23° Convegno Annuale, Sezione Componentistica d'Impianto ANIMP

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ANIMP
ASSOCIAZIONE NAZIONALE DI IMPIANTISTICA INDUSTRIALE

SEZIONE COMPONENTISTICA D'IMPIANTO

ENERGY INDUSTRY GLOBAL MARKETS FORECAST

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AGENDA

MARKET CONTEXT

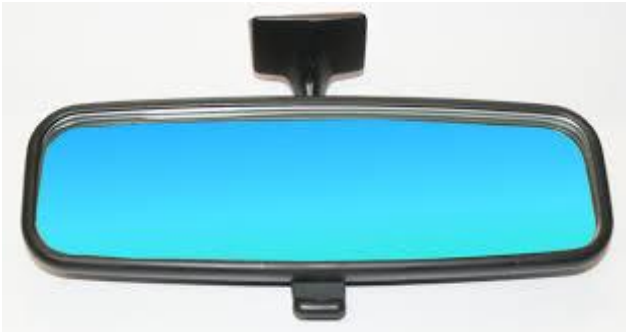
OUTLOOK ON INVESTMENTS

IMPACT ON THE VALUE CHAIN

Bob Dudley (CEO BP) on forecasting

(January 30th,2017)

"Strategic tools"



The energy and EPC industries are facing multiple challenges and TRANSITIONS

Meeting the energy needs of a growing and more affluent population
+35% by 2035

Major evolution in demand and supply:
from ‘energy shortage’ to ‘energy abundance’

Energy prices volatility

Disruptive impact of new technologies
Digitalization

New business models, new market mechanisms

Geopolitics, instabilities and related uncertainties
– e.g. Russia, Iran…
but also ‘One belt, one road’

Many barriers to entry
(e.g. USA, China, Russia…)

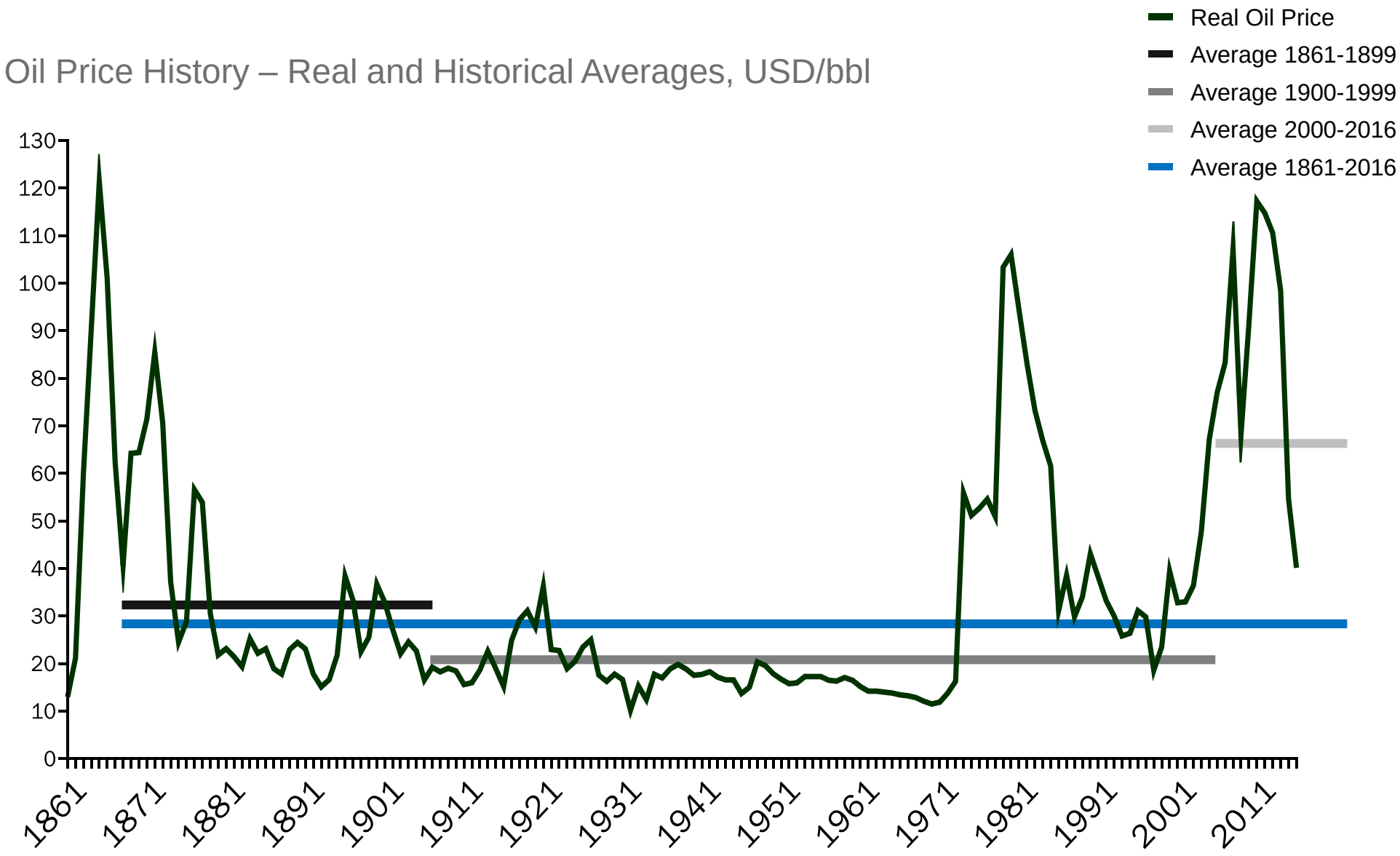
Decisive implementation of mandatory local content policies

