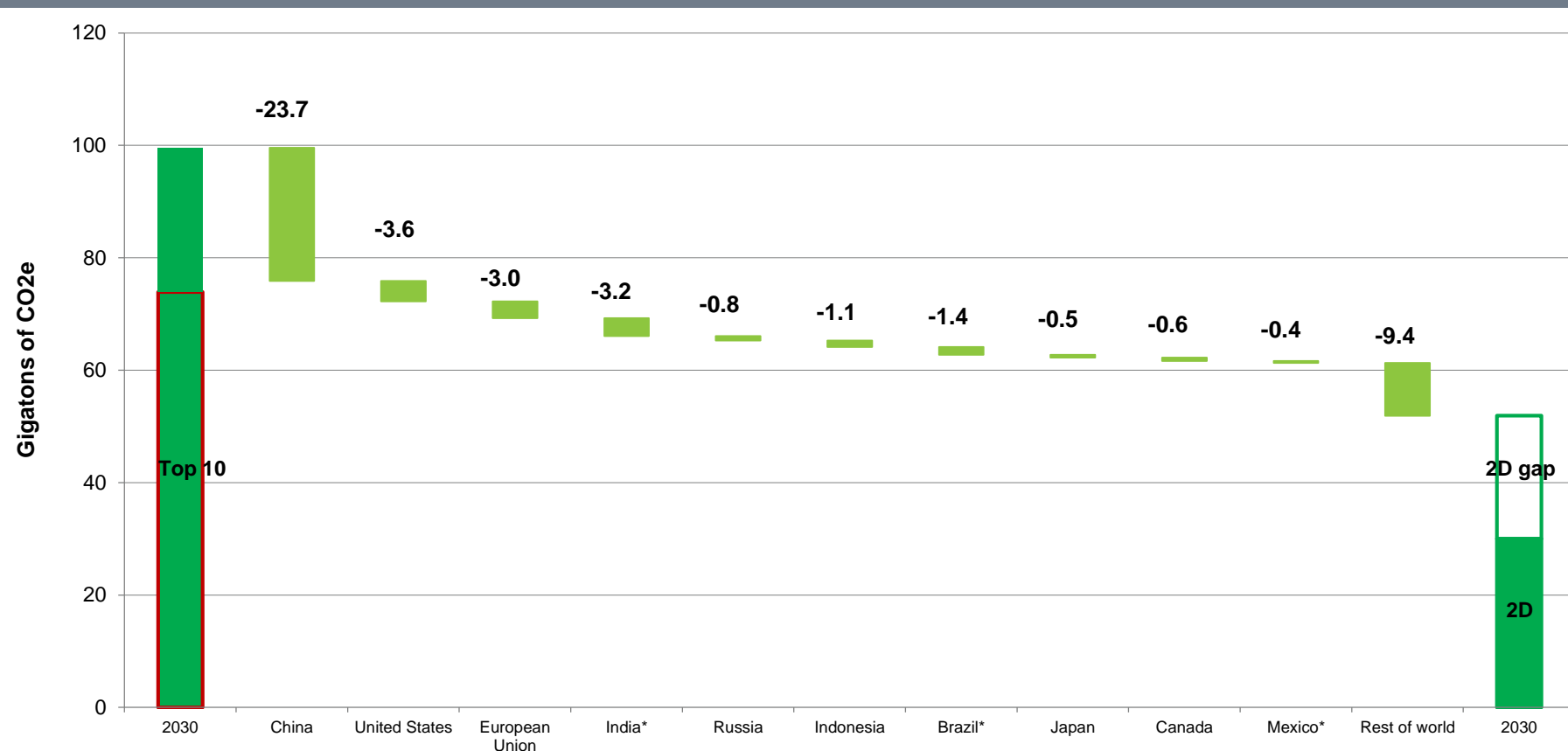
**Not Signed / Withdrawing  
(3)**

Note: Denmark's agreement excludes Greenland. Map is updated as May 31, 2017.  
Source: UNFCCC and Business Insider.

- As the world commits to a low carbon transition, the conversation in oil has shifted from “Peak Supply” to “Peak Demand”
- Base case scenarios see total oil demand continuing to rise through 2040, even in lower carbon pathways
  - > IHS Rivalry: 113mm bpd
  - > IEA New Policies:108mm bpd
- To achieve a 2°C target, Peak Demand would need to occur by 2021
  - > IHS Autonomy: 99mm bpd
  - > IEA 450PPM:94 mm bpd

Eventually the world will have to reconcile NDC pledges with a 2DS target. Will this open new geopolitical battles?

Global GHG emissions and max NDC savings in 2030, BAU versus NDC and 2 Degree emissions levels



Notes: BAU includes LULUCF emissions and is a combination of IHS and country-provided projections; the top 10 emitters shown above are projected to represent up to 80% of reductions pledged by all NDCs.  
Source: IHS Markit

© 2017 IHS Markit

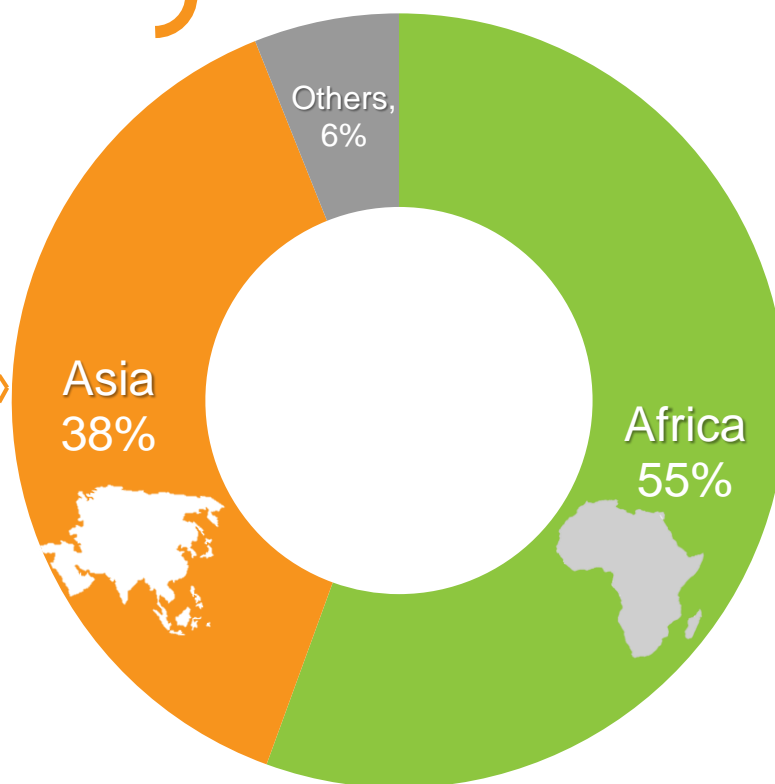
# Defining Challenges: 100% energy access, growing population, sustainability – what are the solutions?



