The strategic impact of shale and renewables and gaining confidence in higher oil prices
An European perspective

JP Morgan Center for Commodities

Denver Business School, Colorado

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JOSCO

Energy Finance & Strategy Consultancy

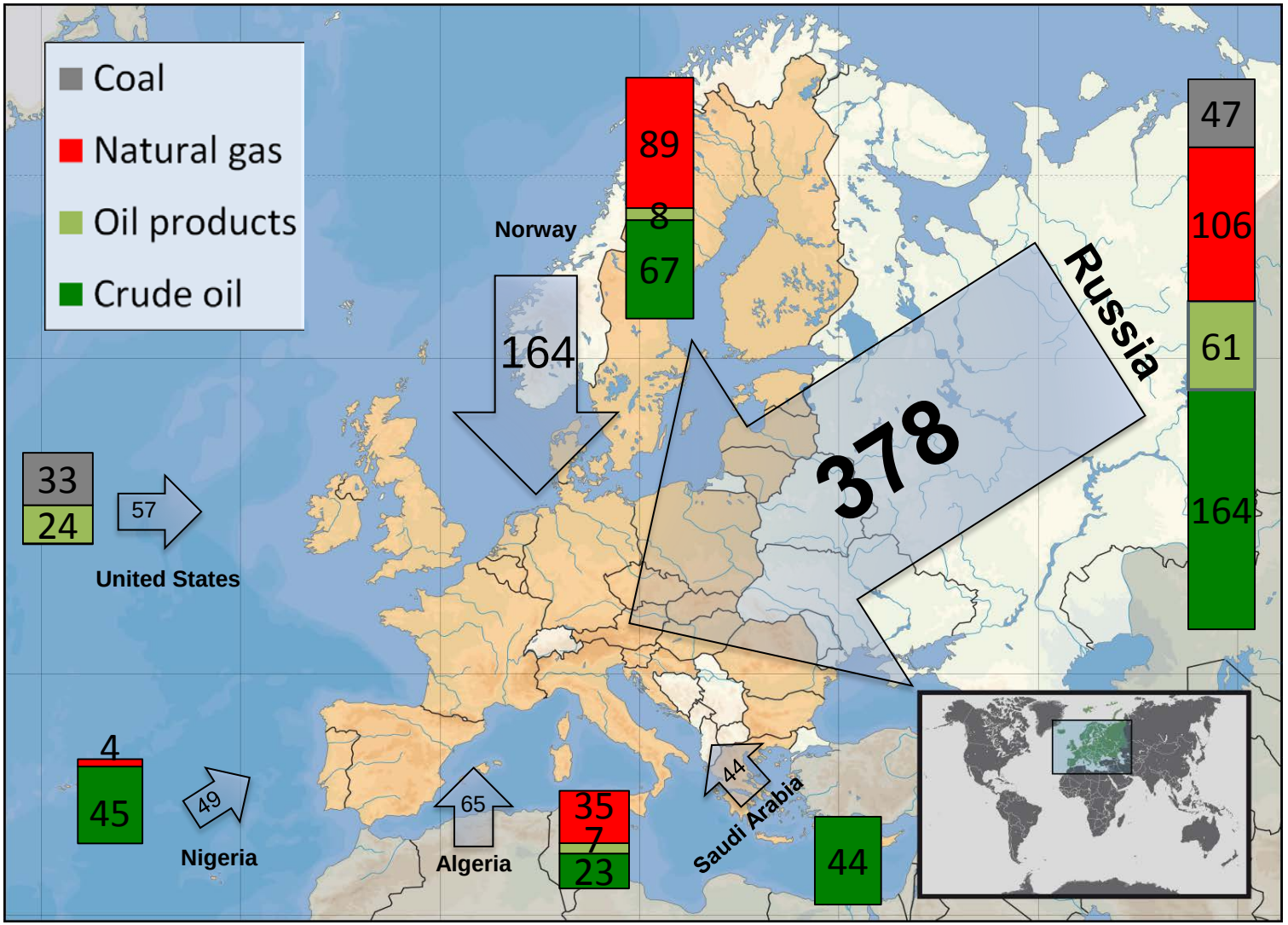
The thesis for this presentation

Will shale & renewables provide Europe with a perfect energy outcome?

1. **Affordable**
   (No excess rent)
2. **Reliable**
   (Security of supply)
3. **Clean**
   (Green & sustainable)
4. **Social Acceptance**
   (A better world, to start locally)

… and would that leave no other option for the major giant producers than to go for market share and volume strategy?

Setting the scene: The European fossil energy imports in 2014



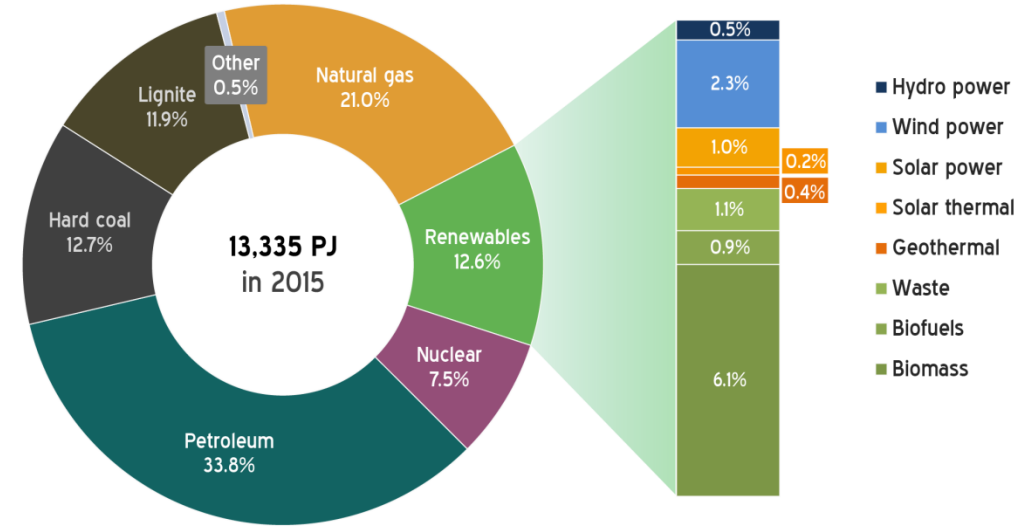
Source: CIEP analysis based on Eurostat data. Numbers are in Mtoe and rounded off. Categories are: Crude oil (3100), Oil products (3200), Natural gas (4000) & Coal (2000), 2016

Primary energy consumption in Germany in 2015 and the impact of the Energie Wende

Primary energy consumption mix in Germany 2015?

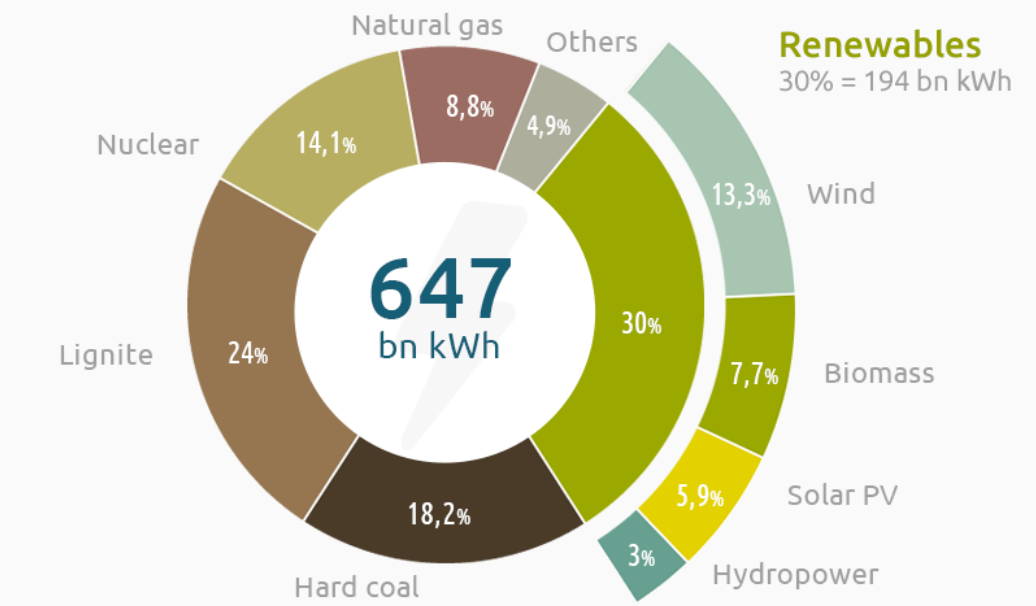
in petajoules & percent

Source: AGEB, AGEE-Stat



Germany's electricity generation mix 2015

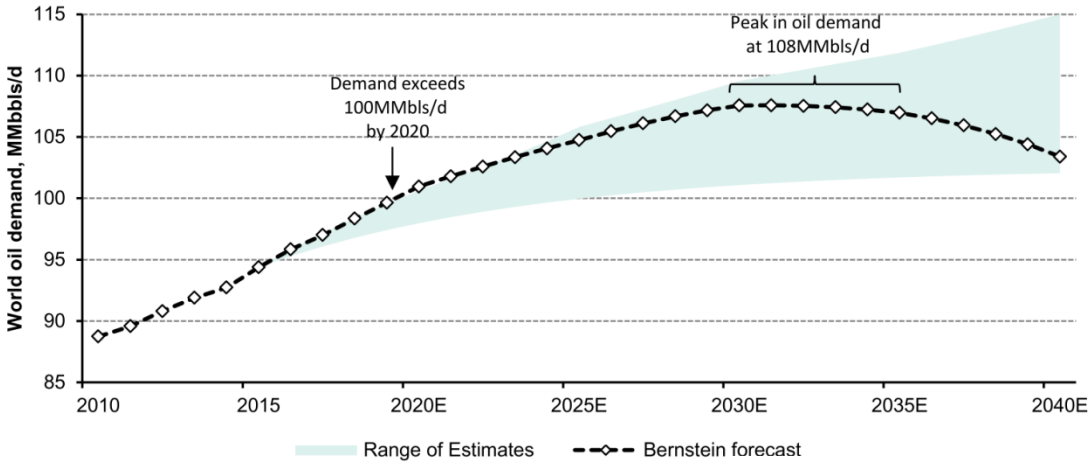
Share of Germany's gross electric power generation



Renewables reach 30% of Germany's gross electric power generation

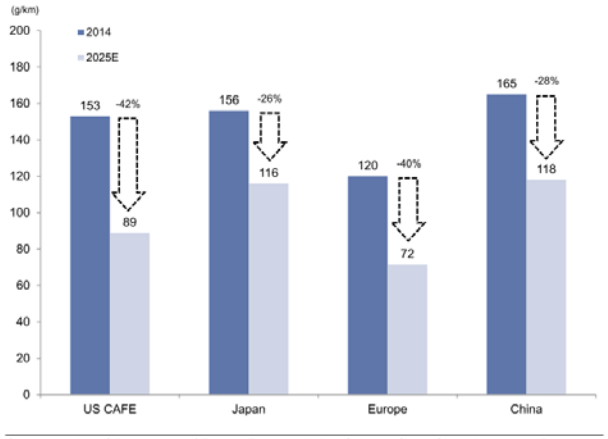
Source: AGEB / AGEE-stat and German association of energy and water, 2016

Future oil demand and the electrification of cars



The auto industry faces tough emission standards

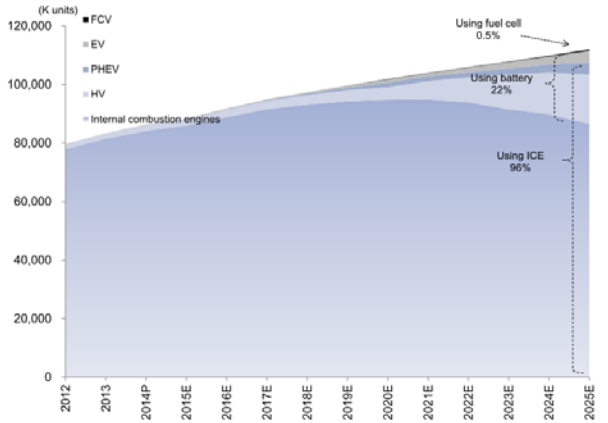
CO2 emission standards in major markets



Source: JAMA, US Department of Energy, European Union, Goldman Sachs Global Investment Research.