Addressing climate change, but with many uncertainties

Several opportunities, increasing complexities, many uncertainties

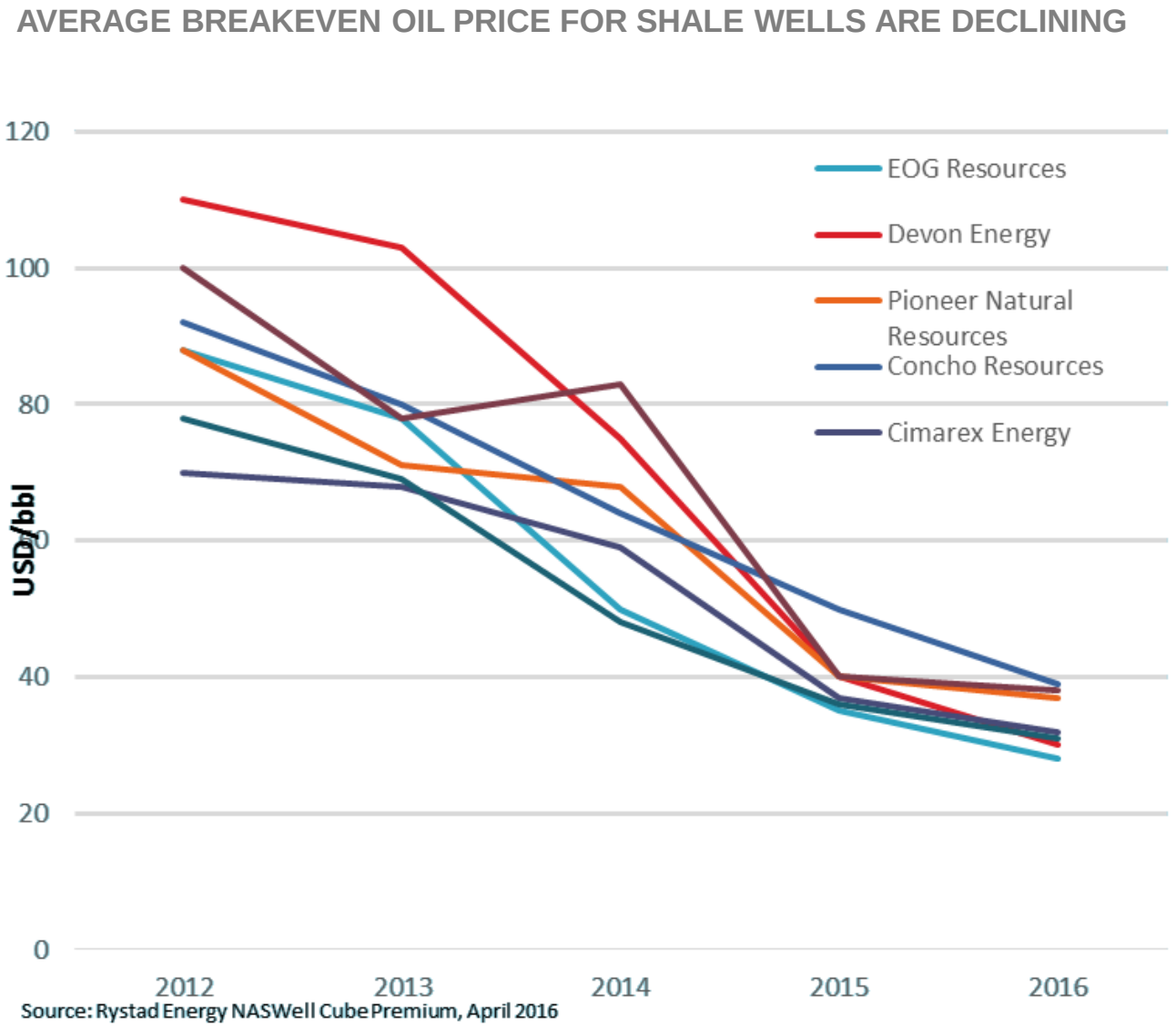
Exploit new trends and discontinuities?

We have seen “Feast-and-famine” alternating scenarios characterizing our industry throughout its history

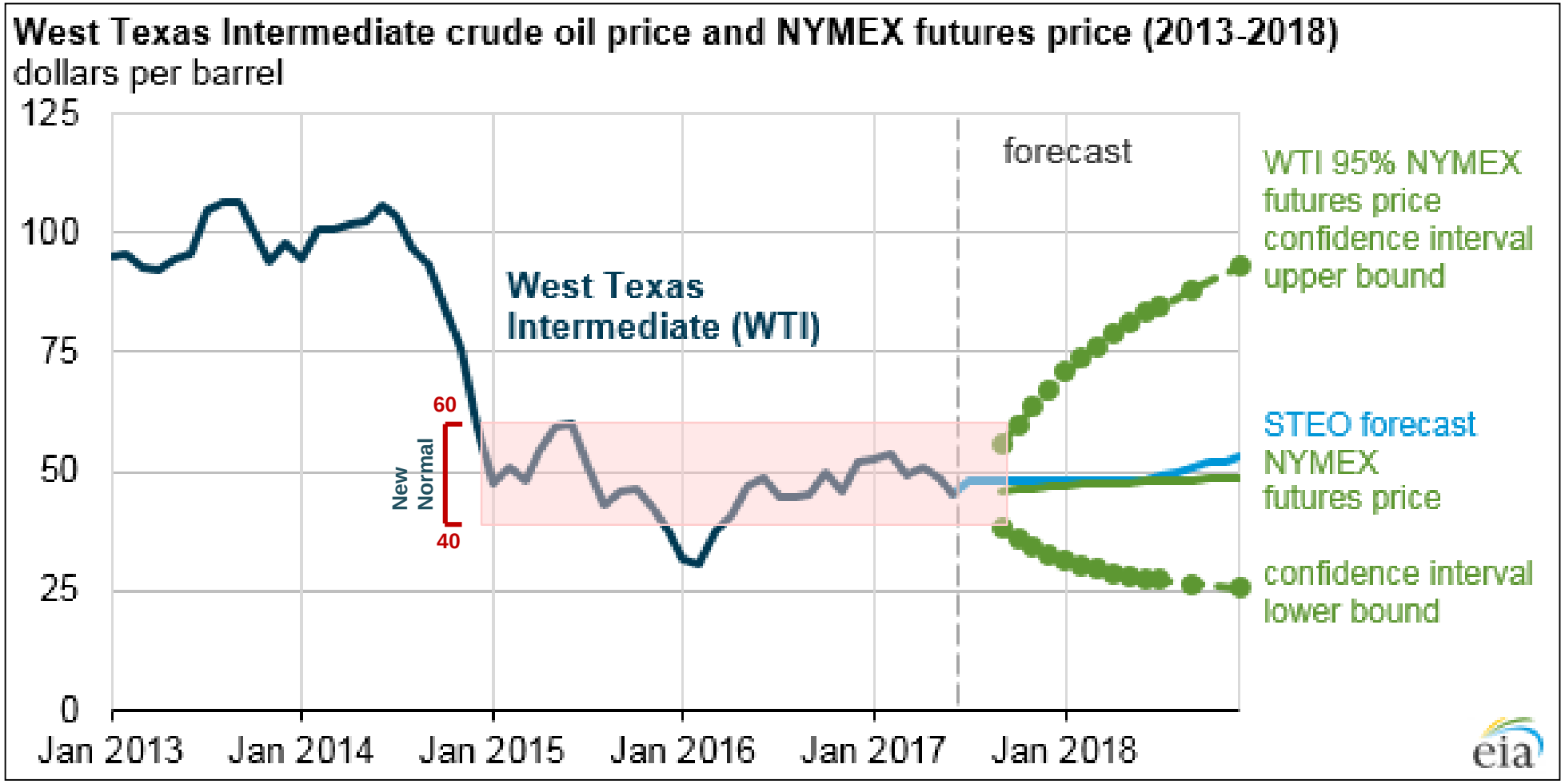


Source: Citibank (2016)