**1.06 billion**

people live without electricity

Power sector's **coal consumption** is expected to **rise by over 40%** during 2015-25

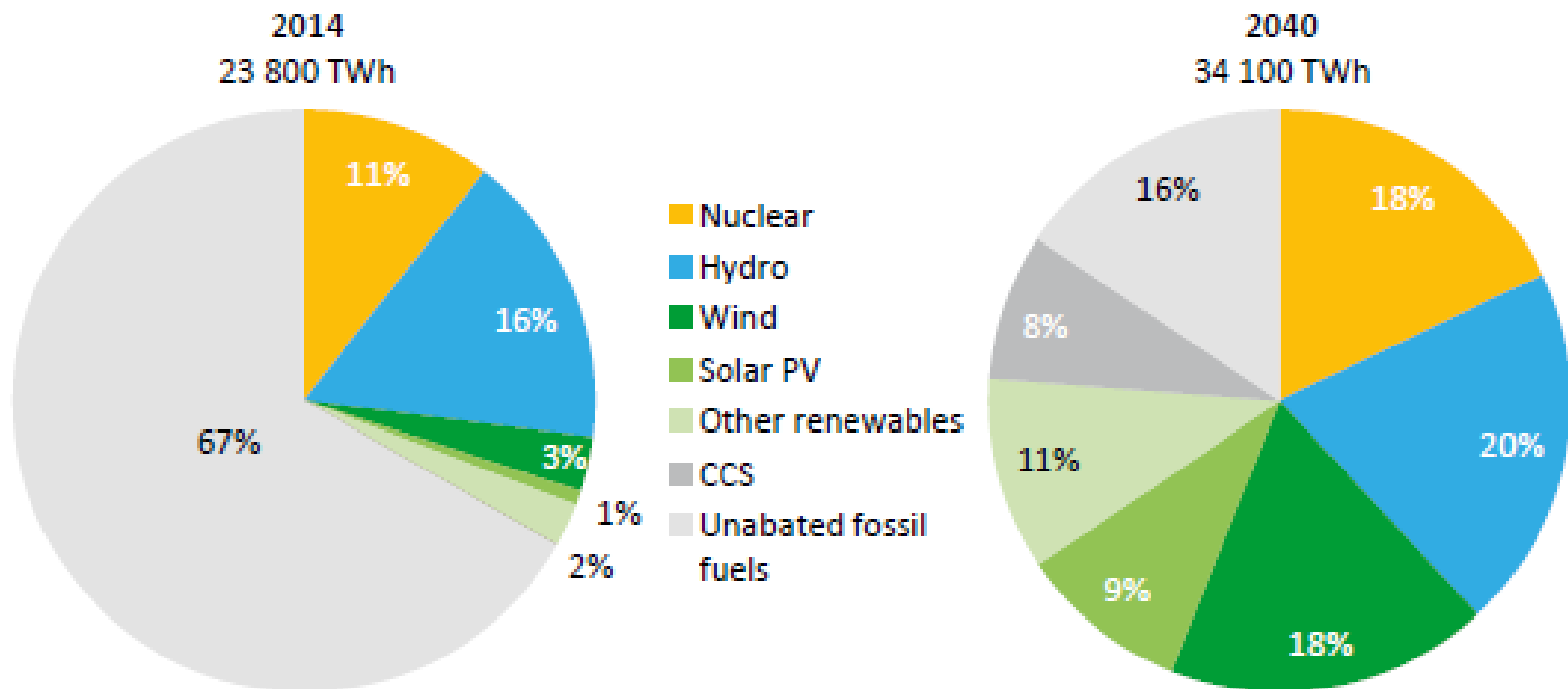


**Coal demand** in sub-Saharan Africa **increases by around 50%** in 2040



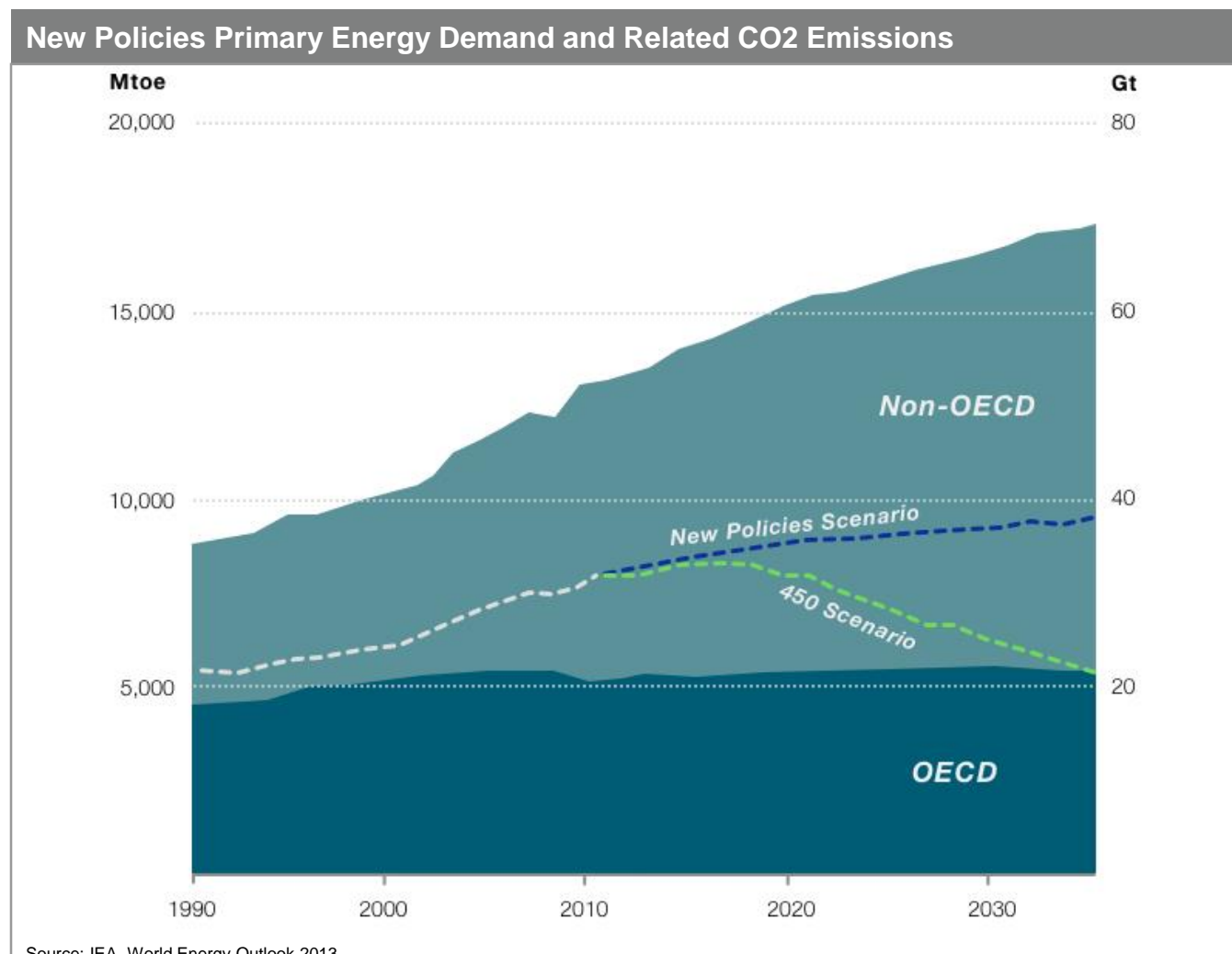
# Success in achieving a 2DS world requires translating technological change into investment