Electrification to advance over the next 10 years

Goldman Sachs forecast for powertrain composition



Source: IIHS, Goldman Sachs Global Investment Research.

While Bernstein forecasts EV sales to reach 10% of total car sales by 2025, Goldman Sachs forecasts that vehicles with an electric powertrain system will account for 25% of global auto sales in 2025, up from 5% in 2015, driven by Europe and California

Source: Bernstein research and Goldman Sachs, April 2016

The global dynamics in oil

Energy (Oil)

Supply and Demand Fundamentals and Price Formation

Geopolitics of Oil

Geo-finance of Oil

A 4th dimension on top of this triangle is Technical Innovation & Climate Change

Also applicable to Gas & Coal

Source: JOSCO, 2008

Oil (Price) Regime Change

Three key changes as a consequence of the decisions taken during the OPEC meeting on 27 Nov 2014

1. **Saudi Arabia: Not the Central Oil Bank any longer**
2. **The end of "the call on OPEC crude"**
3. **The Battle between the Giants**

Volume for Value strategy and tactics to outmaneuver the competition

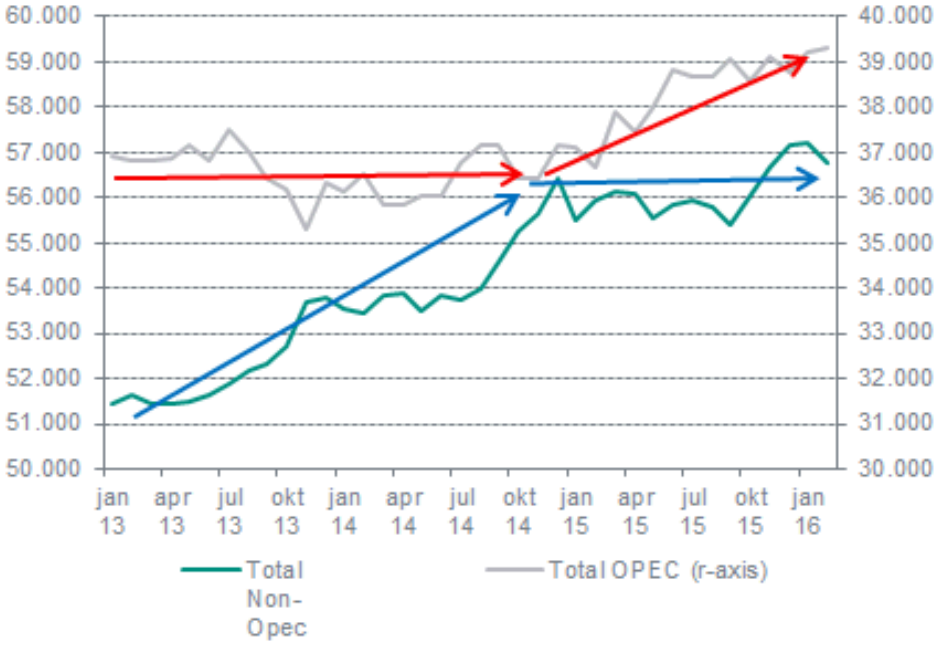
Oil policy is not constant and there is no desired oil price (the oil price is a moving target depending on market conditions)

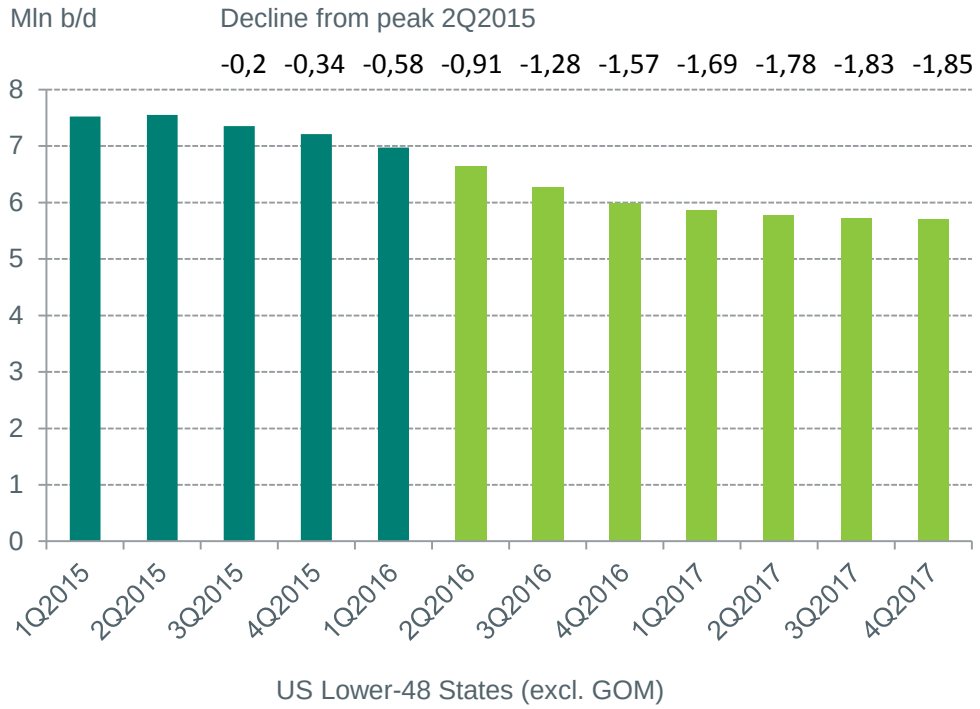
Source: JOSCO, Dec 2014

Brent crude oil price vs. the marginal and cash cost of the barrel

Source: JOSCO

Volume Strategy at work



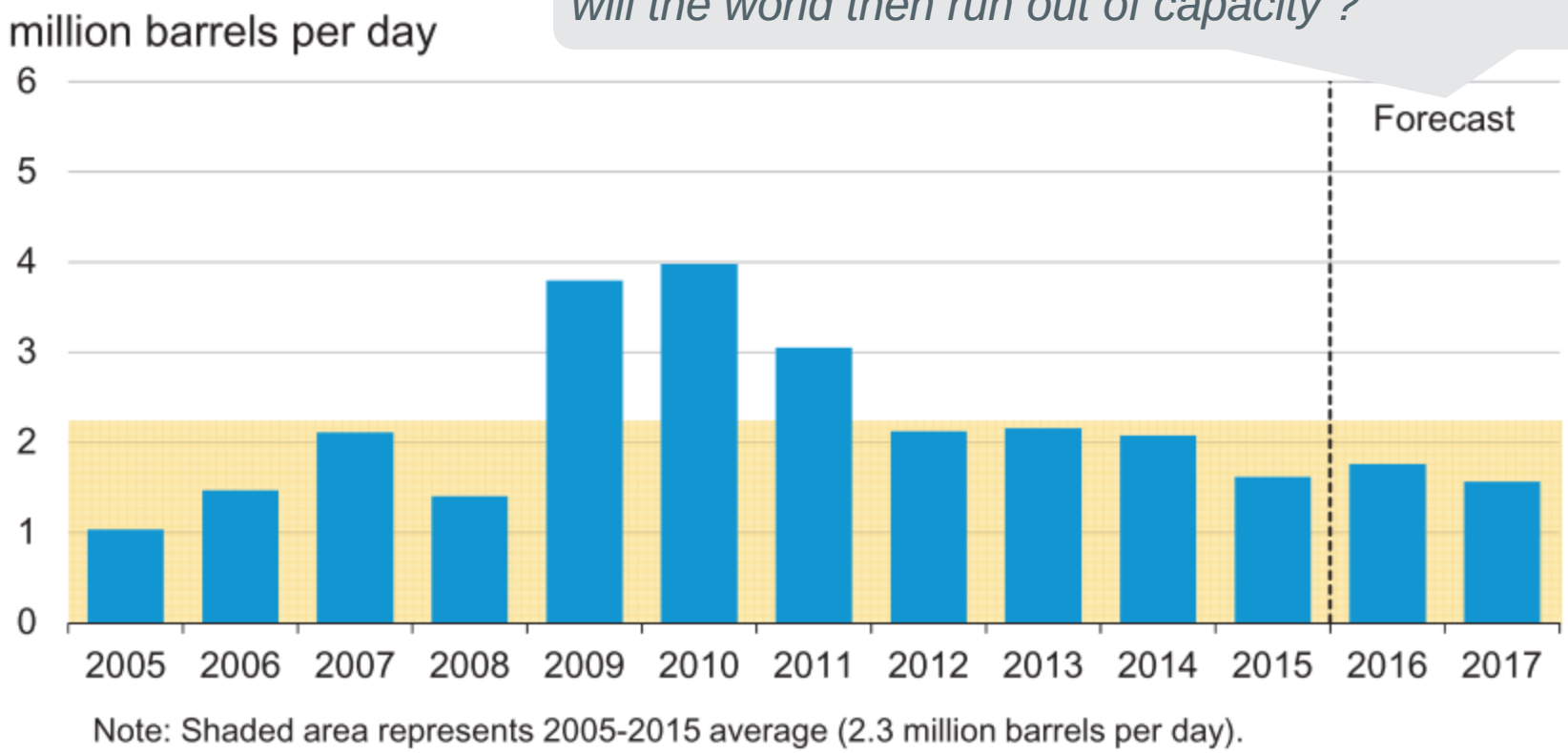


Volume Strategy has stopped non-OPEC from growing, but shale oil is not really a swing producer …… as -1mln b/d swing takes 12 months …. and most likely another 24 months for a full return

Source: JOSCO, 2016; IEA, April 2016

OPEC surplus crude oil production capacity

But what if OPEC disappoints like in the early 2000s, will the world then run out of capacity ?



Official spare capacity excl. Iran is 1.5 mln b/d, all concentrated in Saudi Arabia, where the crown price recently said he could produce 1 mln b/d if there was demand

Source: EIA, April 2016; Bloomberg

Do we have to plan for a final super-cycle in the next decade? And can we expect spikes even earlier?