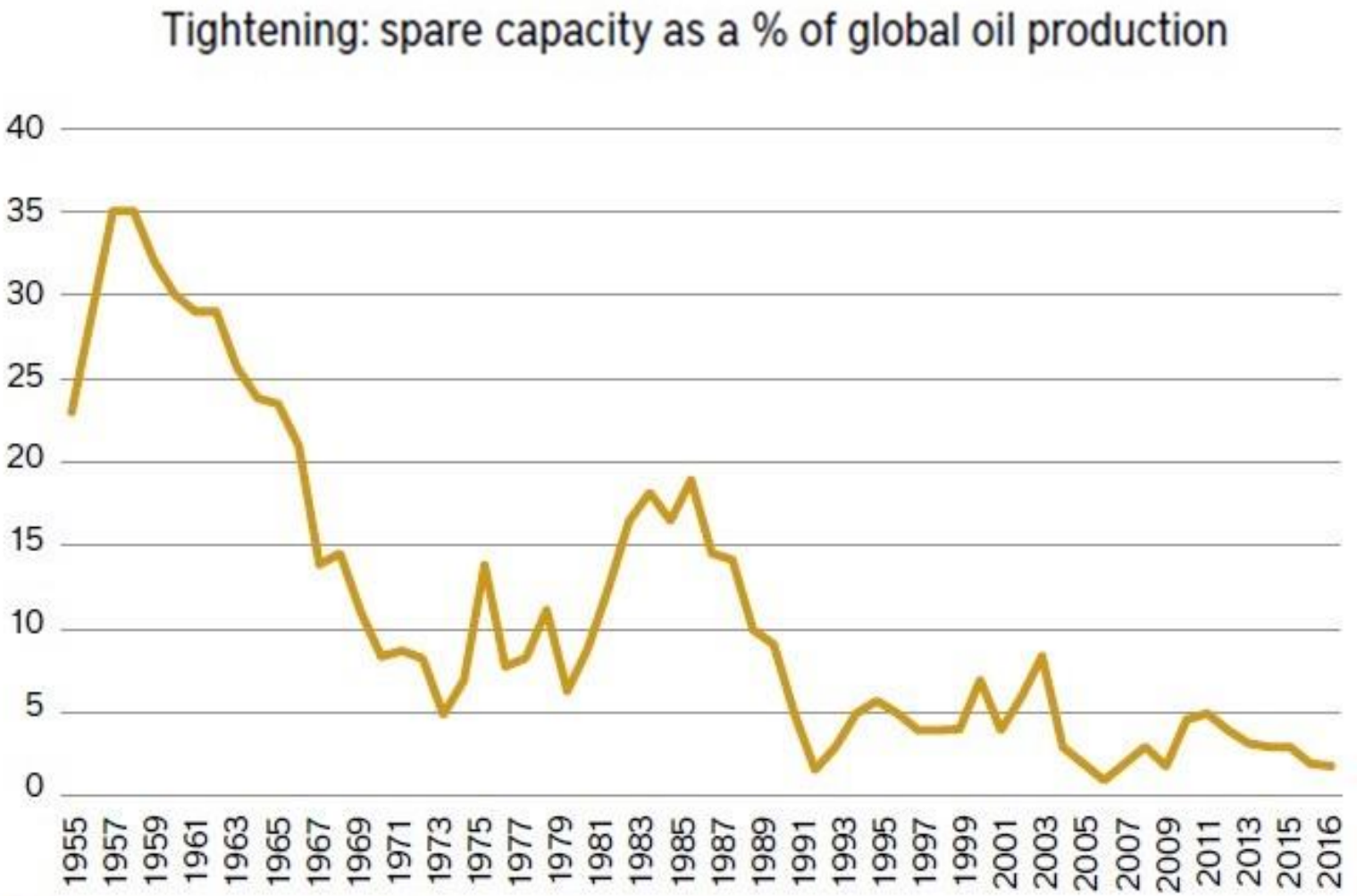
US shale oil producers have survived by reducing their production costs dramatically



In the near future, many (but not all) operators expect a flat oil price – but with significant uncertainties