## Evolution of the power generation mix in the 450 Scenario



Source: IEA

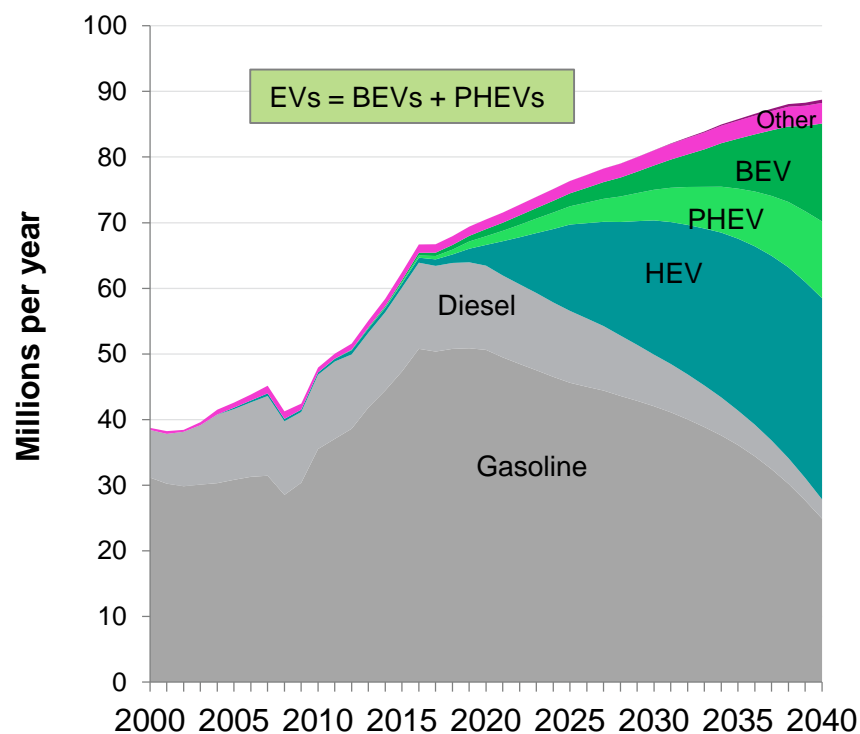
To accommodate Non-OECD growth, all countries must change the way they produce and consume energy



# Mobility: vehicle electrification, peak oil demand, and the geopolitical implications

By 2040 Electric Vehicles could represent 30% (Rivalry) to 60% (Autonomy) of LDV sales in US, Europe, India, China (70% of world sales)