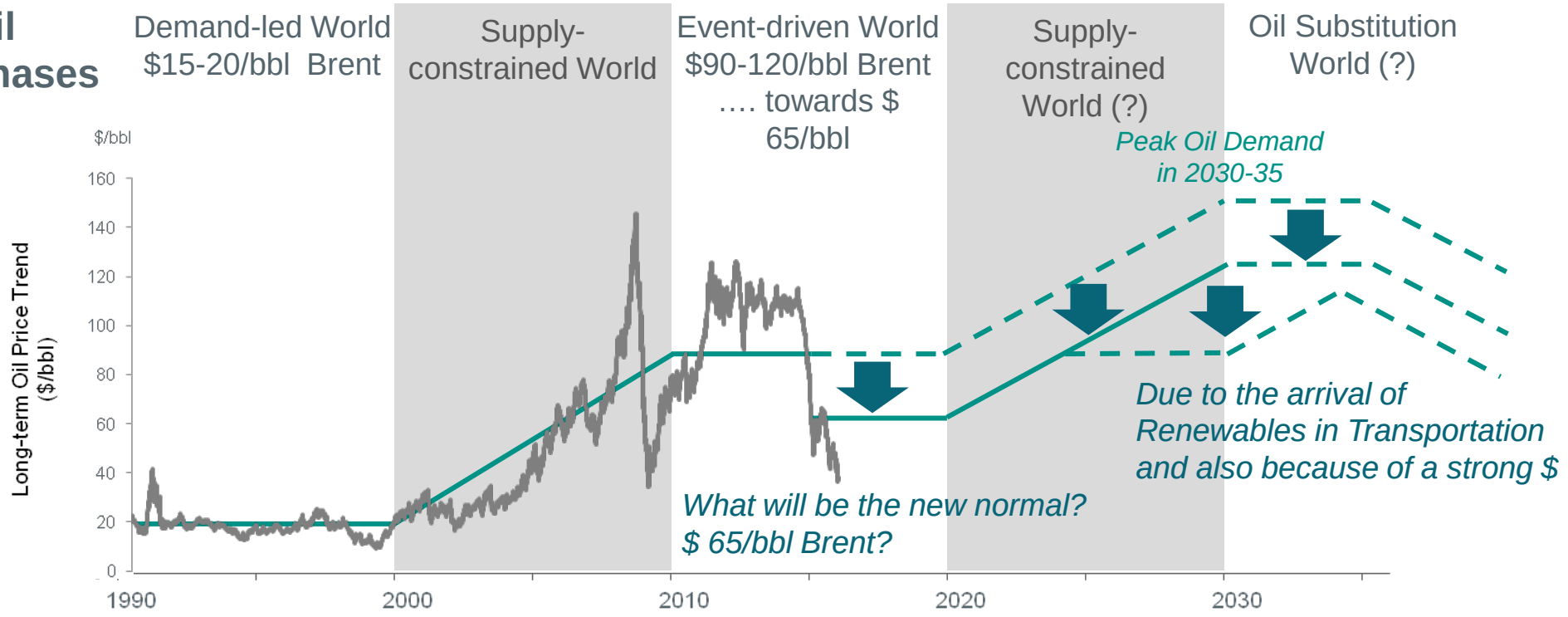
Will Shale and subsequent change from price strategy to volume strategy by the major producers keep oil, but also gas and coal prices low for an extended period?

…….Or will Shale & OPEC Gulf disappoint to deliver?

?

Will Renewables become so big that we do not have to worry for another Supply-constrained world?

Oil phases



Source: JOSCO, 2016

…. While the industry continues to be faced by Black Swans

More instability in Libya and Egypt?

Russia-Ukraine-EU-USA?

Return of Greece financial crisis?

China vs. USA?

Trump as president?

Brexit?

Impeachment of Brazilian president?

The next phase for the enduring Middle Easter civil wars and proxy wars?

More refugees to come?

USA's position in Iran contra Saudi Arabia

Oil prices able to rise from $ 10 to $147/bbl, and back to $ 30/bbl

Gas prices able to rise from $ 2/mcf to $ 8/mcf and back to $ 2/mcf

Financial crisis

Shale gas & Shale oil

Energie Wende and the end of the utility

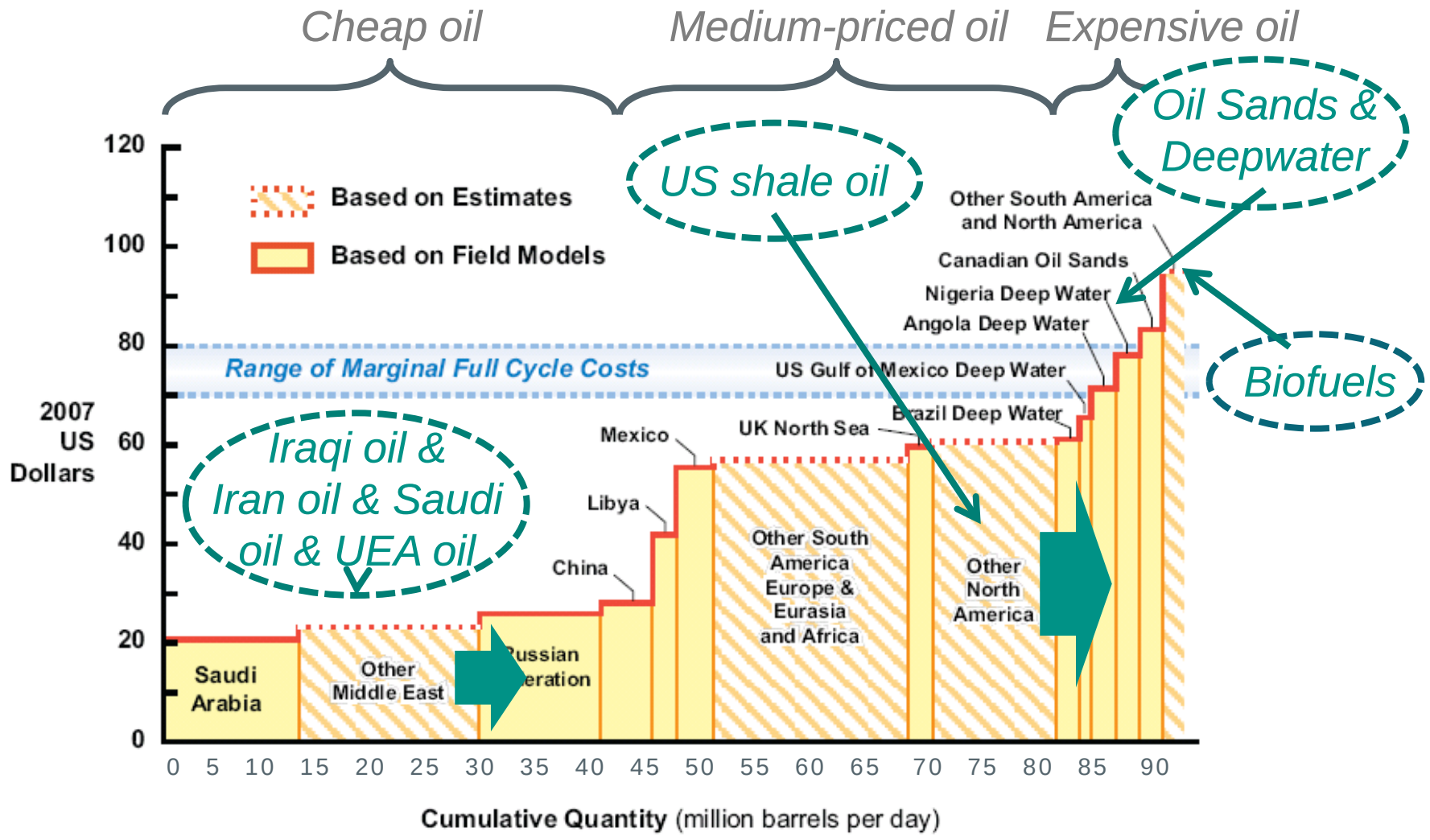
The Fukushima Daiichi nuclear disaster

So far, Natural Gas not being the transition fuel

- Öl Wende – oil substitution in transport?
- High speed monetizing of natural resources, particularly oil & gas (*Volume stategy instead of price strategy*), or ….
- Security of supply issues & policies do oil & gas prices spike again soon
- Wall street cannot manage the oil price

Source: JOSCO, April 2016

The three categories of oil – where is supply growing? What is needed?

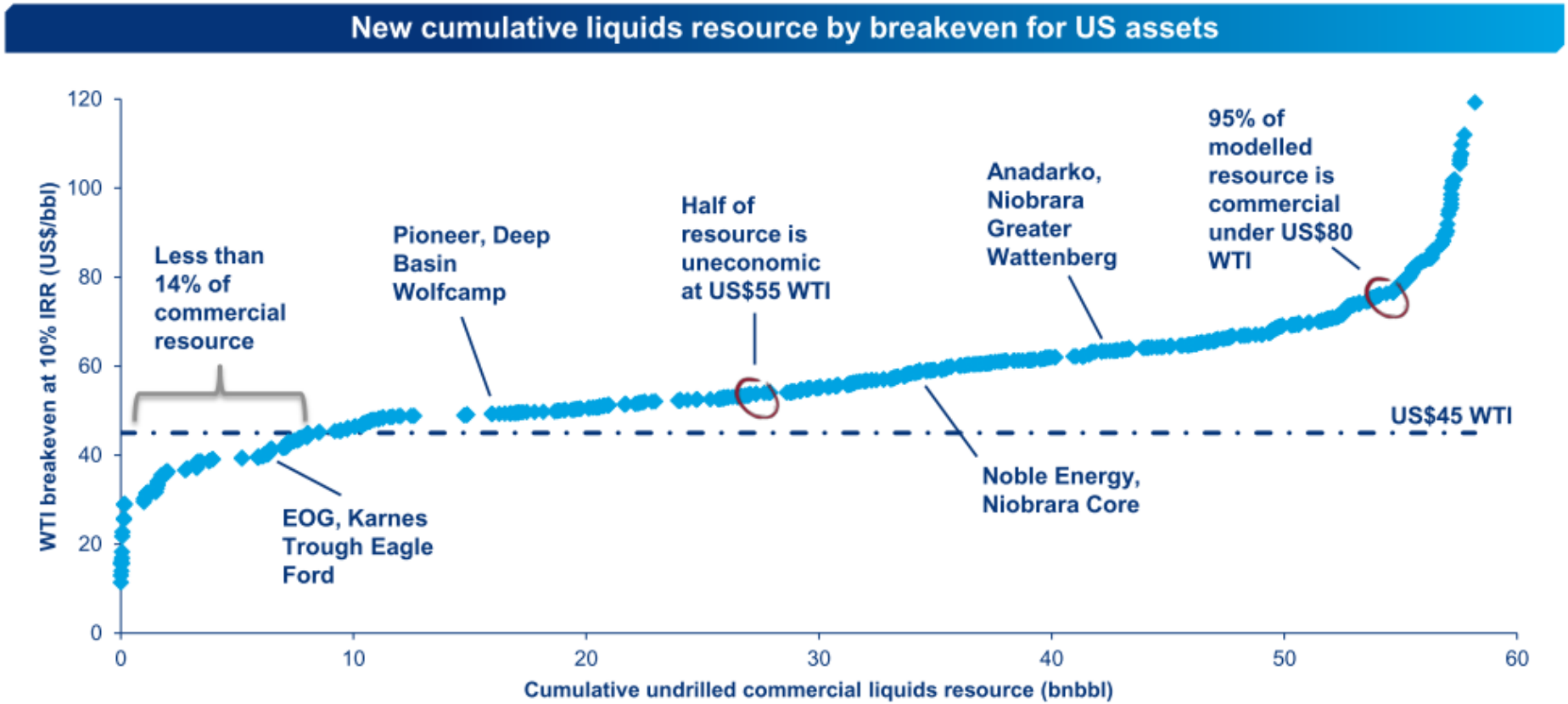


Growing the envelope of new oil supply, increasingly more onshore, increasingly more of cheap oil and medium-priced oil