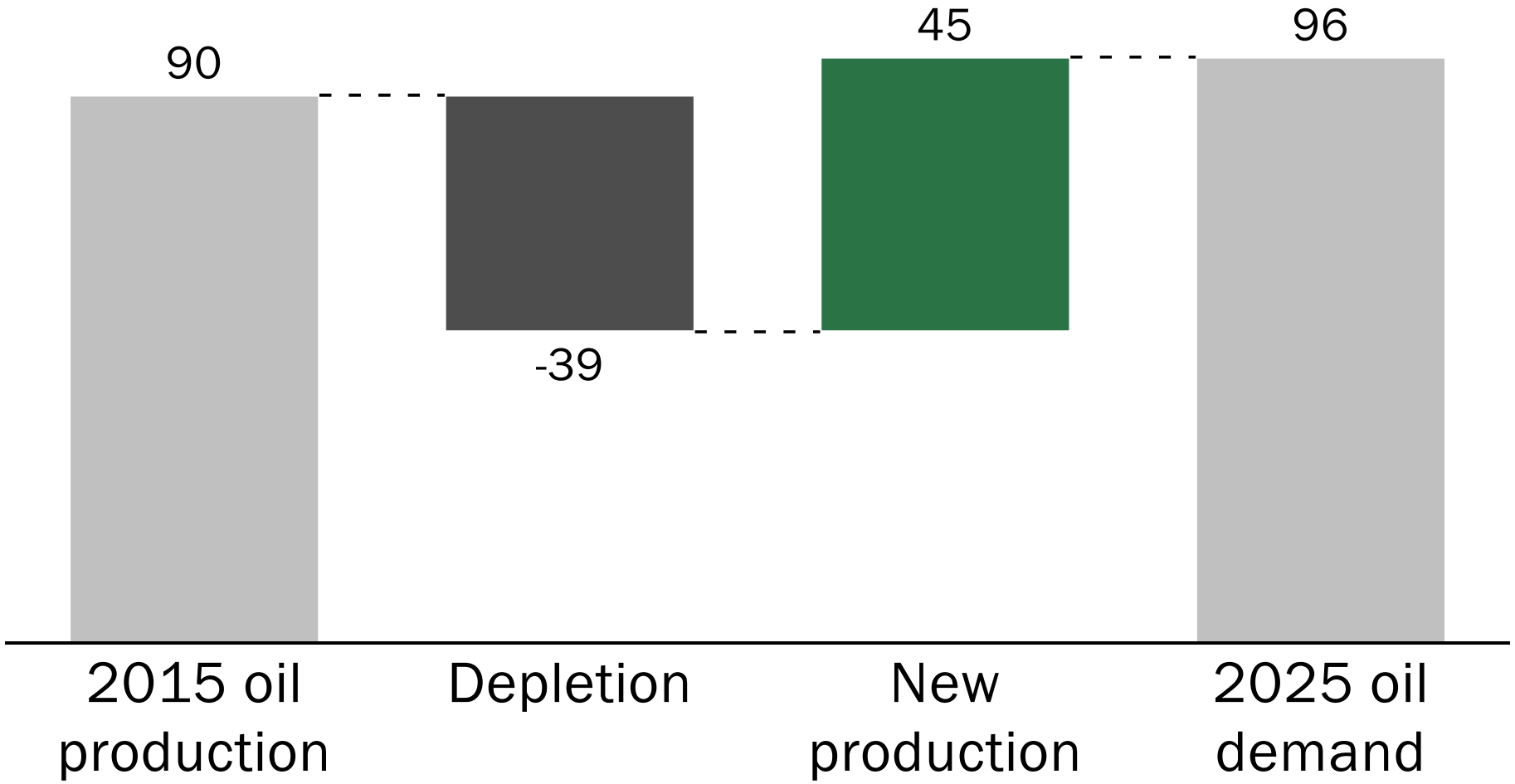
More boom, more bust?



From: Bob McNally, *Crude Volatility: The History and the Future of Boom-Bust Oil Prices* (Columbia University Press, 2016)

New CAPEX will be mainly required to maintain the base oil production

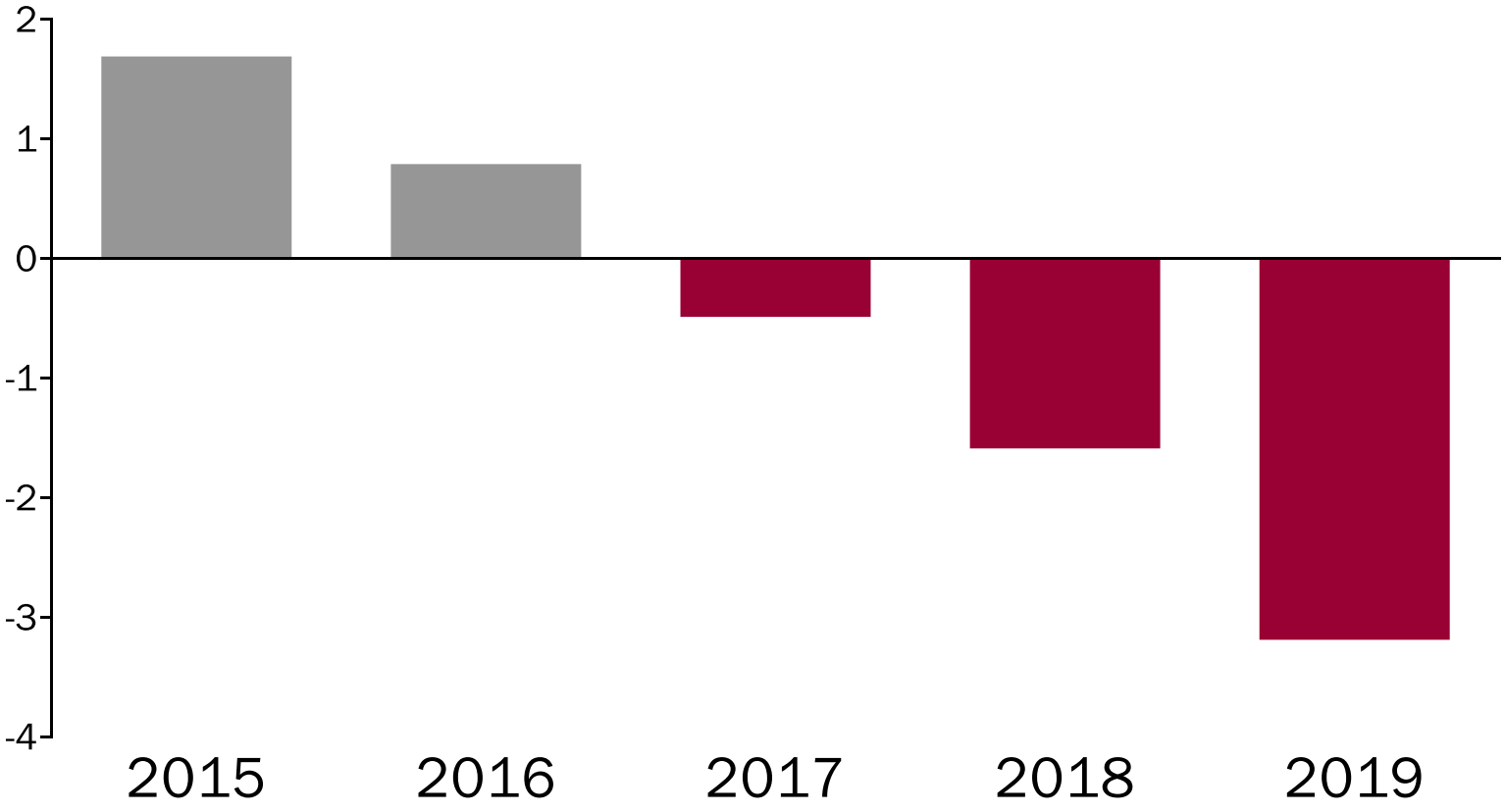
OIL: Base production from current fields, demand, and implied depletion and new production need (MBPD)