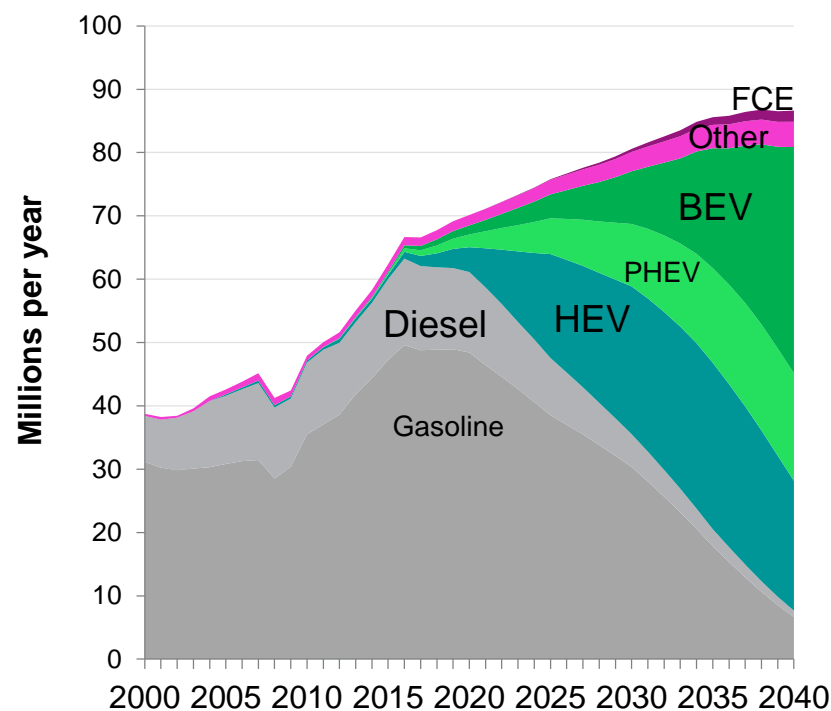
LDV sales by powertrain: Rivalry



Source: IHS Markit

© 2017 IHS Markit

LDV sales by powertrain: Autonomy

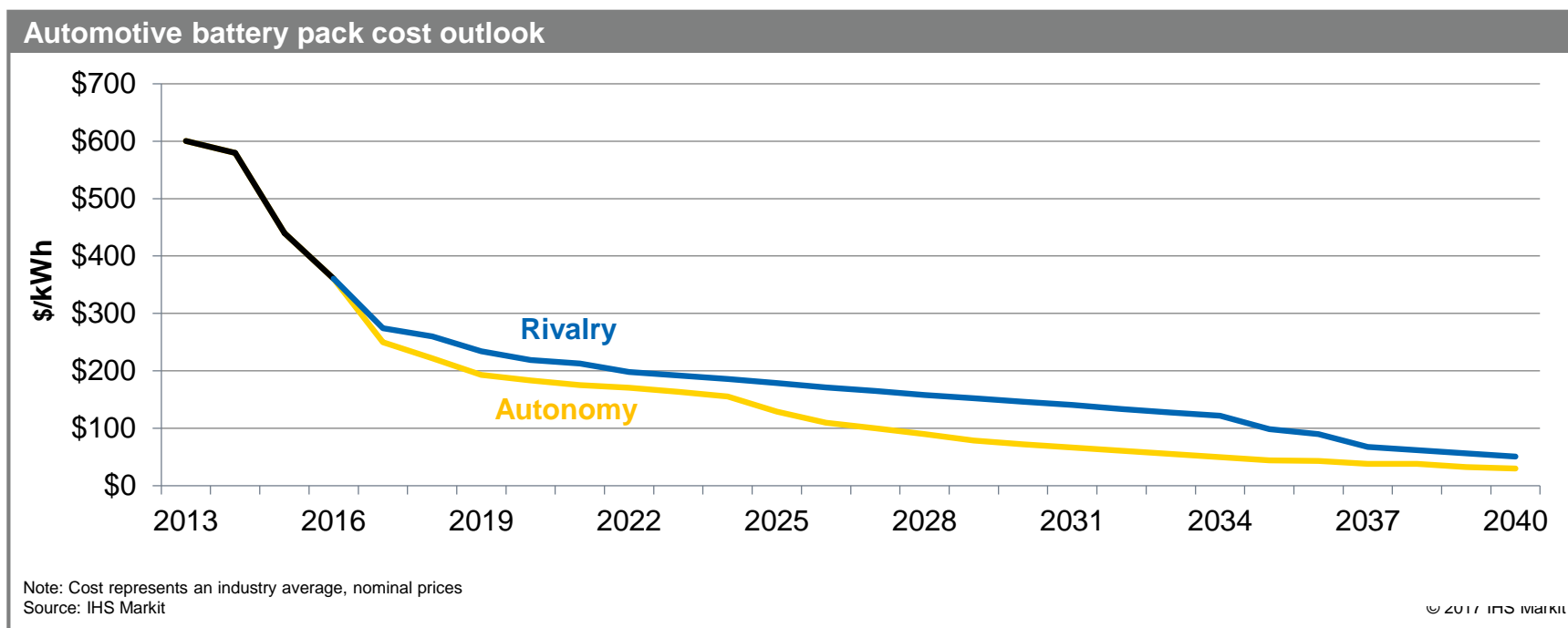


Source: IHS Markit

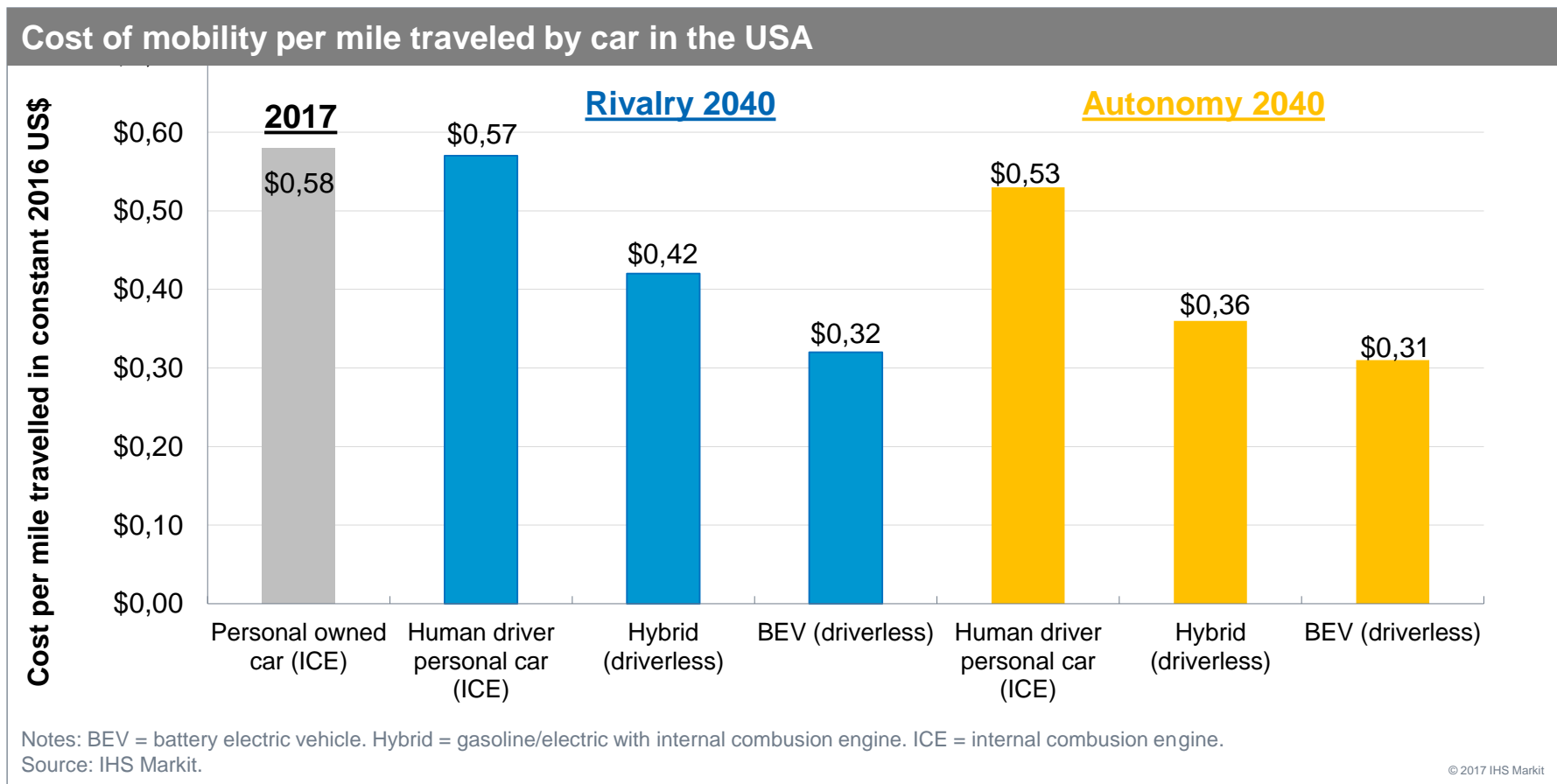
© 2017 IHS Markit

BEV = battery electric vehicle. PHEV = plug-in hybrid electric vehicle.  
HEV = hybrid electric vehicle with gasoline ICE. FCEV = fuel cell electric hybrid.

Declining battery cost is a key assumption in scenario outlooks for EV sales. Automotive battery pack costs have declined 53% since 2013.

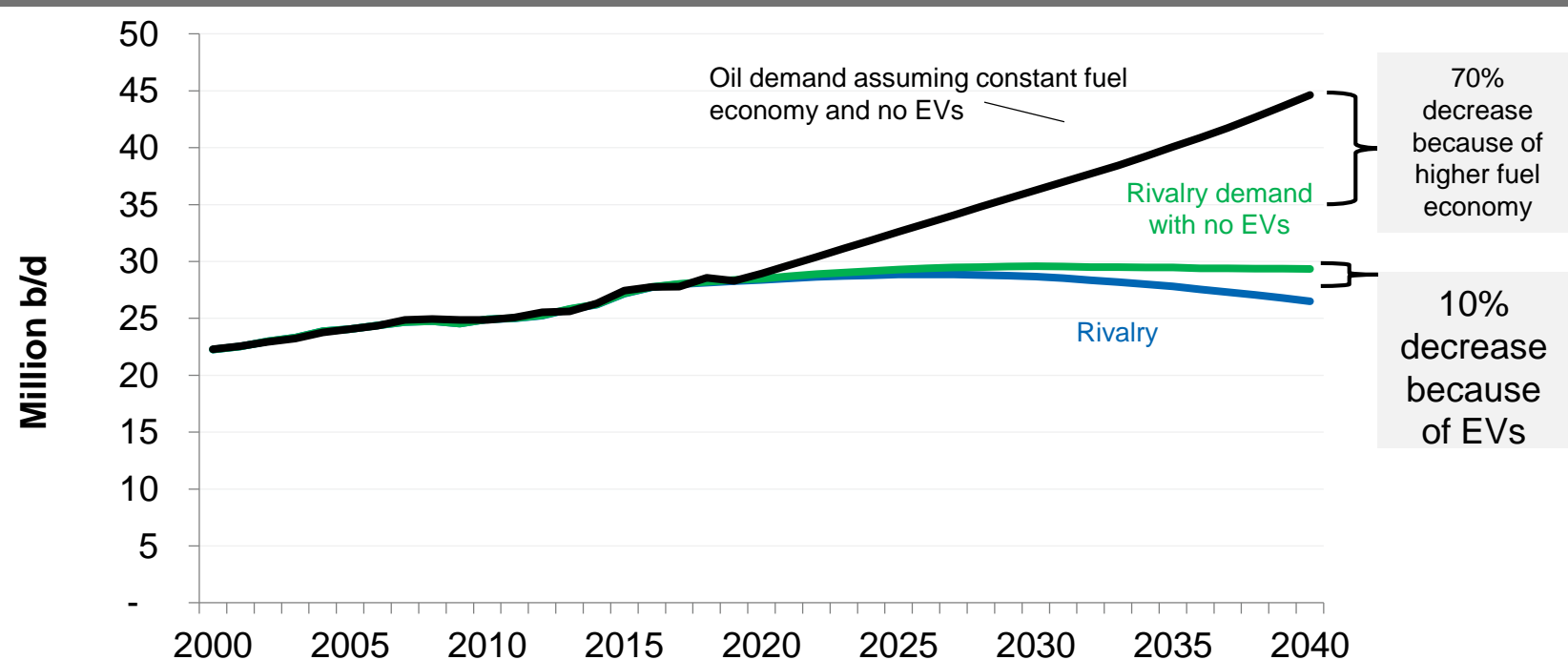


# Driverless technology lowers the cost of mobility and is among the most disruptive forces in LDV demand



# Remember the existing vehicle fleet: fuel economy standards – not EV penetration – have the biggest impact on oil demand