Source: CERA, 2007; JOSCO, 2012

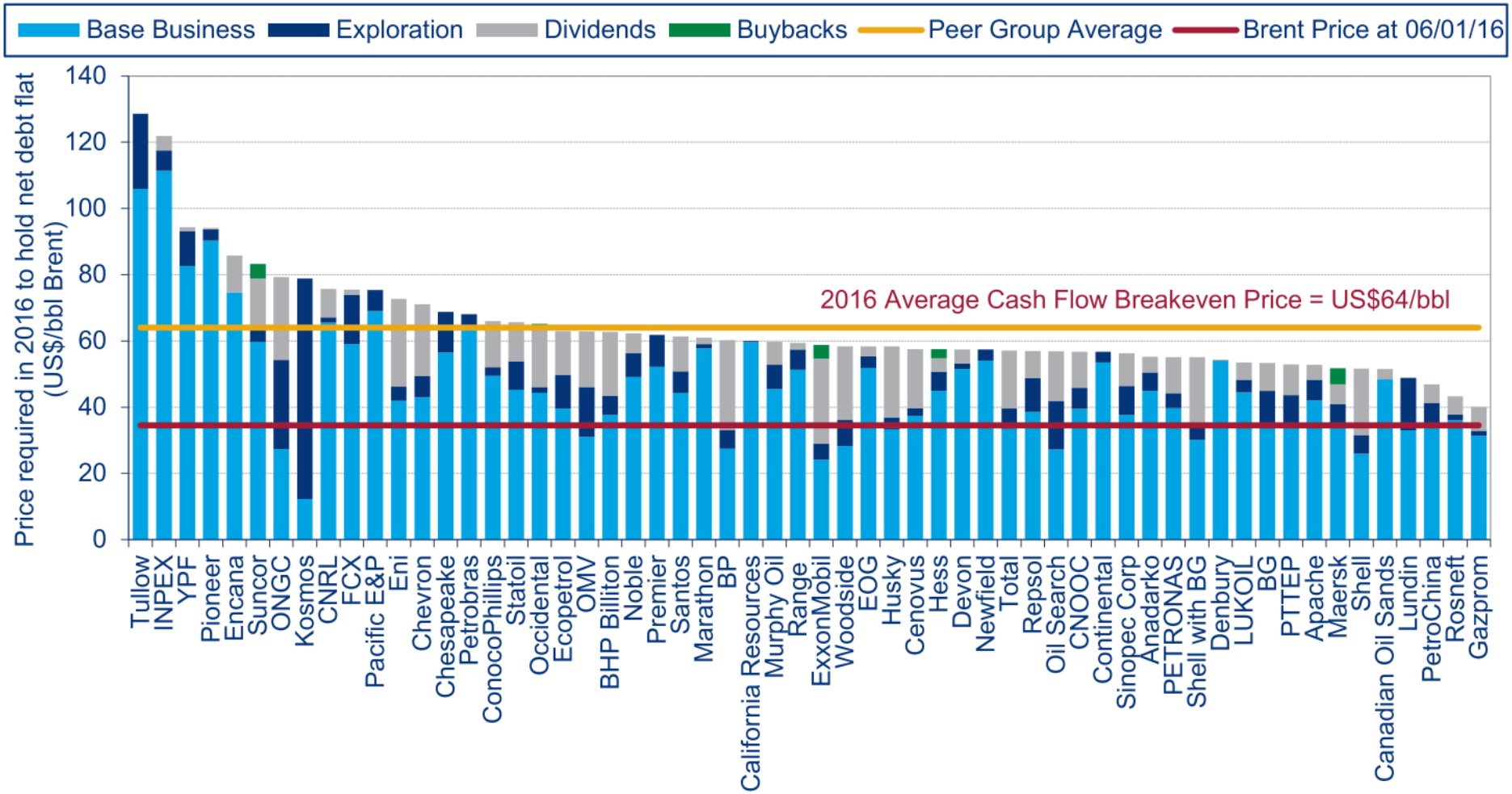
Liquids resources in the US

At prices below $ 50/bbl most of the current commercial resource base is not economic
But at $ 60/bbl, about 50% is economic



Source: Wood Mackenzie

2016 cash flow break-evens



Source: Wood Mackenzie, 4Q2015

Pre-FID project deferral update – January 2016

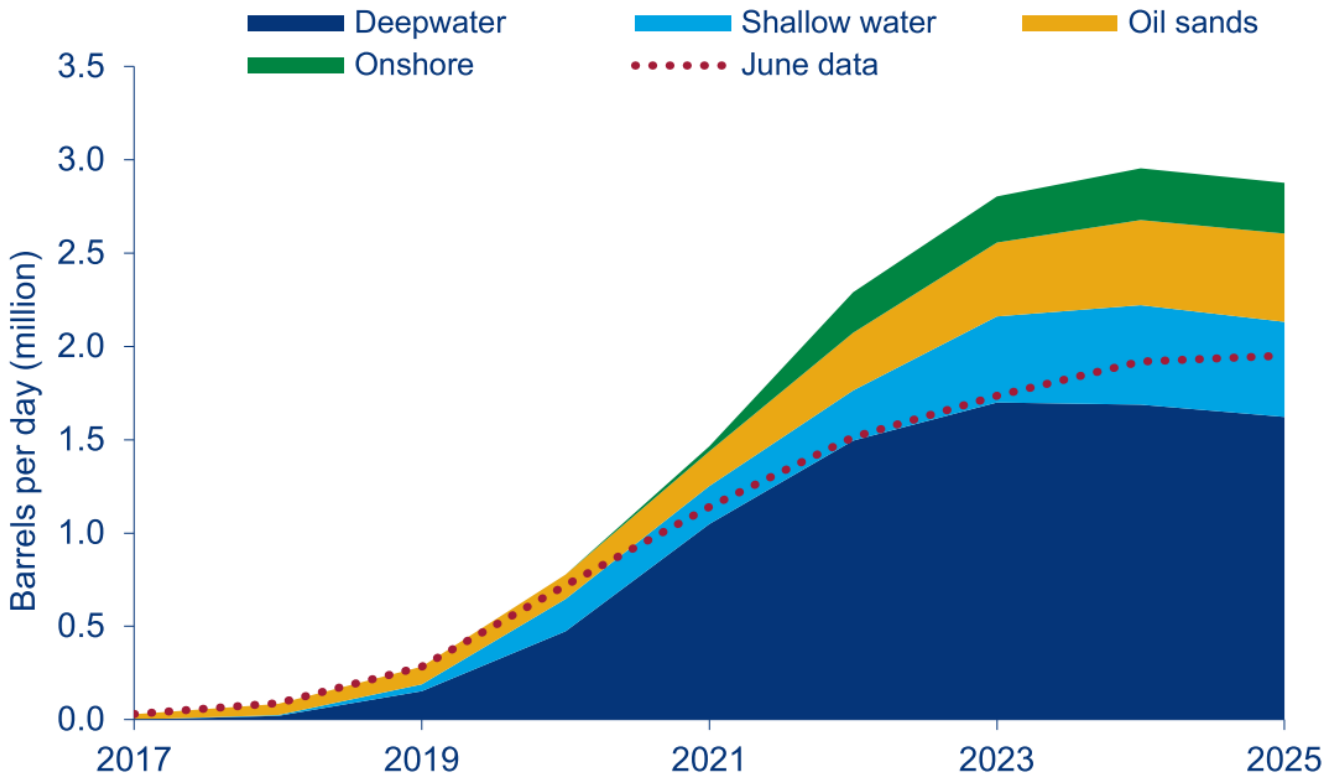
Twenty-two major projects and seven billion boe of commercial reserves delayed – that's the damage of the last six months. This represents the additional pre-FID projects and volumes we estimate have been deferred due to lower oil prices, on top of the of the 46 developments and 20 billion boe of reserves we identified in June 2015. The total tally now stands at 68 major projects, containing 27 billion boe. And with oil prices dipping to new lows at the start of 2016 and capital allocation tightening, the list will continue to grow.

Key takeaways from the last six months:

- US$380 billion of total project capex deferred (real terms), with US$170 billion at risk from 2016 to 2020
- Deepwater hit the hardest: more than half of new project deferrals, up from 17 to 29, and now 62% of total reserves and 56% of total capex
- 2.9 million b/d of liquids production deferred to early next decade, up from 2.0 million b/d in June
- Oil most impacted: deferred liquid volumes up 44%, versus 24% for gas
- Average breakeven (Brent, NPV10) of delayed greenfield projects is US$62/boe

A growing impact on future oil production…

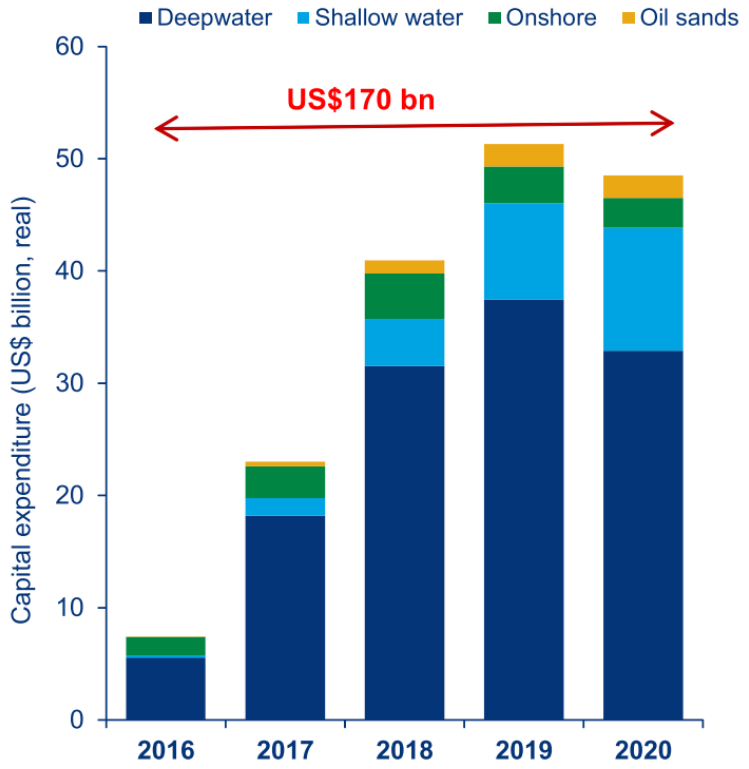
The production impact of these deferments is material in a global context. In the June update we estimated that delayed projects accounted for around 1 million b/d of liquids by 2021, rising to just under 2 million b/d by 2025. With more deepwater oil projects being pushed back, the impact six months later is significantly greater – by 2021 deferred volumes are at 1.5 million b/d, rising sharply to 2.9 million b/d by 2025.



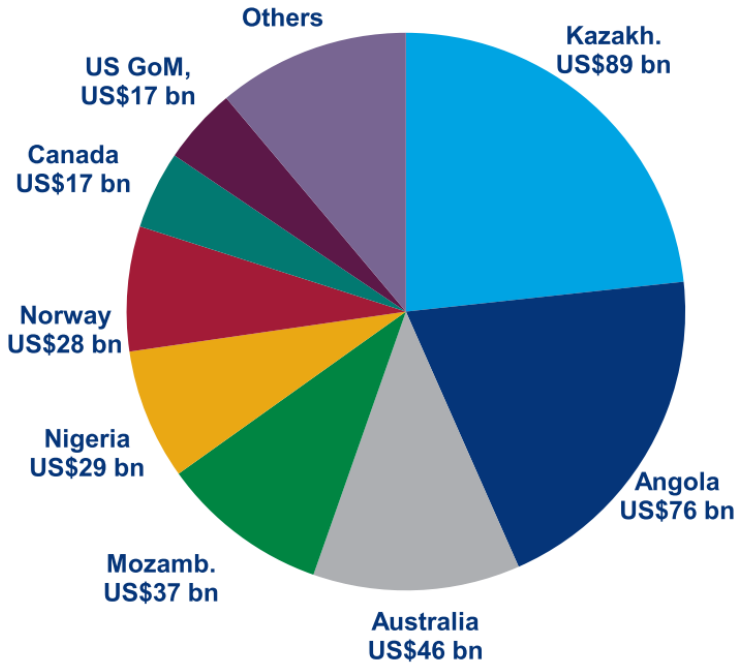
Pre-FID project deferral update – January 2016

In the short-term, around US$170 billion (real terms) of potential investment over the next five years currently hangs in the balance, across the 68 projects. This represents 65% of the US$260 billion we currently estimate will be spent on pre-sanction conventional developments globally over the same period. Most of the US$170 billion is disproportionately weighted towards deepwater projects, given the scale of the up-front investment. By contrast, Canadian oil sands and large incremental investments in shallow-water and onshore projects have a more phased investment profile stretching mainly through the next decade.