Note: assumes 5.5% depletion rate for oil fields
Source: SupplHi analysis on BP Energy Outlook 2015 and Galp Energia “Capital Markets Day 2015”

Shortly, there could be an Oil production deficit

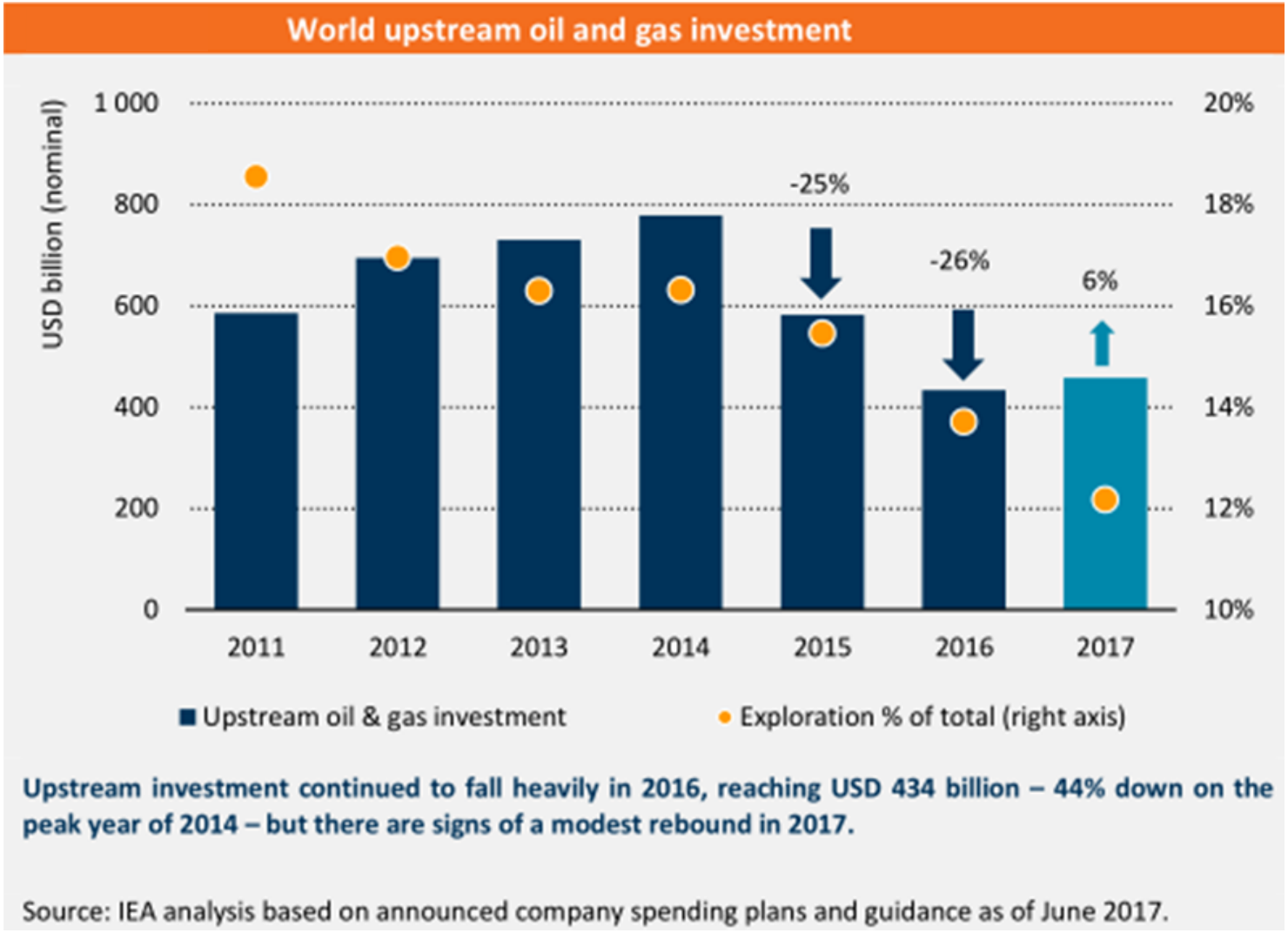
Implied Oil market surplus (deficit) based on existing projects



Note: assumes 5.5% depletion rate for oil fields
Source: Barclays Research (September 2016)