Global LDV gasoline and diesel demand: Rivalry



Notes: This is an illustrative example of how much gasoline EVs displace vs improving fuel economy

"Rivalry without EVs" is calculated by assuming all global electric miles are instead driven by gasoline HEVs

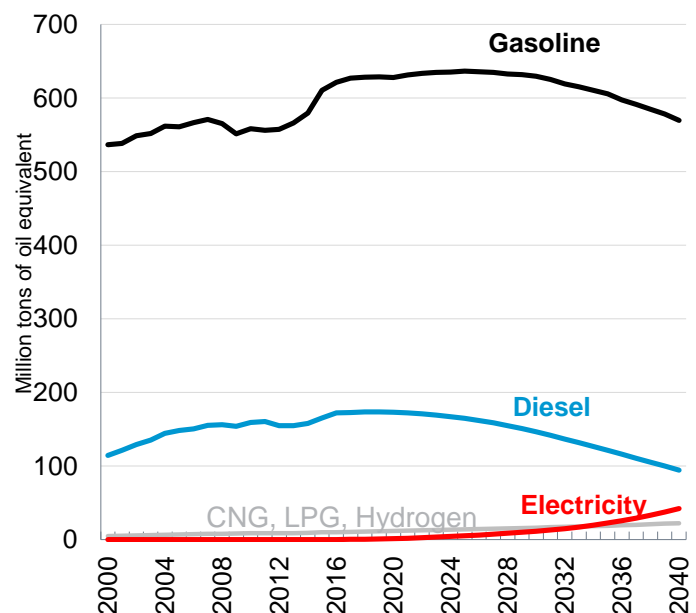
"Rivalry without EVs and constant fuel economy assumes" that all global LDV miles are travelled by vehicles with a constant 25 mpg fuel economy from 2020 out 2040

Source: IHS Markit

© 2017 IHS

# Gasoline and diesel demand will decline, but existing fleets will still make them the principal fuel sources through 2040

## Rivalry LDV energy demand in RTW markets

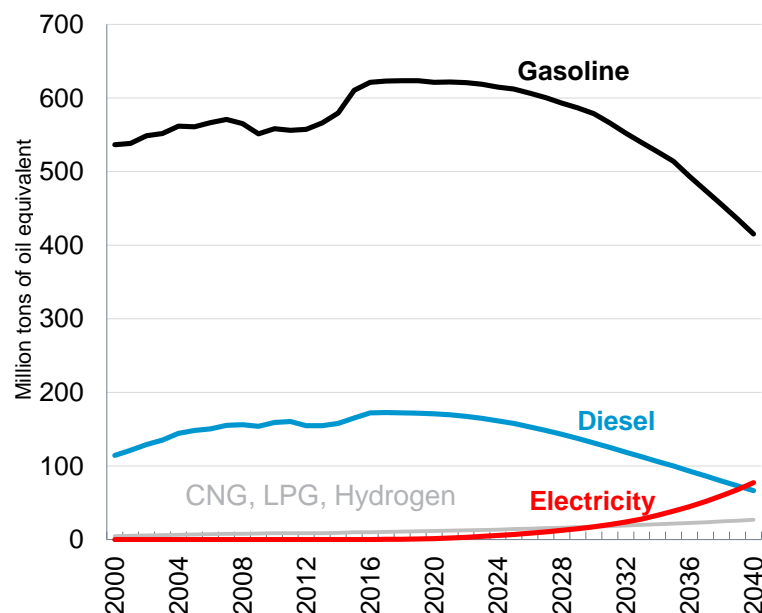


Notes: Ethanol is included in gasoline. CNG = compressed natural gas. LPG = liquified petroleum gas

Source: IHS Markit. Electricity is consumed by LDVs, not demand

© 2017 IHS Markit

## Autonomy LDV energy demand in RTW markets

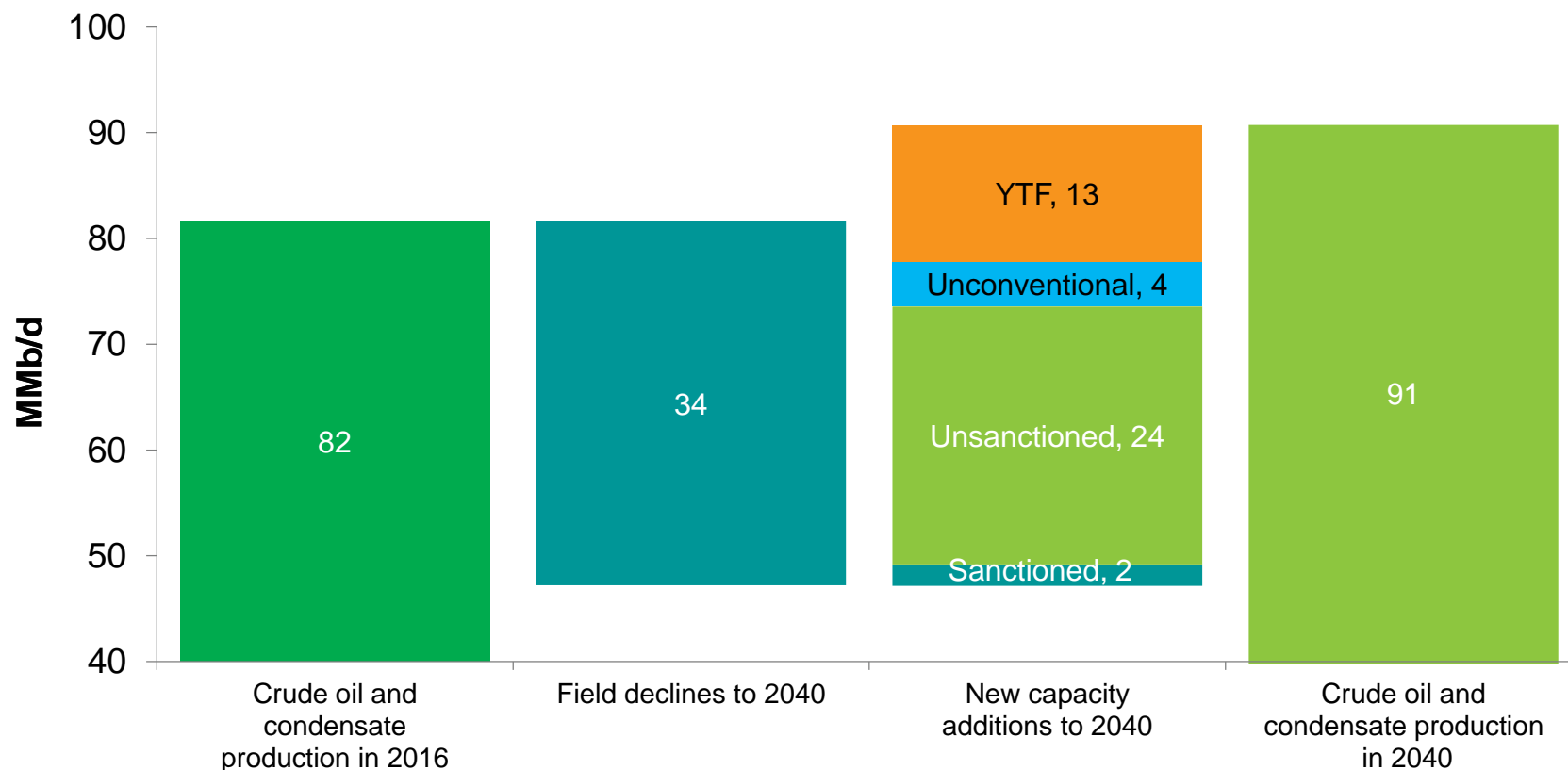


Notes: Ethanol is included in gasoline. CNG = compressed natural gas. LPG = liquified petroleum gas