Deferred pre-FID capex 2016-20 (US$ billion, real)



Deferred capex by country (US$ billion, real)

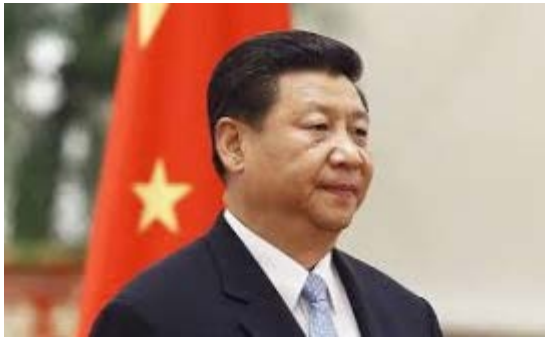


The countries with the largest inventory of delayed oil projects are Canada, Angola, Kazakhstan, Nigeria, Norway and the US. These six hold nearly 90% of all deferred liquids reserves. This includes oil sands, onshore, shallow-water and deepwater assets in both greenfield and incremental developments.

The same players that define the events and outcome

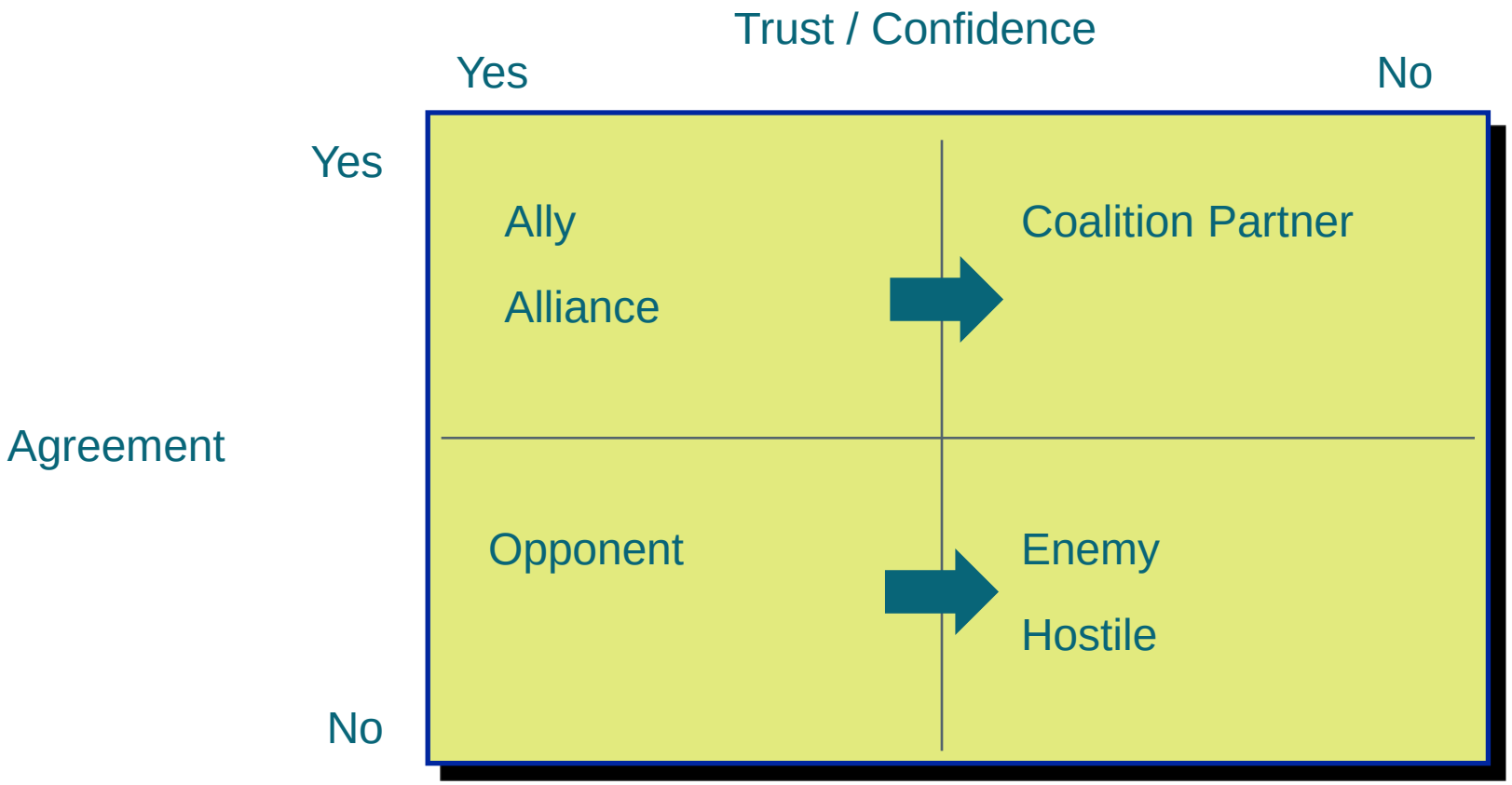
Oil is rapidly becoming a BIG EVENT-DRIVEN arena, difficult to forecast

Syria, Iran, Iraq, Libya, Venezuela, Nigeria, South China Sea, Ukraine, Arctic



Geo-political relationships

Enduring Allies from the past seem to change rapidly into coalition partners, while a number of opponents seem to become enemies



Source: JOSCO

How to divide the Middle East? Crafting new boundaries

“Angola type cold war “ in the Middle East: The battle over Syria will define the battle over Iraq, and hence the battle over the Middle East, and hence the position (survival) of the State Israel and Saudi Arabia in their conflict with Iran

What will the next president of the USA do?

Another event driven issue that is still far from being resolved

China’s Mandate: Not any longer sustainable !?

No 1 overarching objective: Consolidation & Survival of Communist Party

No 2 objective: Social stability & no corruption

No 3 objective: High economic growth & respected by the RoW

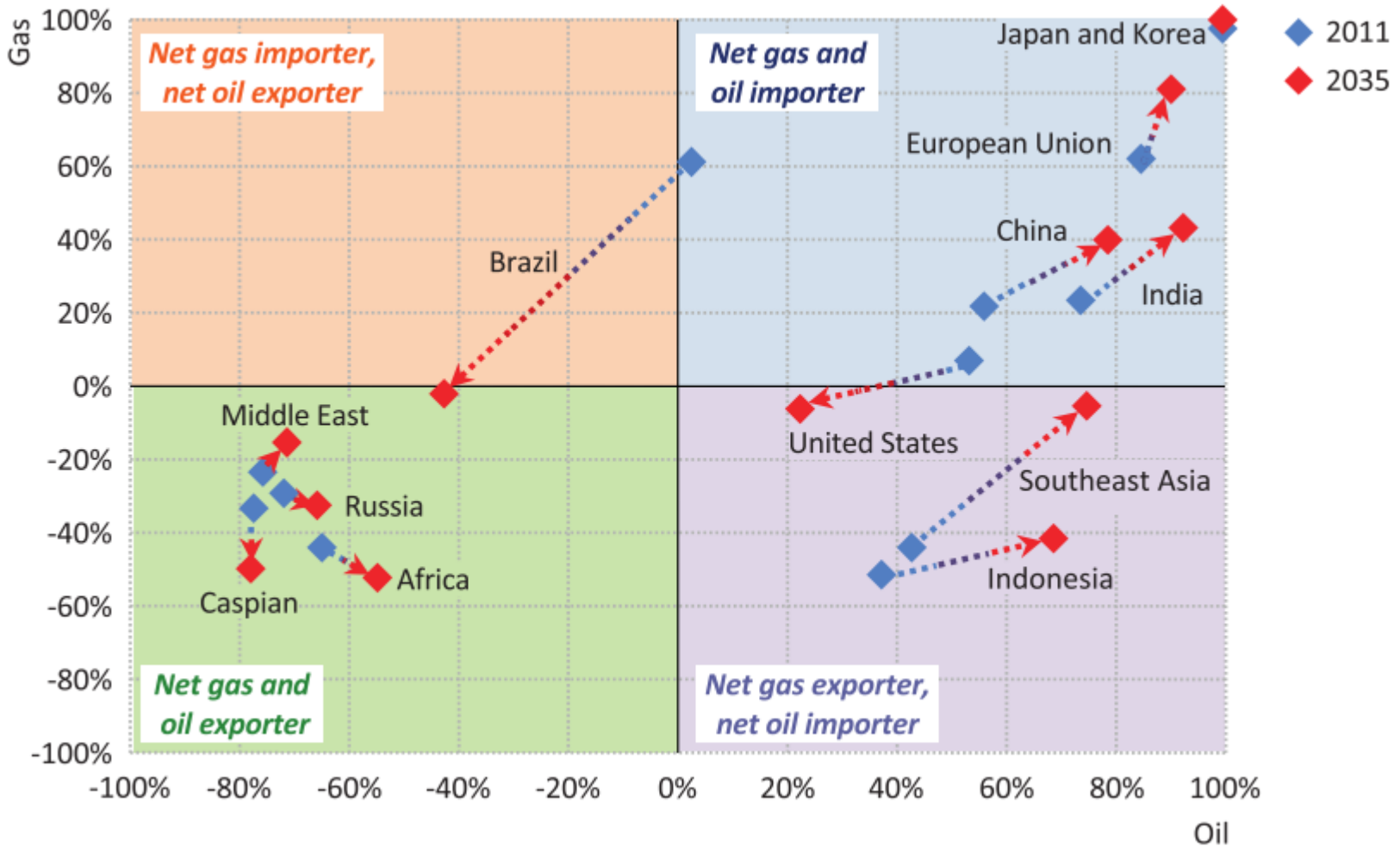
No 4 objective: Shifting the economy but still access to natural resources and markets

No 5 objective: Dominant positions in price setting

Chinese territorial claims give rise to escalating disputes in the South China Sea

Net oil and gas import/export shares in selected regions in the New Policies scenario

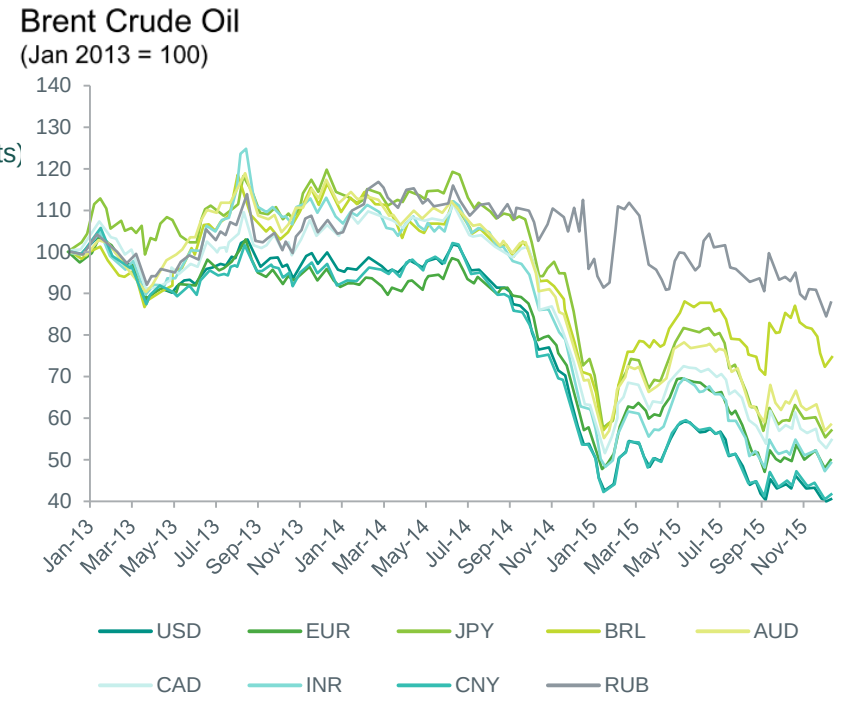
Geopolitical oil & gas wars?