TRANSITION: Gradual return to investments – e.g. upstream

World total energy investment in 2016: USD 1,700 billion

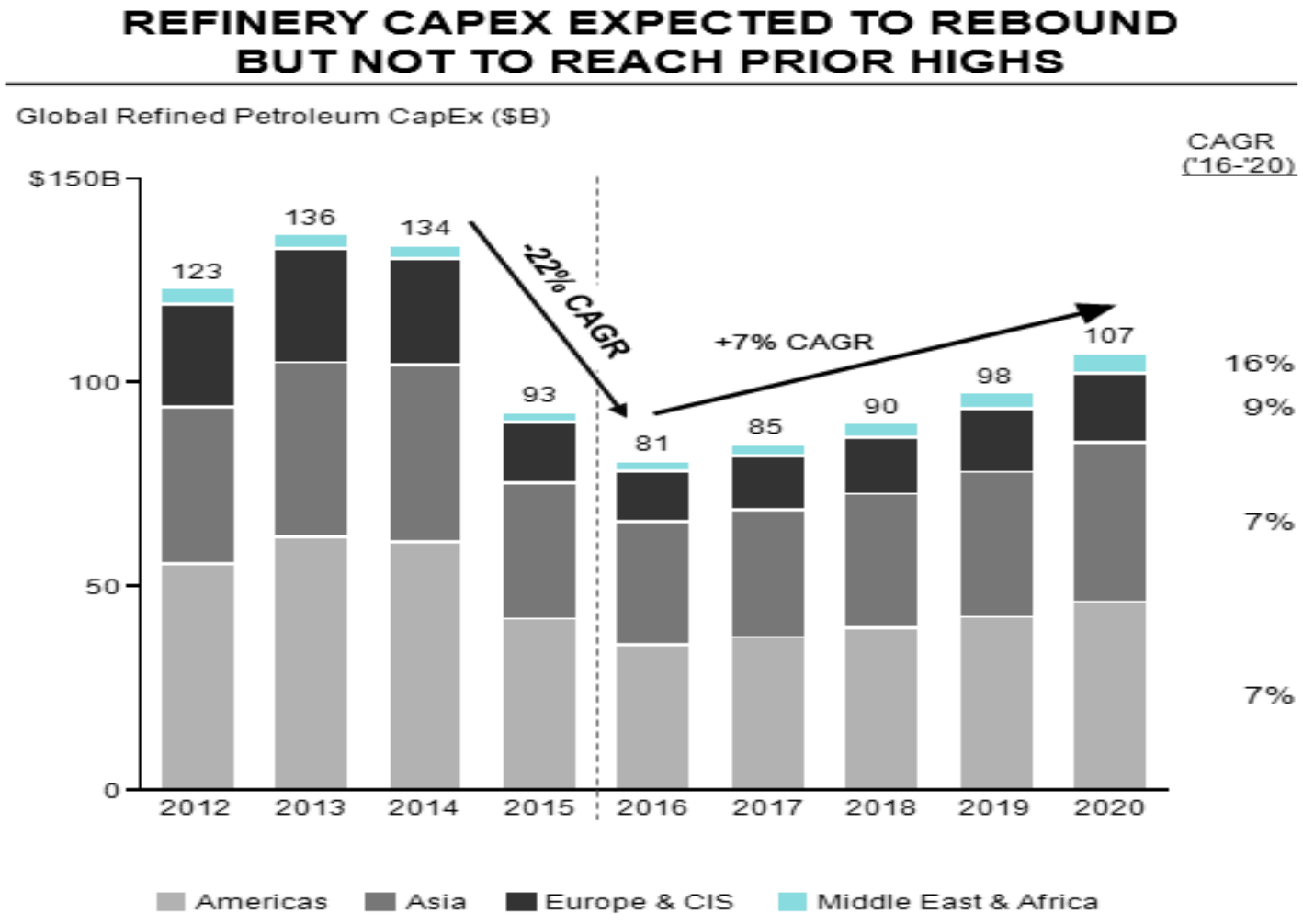


2018 (o)

4%

(o) Barclays Mid-year 'Global Spending Survey' (09/2017)

Downstream investments to follow similar trend

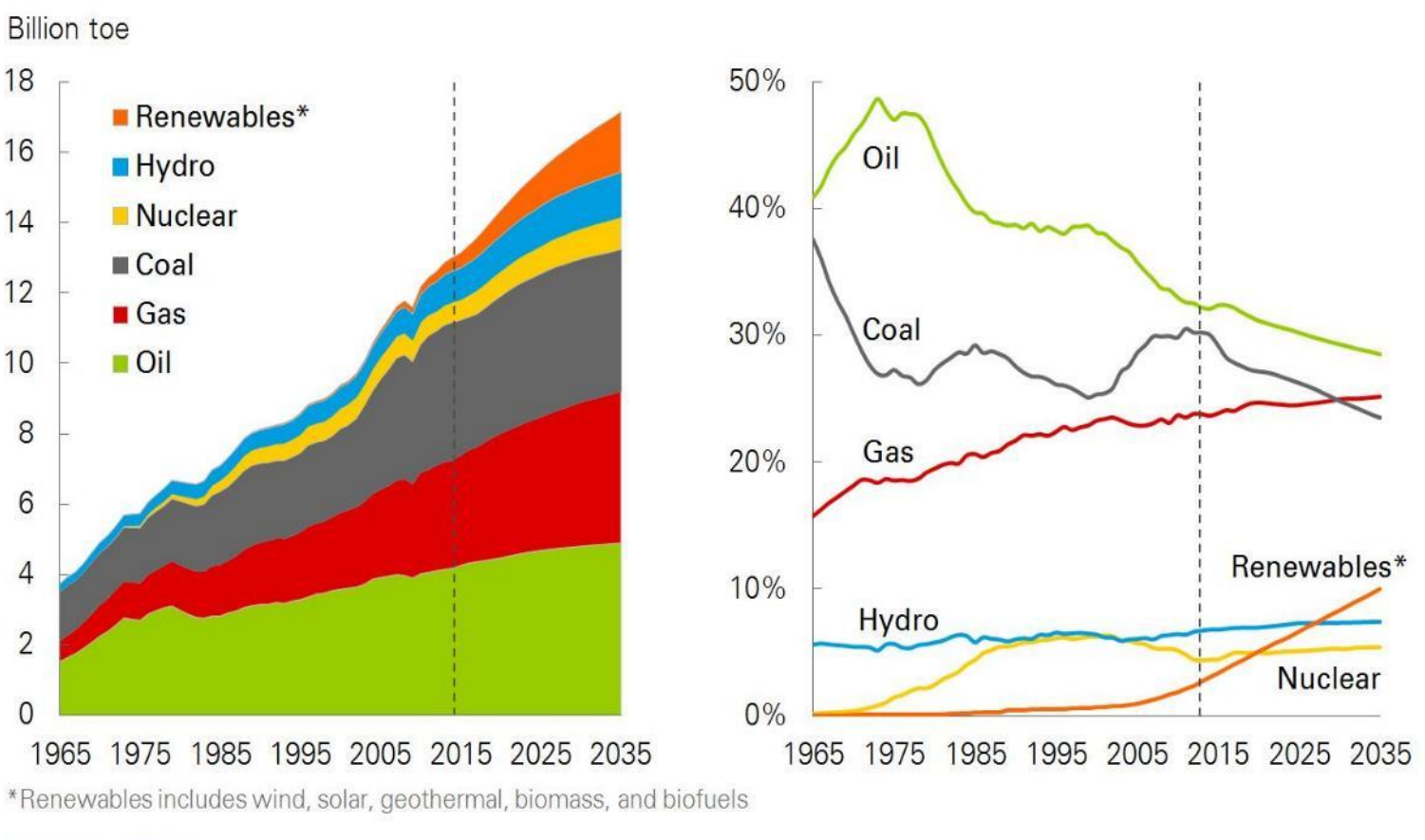


Source: IHS Global Insight (Jul 2016); Economist Intelligence Unit

Gradually, we see a return to modest growth in investments

TRANSITION: Gas and renewables to become the dominant primary energy sources in mid-21st century