© 2017 IHS Markit

# Higher demand and field declines will still require the world to find 43 MMb/d by 2040

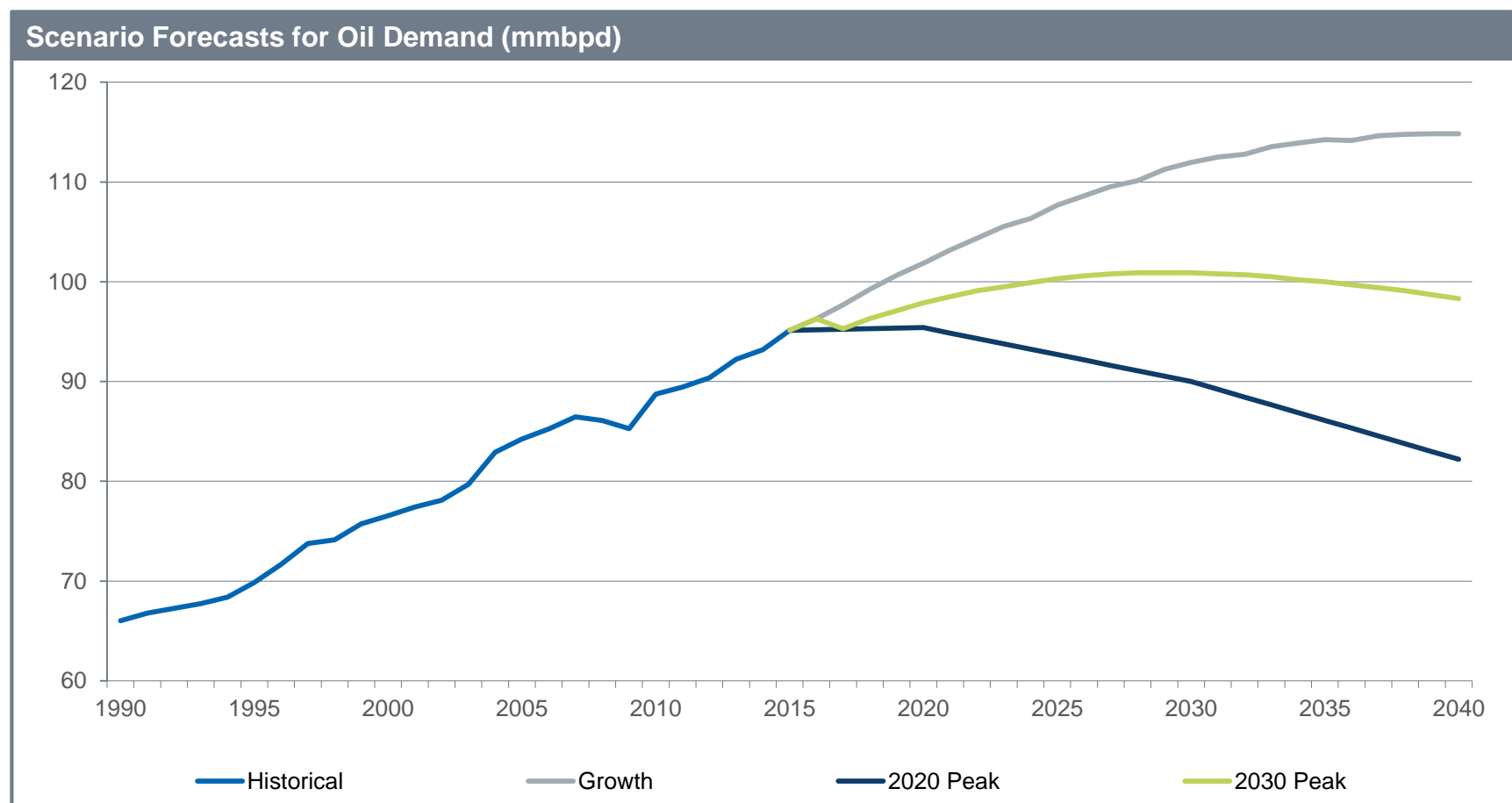
## Global crude oil and condensate production outlook in 2040



Source: IHS Markit

© 2017 IHS Markit

# Peak Demand: do science fiction and constructive realism meet? Oil countries and companies weigh economic futures



## Diversification the new strategy: Saudi Arabia's Vision 2030

- The Saudi economy is expected to expand **1.3 percent** in 2018, **down from a 2.3 percent projection** in January, according to the IMF.
  - > Deputy Crown Prince Mohammed bin Salman's plan to overhaul the economy and **reduce its reliance on crude** are weighing on growth.
- Successful USD 17.5-billion debut sovereign issue and expectations of additional packages during 2017 expected to unlock **public-private partnerships** and generate greater investment
- The **Saudi Aramco IPO** marks a historic shift for the Saudi economy and the global oil market writ large.
- **Vision 2030** intends to **diversify the Saudi economy beyond the oil sector** while addressing budget deficits that have plagued the government since 2014.
  - > Aramco is working to diversify its portfolio, signing roughly **\$50 billion in deals with U.S. companies**.
    - Some of these deals did not directly involve oil, such as one for a new shipbuilding complex in Saudi Arabia.

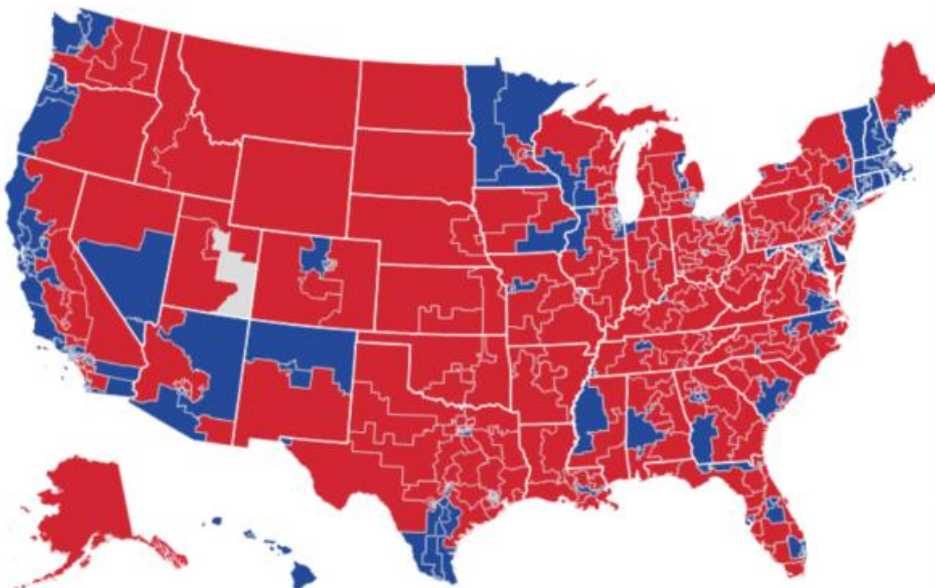


Targets	2016	2030
Non-Oil Government Rev.	\$163 B	\$1 T
Non-Oil Exports	16.0%	50.0%
Women in Workforce	22.0%	30.0%
Unemployment	11.6%	7.0%
Life Expectancy	74	80