The world is upside down from 10 years ago

10 years ago

Strong and surprising GDP growth
Very weak US dollar (big current account deficits)
The rise of the BRIC
Strong commodity currencies
High inflation
High commodity prices
High global trade
High expectations
Real risks > perceived risks
Positive feedback loops



Today

Weak and disappointing / lower GDP growth
Very strong US dollar (much lower oil imports)
The fall of the BRIC
Weak commodity currencies
High deflation
Negative interest rates
Low commodity prices
Lower global trade
Low expectations
Perceived risks > real risks
Negative feedback loops

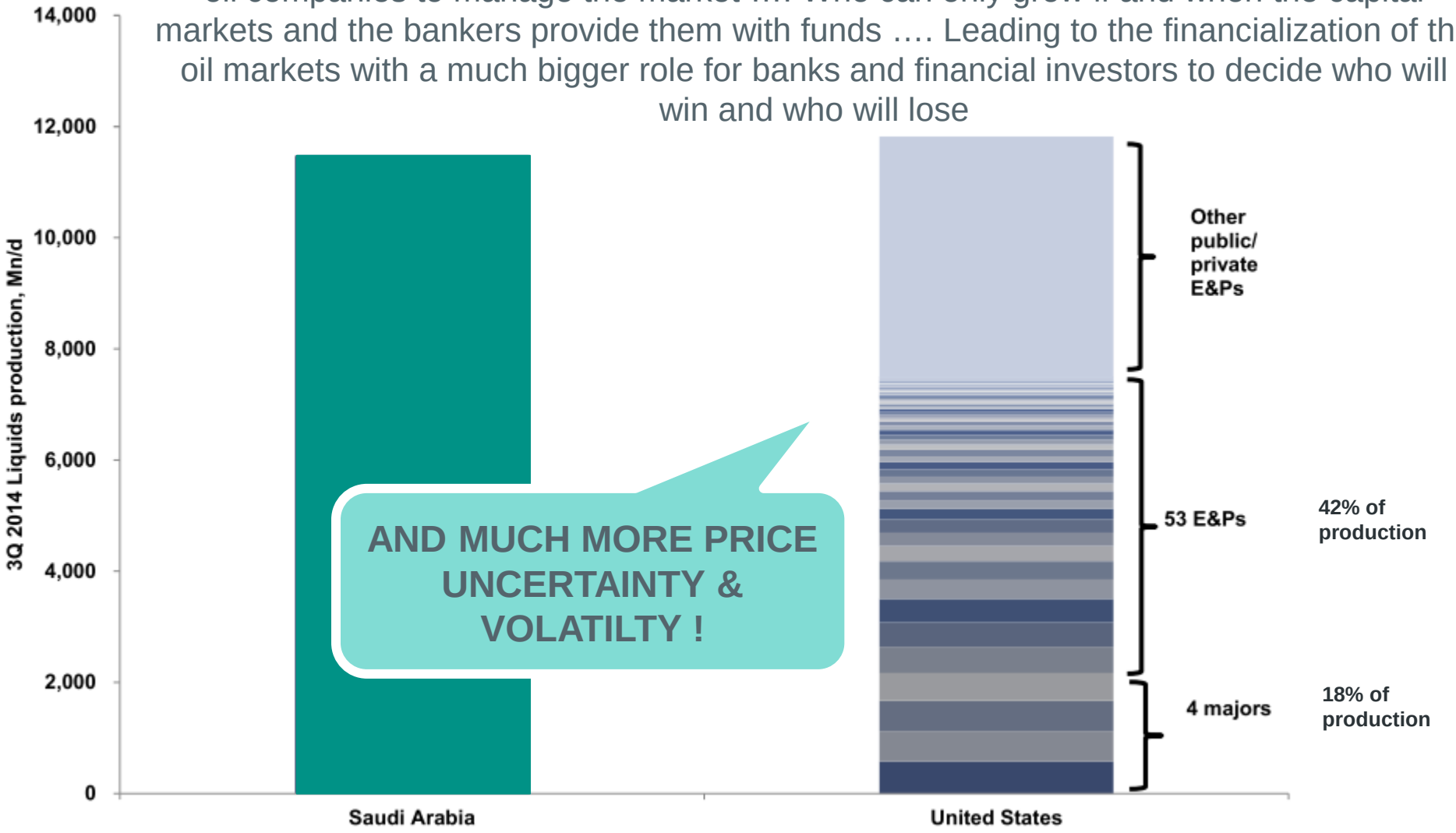
We enter many new unchartered territories

In the current economic environment oil prices can never move back to $ 100/bbl on the basis of normal economic fundamentals ! Will it happen, then it will be a shock for the world economy

Source: JOSCO, January 2016

Will Wall street be a better agent than Saudi Arabia to manage the oil price and keep oil prices relatively low?

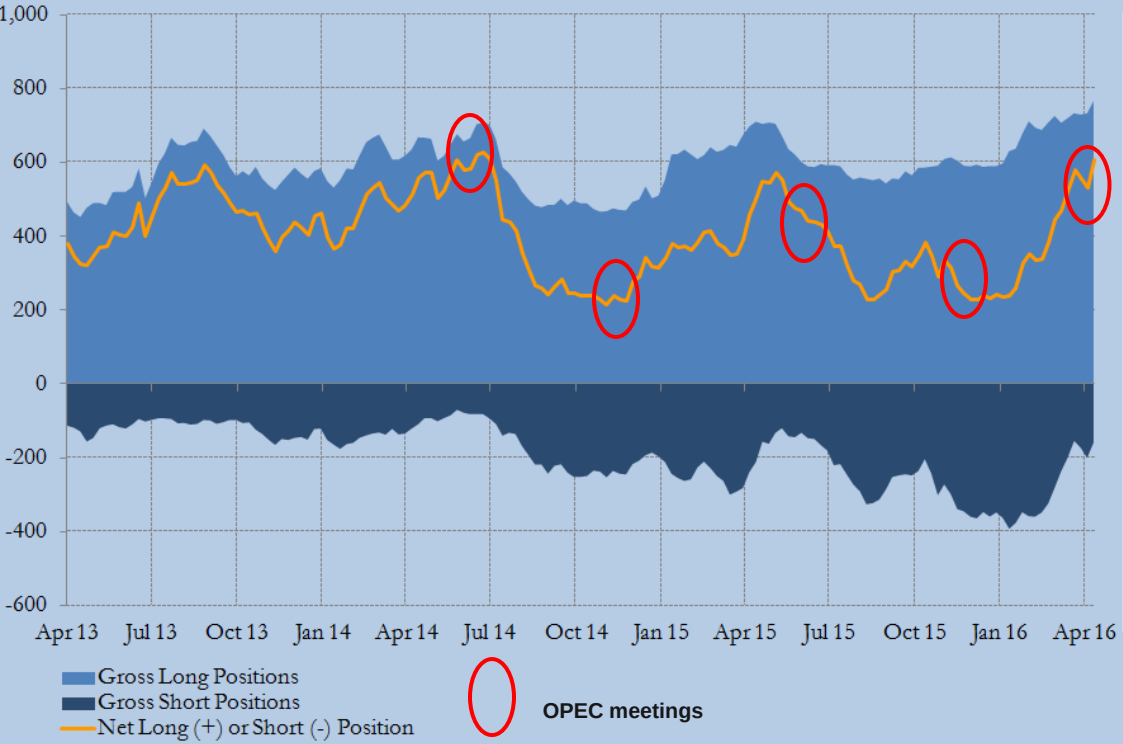
Without Saudi acting as Central bank, the oil market is now dependent on 600 US shale oil companies to manage the market …. Who can only grow if and when the capital markets and the bankers provide them with funds …. Leading to the financialization of the oil markets with a much bigger role for banks and financial investors to decide who will win and who will lose



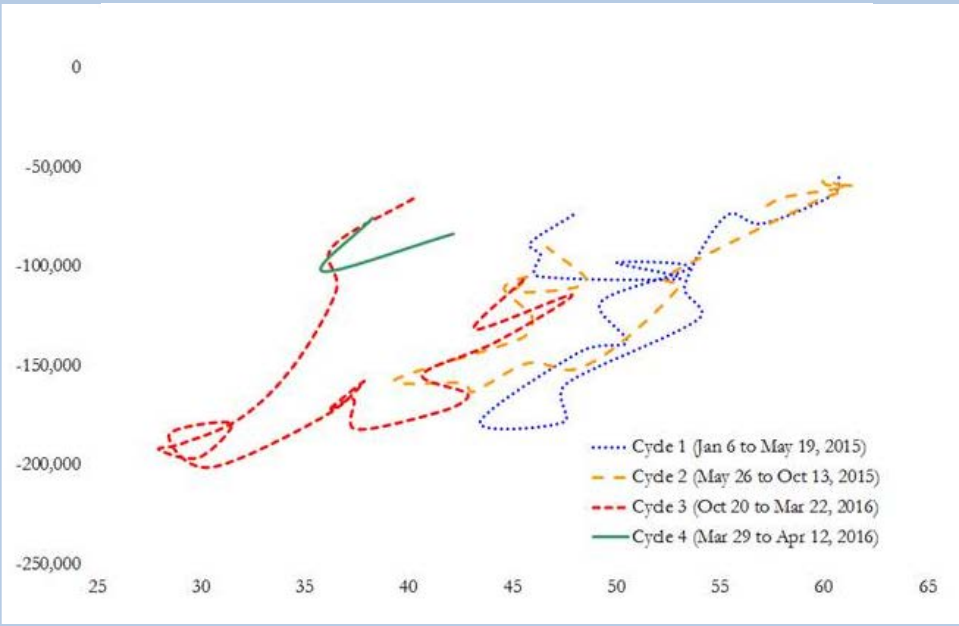
Source: Goldman Sachs

Oil prices have been pushed up by non-commercial investors, having made oil market more forward looking than historically has been the case ….

Money managers' long and short positions in the three main crude oil futures and options contracts (million barrels)
(NYMEX WTI, ICE WTI and ICE Brent)



Money managers' short positions and US oil prices in 2015/2016
Gross short positions in main NYMEX light sweet crude contract
WTI front-month futures price