The gradual transition in the fuel mix continues…



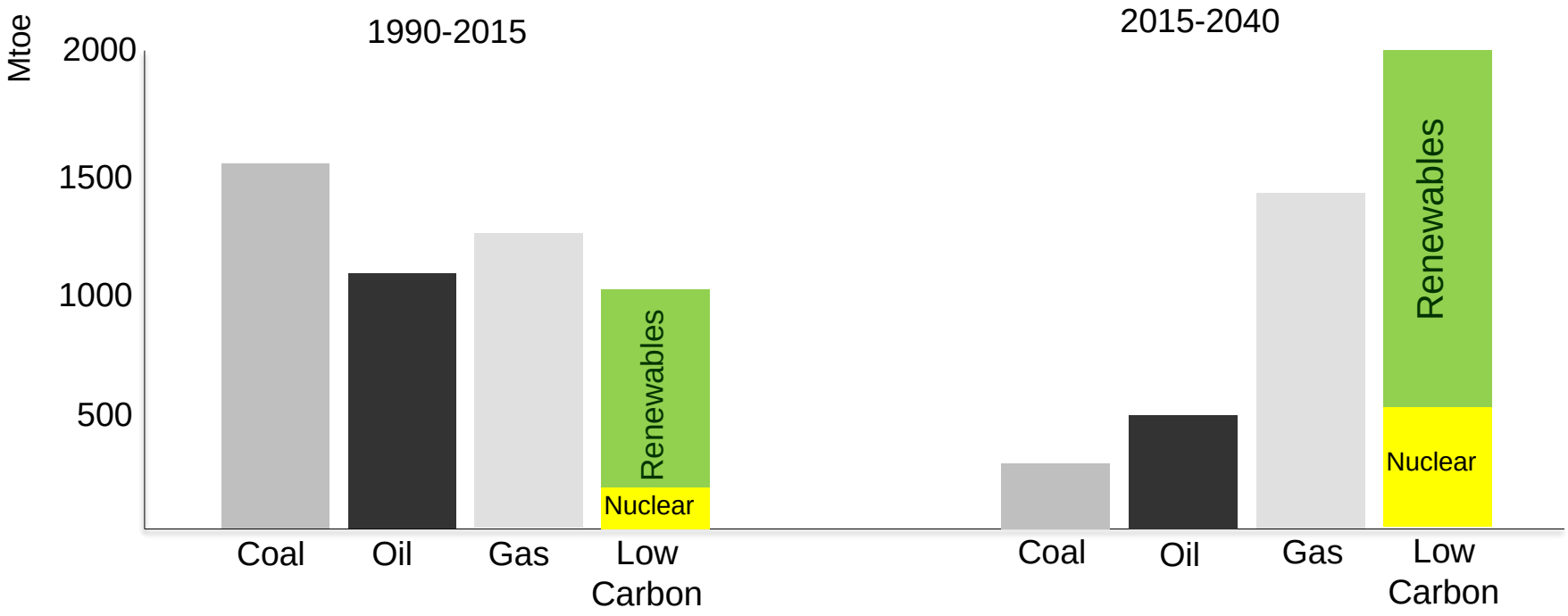
*Renewables includes wind, solar, geothermal, biomass, and biofuels

2017 Energy Outlook 14 © BP p.l.c. 2017

Cleaner fuel for electric power generation, direct use in transportation, petrochemicals…

TRANSITION: Big changes in the future energy mix

Changes in total primary energy demand

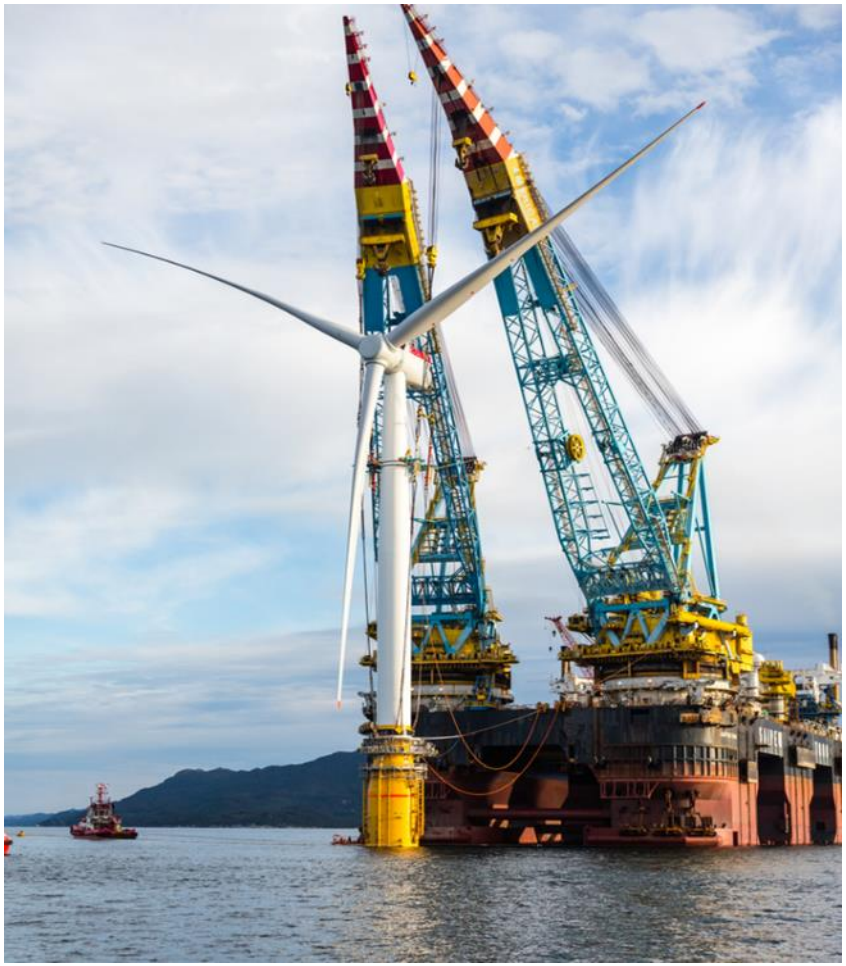


Source: IEA (2017)