# US Politics and Global Uncertainties: Russia, the Middle East, Iran, China, North Korea

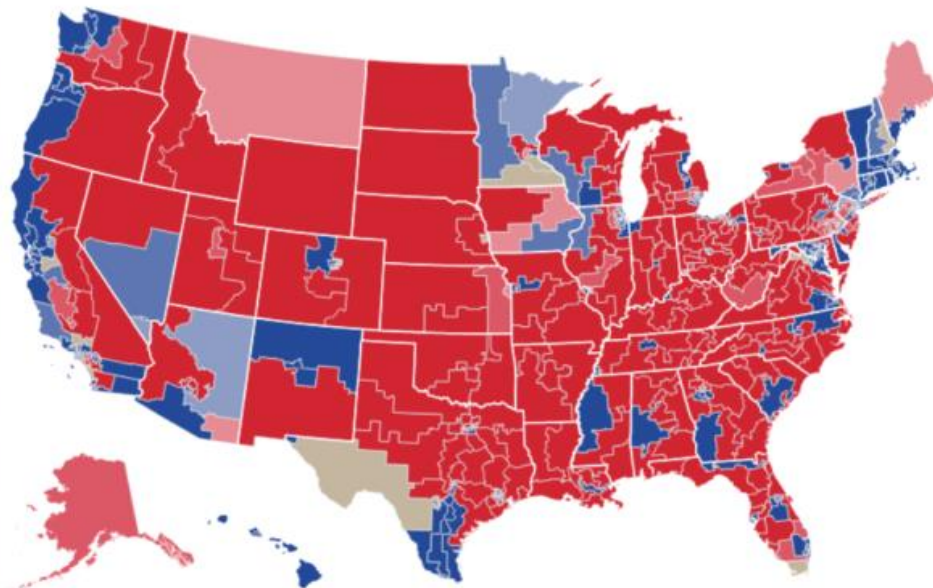
## House of Representatives 2017

Democrats 194 Republicans 240

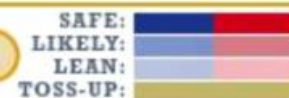


## House of Representatives 2018

Democrats 193 Republicans 231



### Election Race Ratings

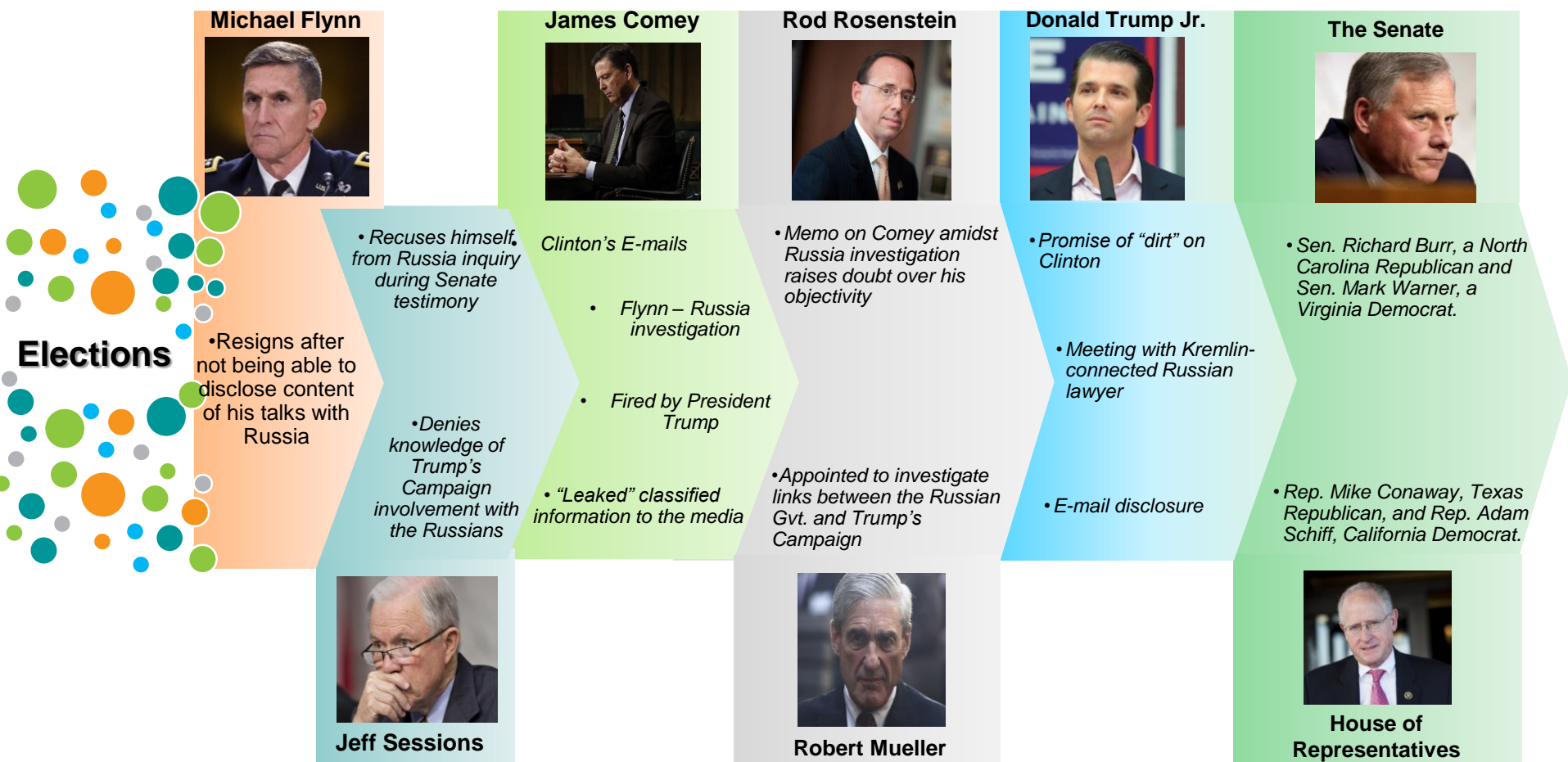


### House Elections 2018

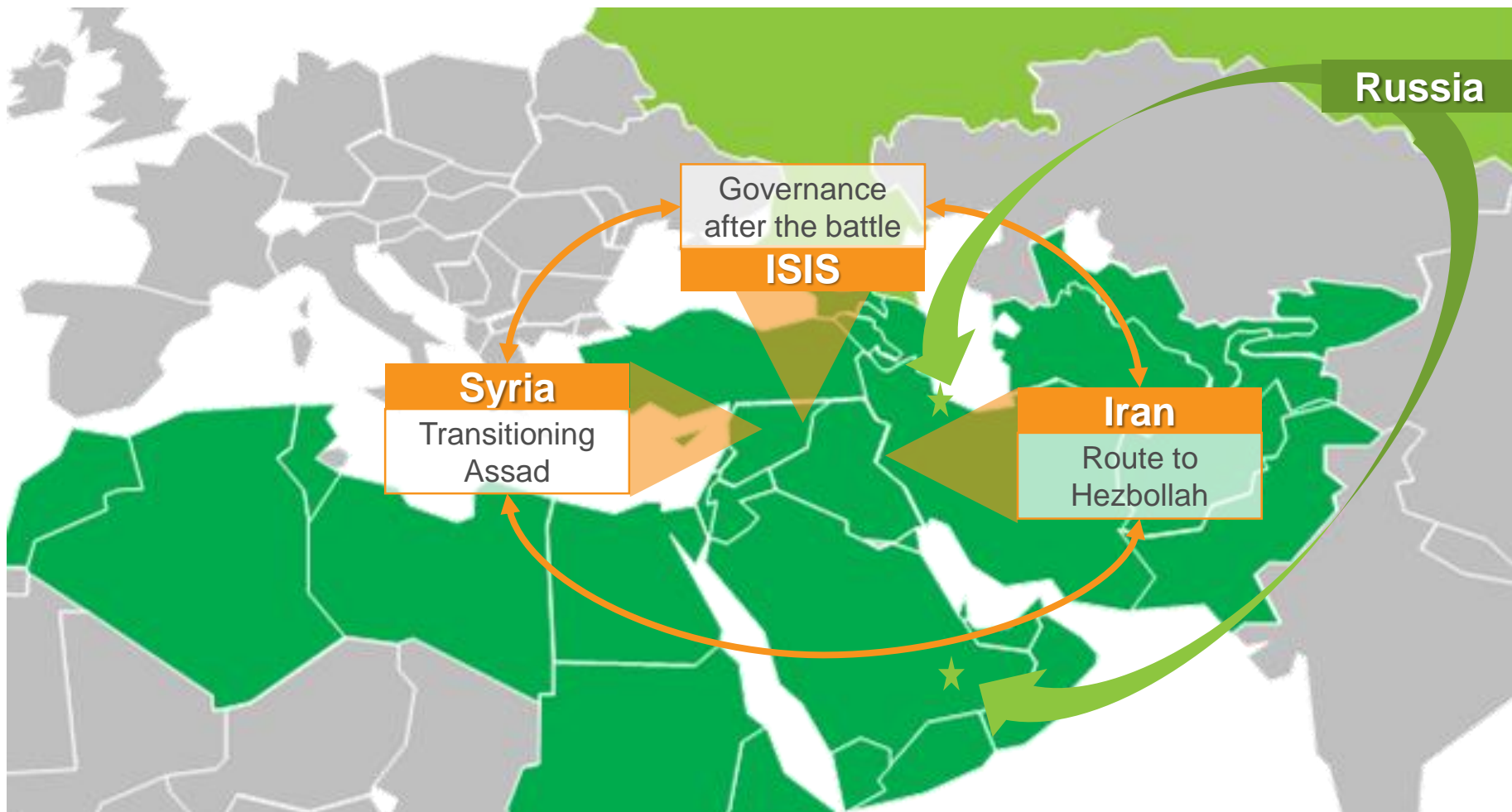
All 435 Voting Seats. 218 Needed for Control.

	Current	Pro	(a)
194	240	11	
193	231		

# US-Russia: domestic crisis and breach of trust complicates tragedy in the Middle East



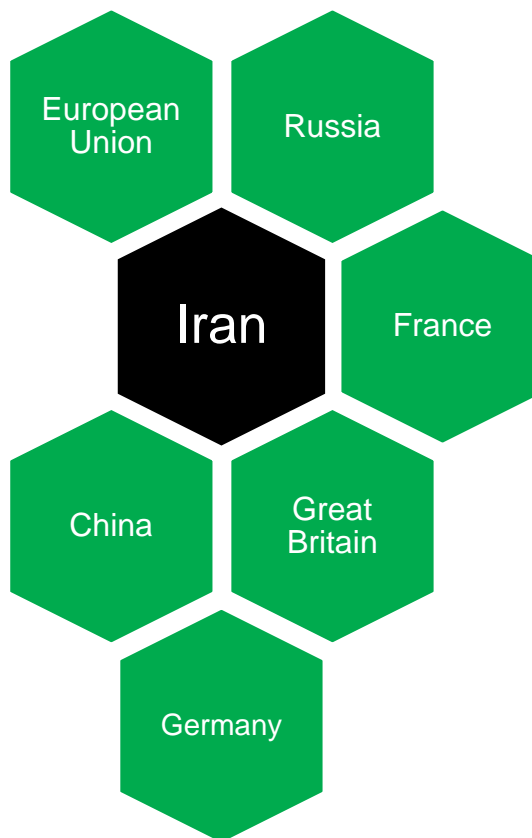
## U.S.-Russia Tensions Block Cooperation to Stabilize the Levant, while Russia's leverage with OPEC increases



# Iran: Trump decertification triggers uncertainty that can threaten the nuclear agreement

## What **decertification** means:

- U.S. decides the suspension of sanctions was not “appropriate and proportionate” to the steps that Iran has taken to end its illicit nuclear activities.
- Waivers to continue agreement remain through June
- Administration opens 60-day door to Congress to impose sanctions
- U.S. military against decertification
- Congress may be split
- Impact on oil markets may change over time



## Other Parties to the agreement:

- Respect IAEA *certification*

## Core Elements

- From 20,000 to 5,000 centrifuges at Natanz
- Uranium stockpiles reduced by 98% to 300kg for 15 years
  - Uranium stockpiles capped at an enrichment level of 3.67%
  - R&D limited to the Natanz facility for 8 years
  - Fordo facility ceases enrichment for 15 years
- Arak facility redesigned into a research and production facility for medical isotopes
- IAEA access within 24 days for 15 years

# China: once excluded from TPP, now writing Asia's rules of commerce and security

## One Belt, One Road (OBOR)

### > Silk Road Economic Belt &

### Maritime Silk Road

- “This project of the century.”- Xi Jinping
- More than 60 countries, with a combined GDP of \$21 trillion.
- China has spent \$50 billion on the initiative

## Asian Infrastructure Investment Bank (AIIB)

### > \$100 billion in Initial Capital

- Non-regional members: 25 billion