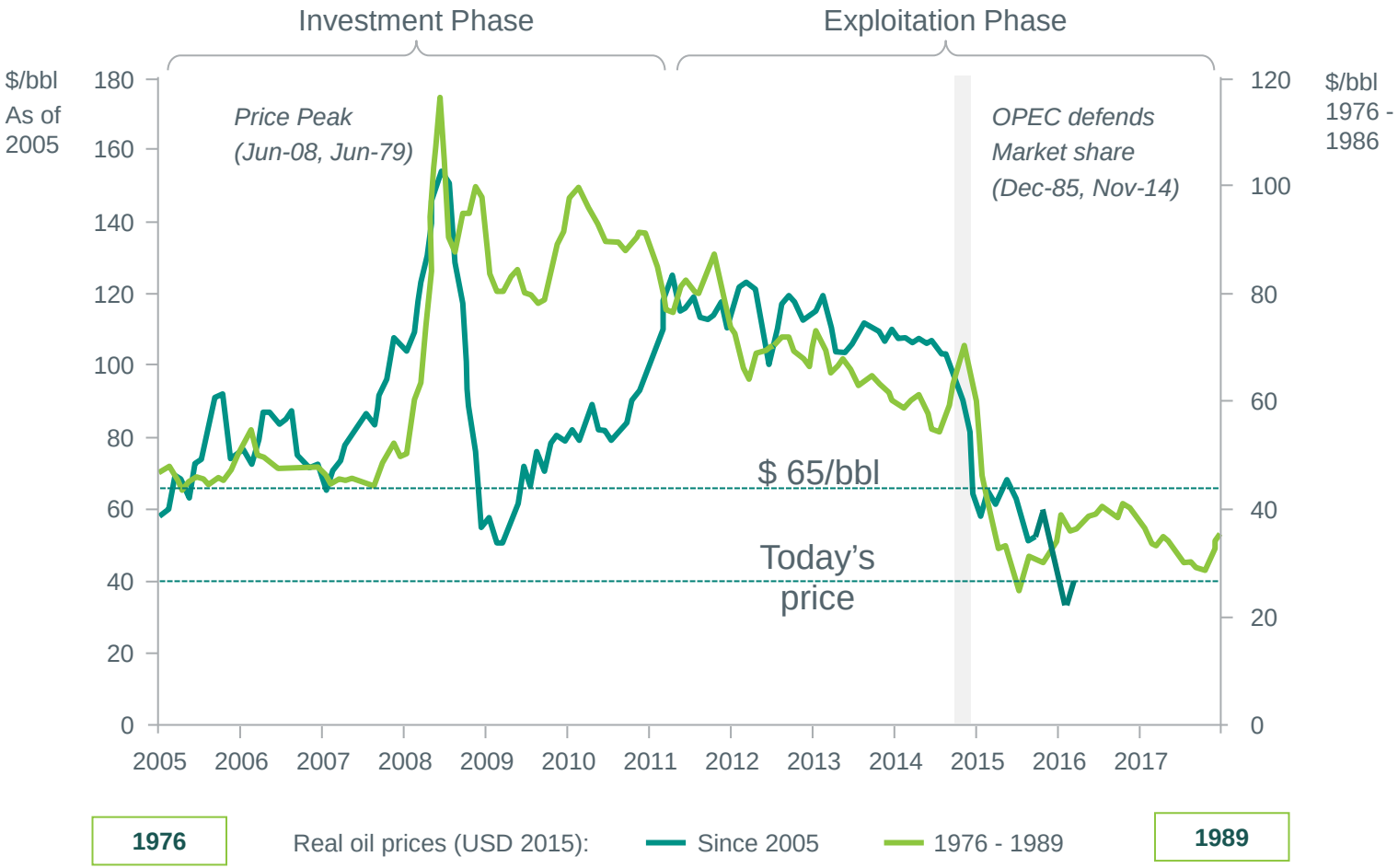
Managed money net length is at its highest pre-meting level since the June 2014 OPEC meeting, but gross long positions is higher today

Source: CME Group, ICE Futures Europe, 19 April 2016; CFTC, NYMEX, 18 April 2016

…. Still, this price down cycle is similar to the 1980s …..

There is a good chance that this price down-cycle is similar to the 1980s, where it will take multiple years to work through oversupply and shale oil is profitable at $ 65/bbl

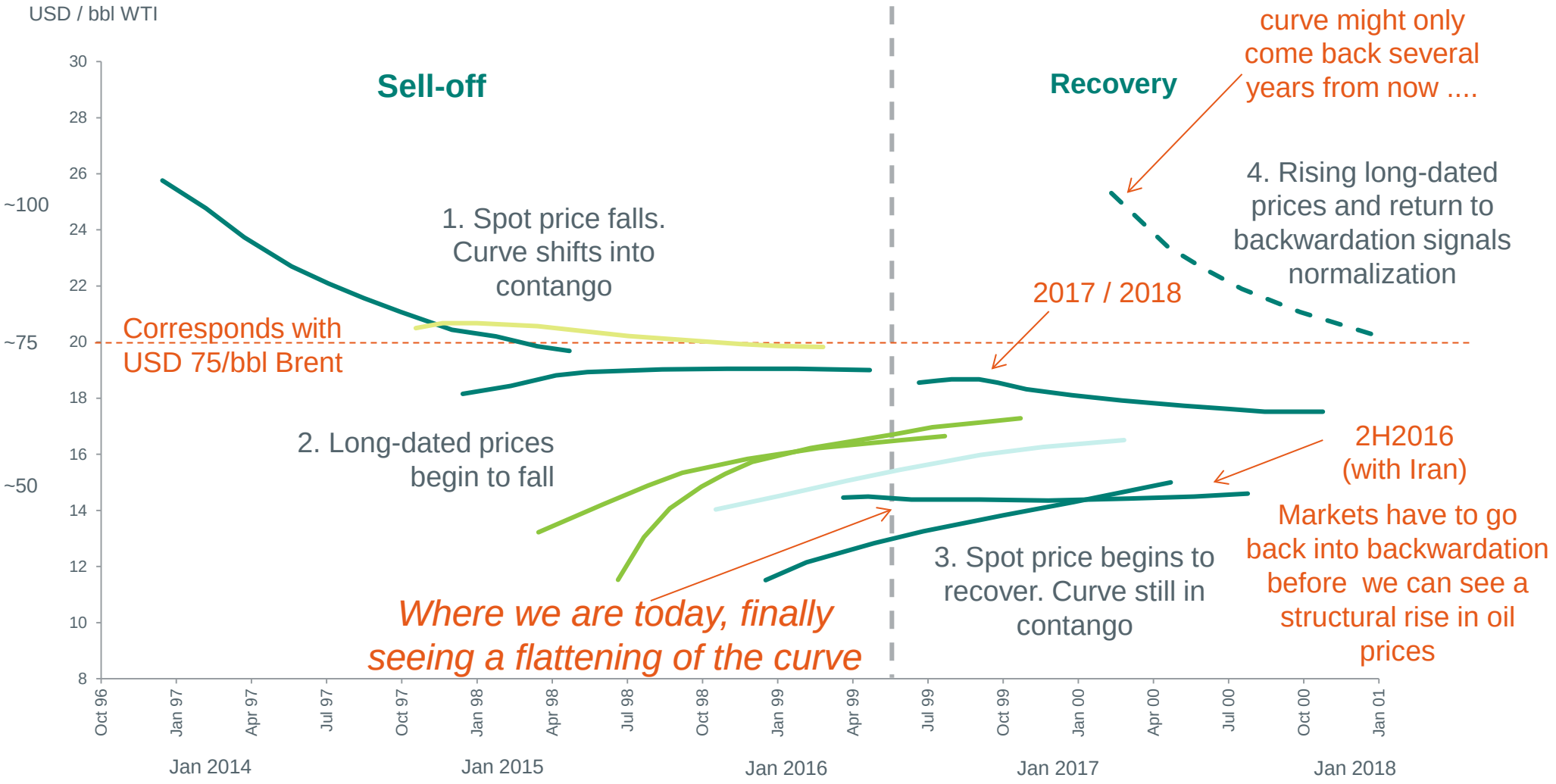
Comparison of real oil prices, 1976 – 1986 (right axis) to 2005 – today (left axis)



Source: Goldman Sachs

Turning the corner and entering the vertical leg of the U-shaped oil price recovery (in tune with 1997 – 2001)

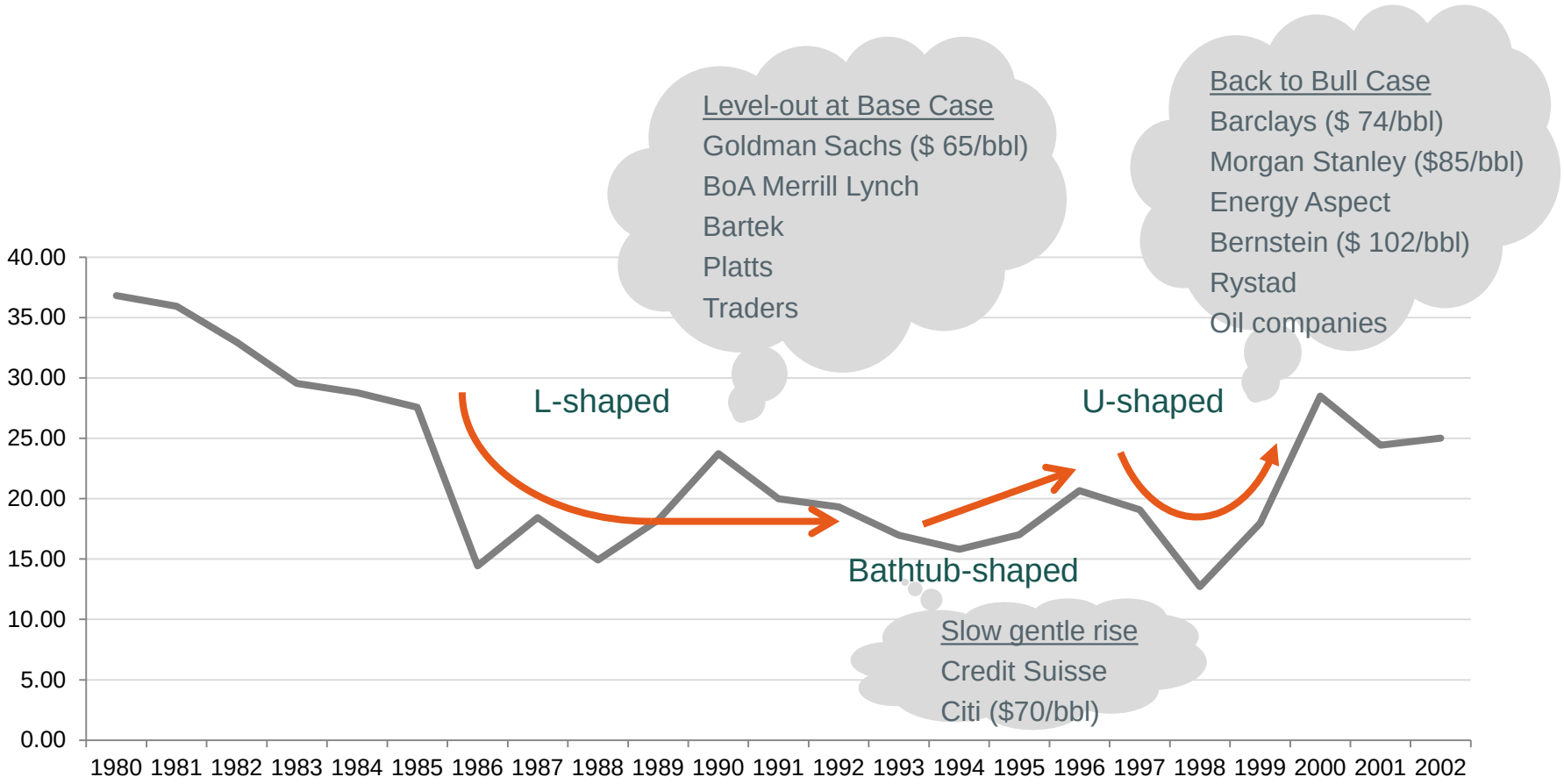
So far, we are following the same path as in the late 1990s