- Regional members: 75 billion
  - China: 29.8 billion

## After TPP

- > “Losing the United States from the TPP is a big loss, there is no question about that, but we are not about to walk away [...] certainly there is **potential for China to join the TPP.**” Malcolm Turnbull, Australian Prime Minister

### > Regional Comprehensive Economic Partnership

## Regional Security

### > North Korea:

- Clash of Chinese identities –
  - dominance v intervention averse

## South China Sea

- > Each year, \$5.3 trillion of trade passes through the South China Sea
  - U.S. trade accounts for \$1.2 trillion.
- > 7 billion barrels of proven oil reserves
- > An estimated 900 trillion cubic feet of natural gas

## North Korea: Neither key parties nor critical tools engaged to generate solutions



*"I told Rex Tillerson, our wonderful Secretary of State, that he is wasting his time trying to negotiate with Little Rocket Man"*



*"I will surely and definitely tame the mentally deranged U.S. dotard with fire."*

### Stakes

- Regional: South Korea, North Korea, Japan
- Global: China, U.S., Russia, Europe
- At risk: Global Non-Proliferation regime

### Critical Tools

- Mechanism to engage key parties
- Generate options for solutions & consequences

## Conclusions: Drivers of Power, Wealth and Sustainability

### Lower for longer is today's energy drama

- Unconventional oil abetted by capital flows create short-term reactivity that rapidly modulates supply and price.

### Only cheapest barrels will compete with Gulf and US Shale to enter market

- FID delays could risk future supply shortfalls – but when?

### Diversification starts now

- Hedging risk takes time:
- IPOs, Sovereign Wealth management, gas transition, energy v oil company.
- EVs will reshape, not end, oil demand

### Politics of Confrontation has added U.S. to drivers of global risk

- Russia: Stalemate in relations until U.S. file settled
- Middle East: U.S. alone lacks tools for stability
- Iran: Decertification triggers uncertainty that could reopen nuclear account
- China: U.S. ceases to write rules of the game
- Korea: Ingredients for solution missing