Source: JOSCO

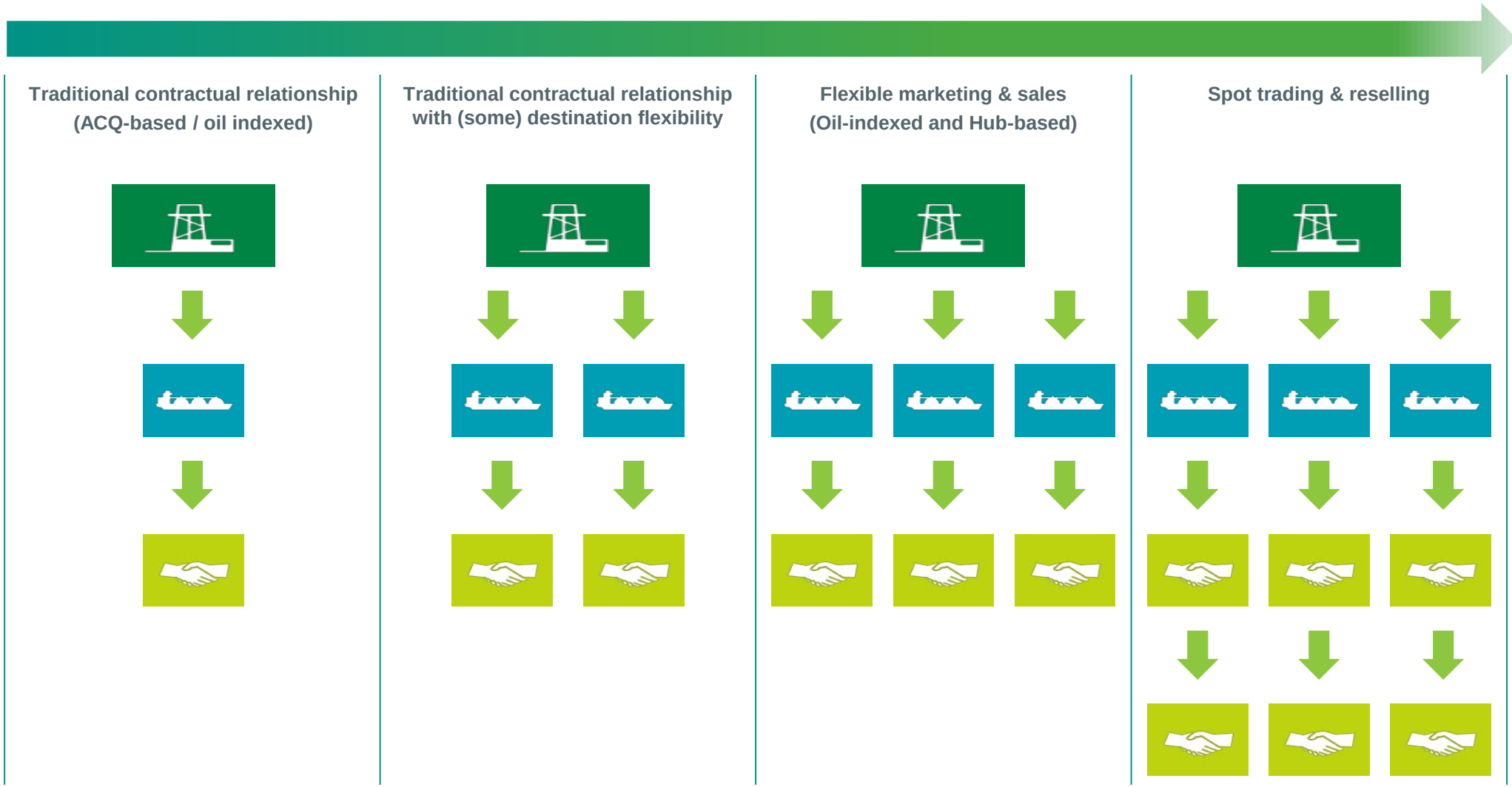
Research firms could be split in three different categories

There is high uncertainty about the price of oil in 2018-2020



Oil prices in brackets are Brent 2018 price forecasts

The LNG industry evolution – an increasingly complex trade

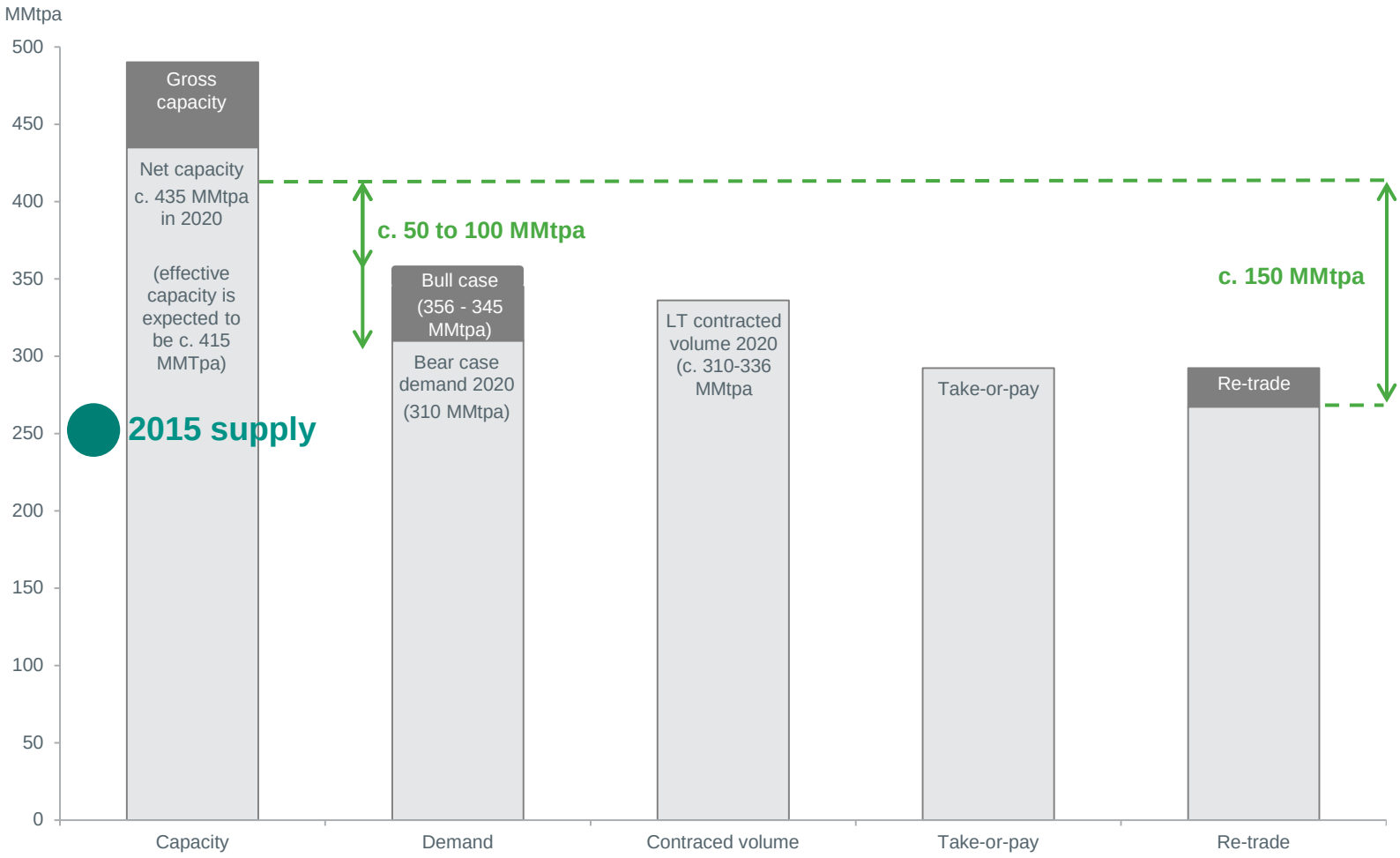


Source: JOSCO

Global LNG capacity and demand by 2020, and as much as 150 Mmtpa still looking for an end-consumer ….. Half of this at risk

c. 150 MMtpa of capacity, representing 35% of total effective capacity in 2020, will be either:

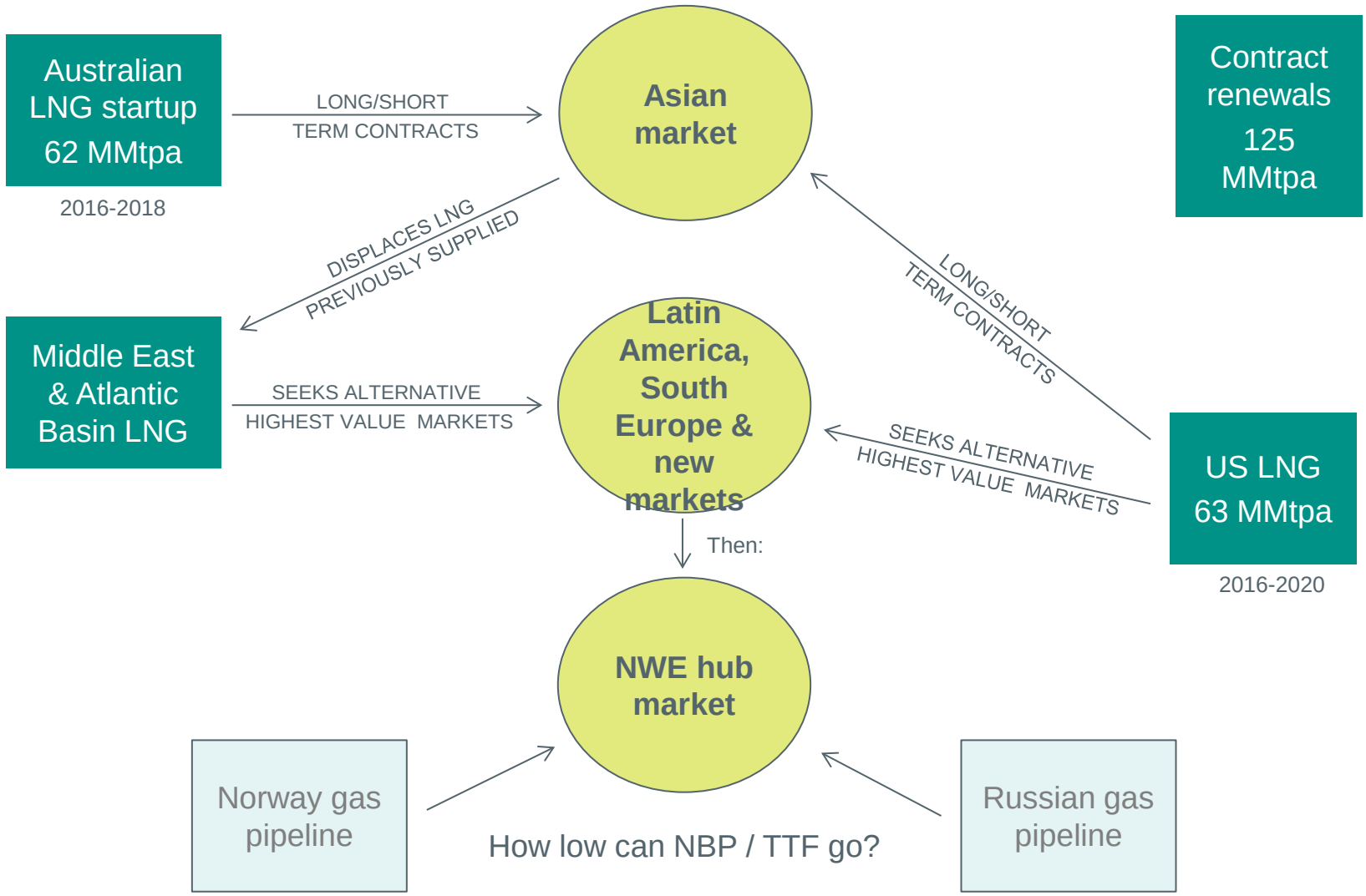
1) Not used
2) Sold spot
3) Sold under short-term contracts
4) Contracted under LT contracts still to close
    a) Large volume contracts (generally sold by producers)
    b) Small volume contracts (increasingly sold by aggregators



Net new demand growth is not large enough to absorb all that gas; gas for coal substitution and head-on-head gas competition are needed

Source: JOSCO, April 2016

2017-2020: New LNG supply from Australia and North America could lead to an extended period of weakness in European gas prices



Will Russia allow US LNG to win market share in Europe and cause prices to stay low?

Source: South-Court, Jan 2016

A final Super-cycle is possible, but could be avoided !

Will shale & renewables provide Europe with a perfect energy outcome?

1	**Affordable** *(No excess rent)*	***Perhaps, as long as OPEC will not disappoint and Wall street can manage the oil price***
2	**Reliable** *(Security of supply)*	***Maybe, as real spare capacity is not there anymore, geo-political and geo-finance risks are high and the Energie and Öil Wende is a long journey***
3	**Clean** *(Green & sustainable)*	***Yes, but step-by-step and expected to accelerate as gas comes back and electrification is there***
4	**Social Acceptance** *(A better world, to start locally)*	***Lots of ambition, high (moral) values … but at the end we are also consumers***

Source: JOSCO

Keep smiling ……

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The views expressed in this report accurately reflect the personal views of Jan-Hein Jesse (JOSCO), the primary individual responsible for this report

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