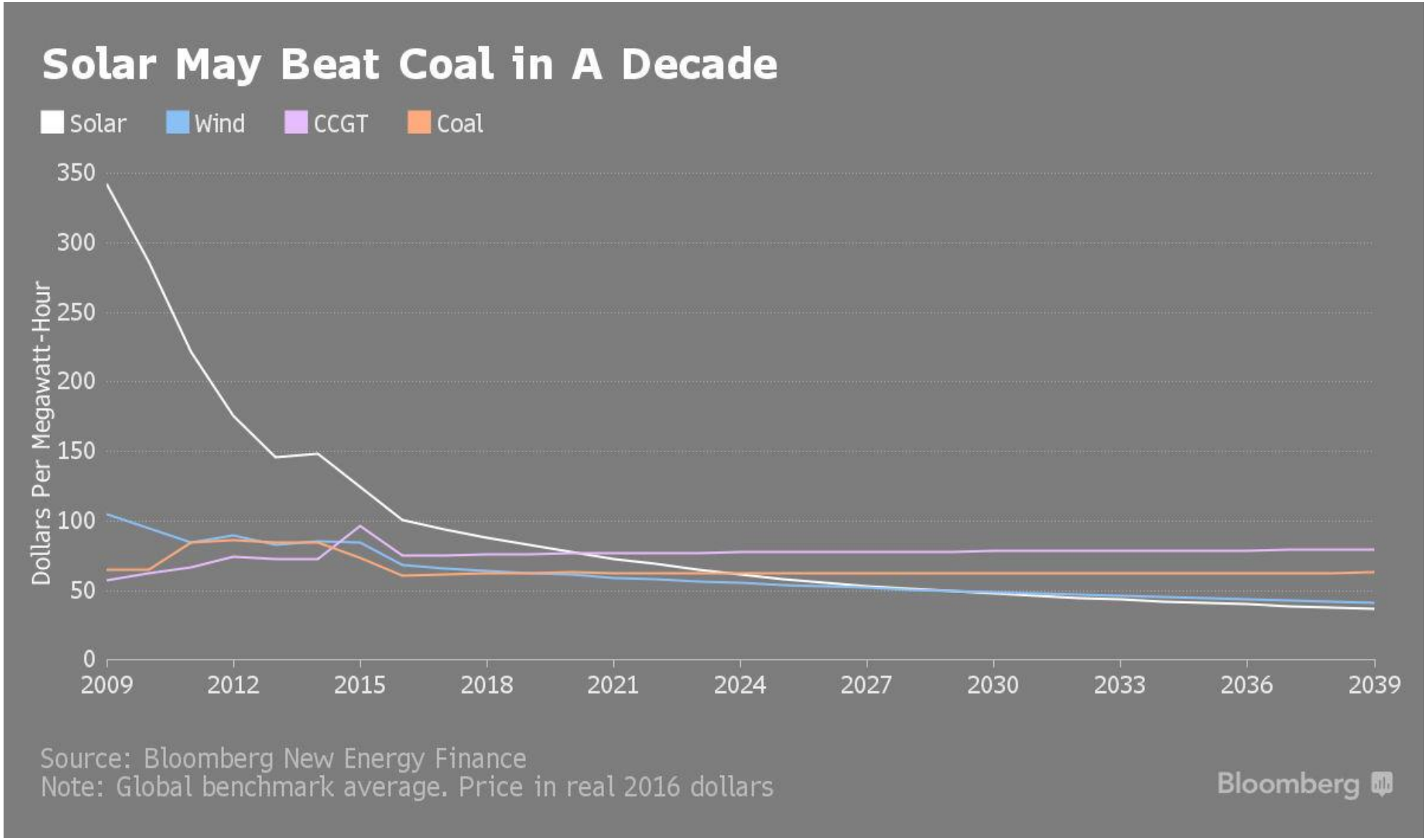
Low-carbon fuels & technologies, mostly renewables, to supply nearly half of the increase in energy demand to 2040

We may have to use our traditional competencies and assets to exploit new market trends

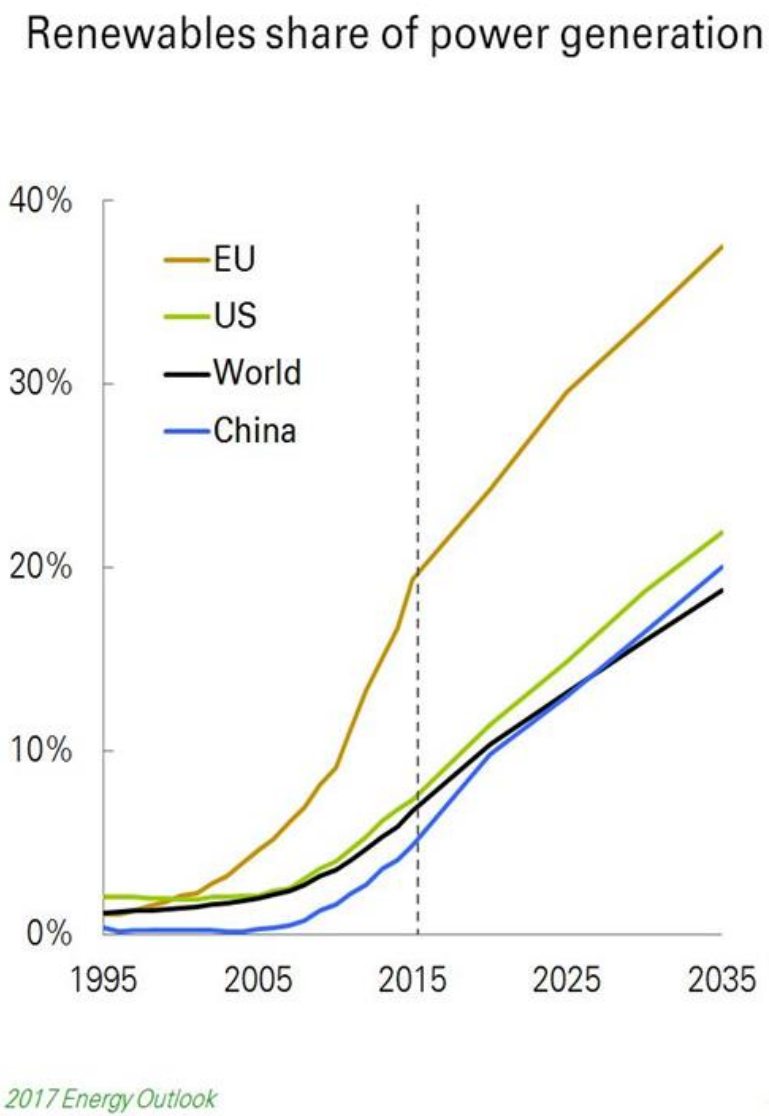
….often more difficult to identify and quantify



Solar power gen becoming fully cost-competitive

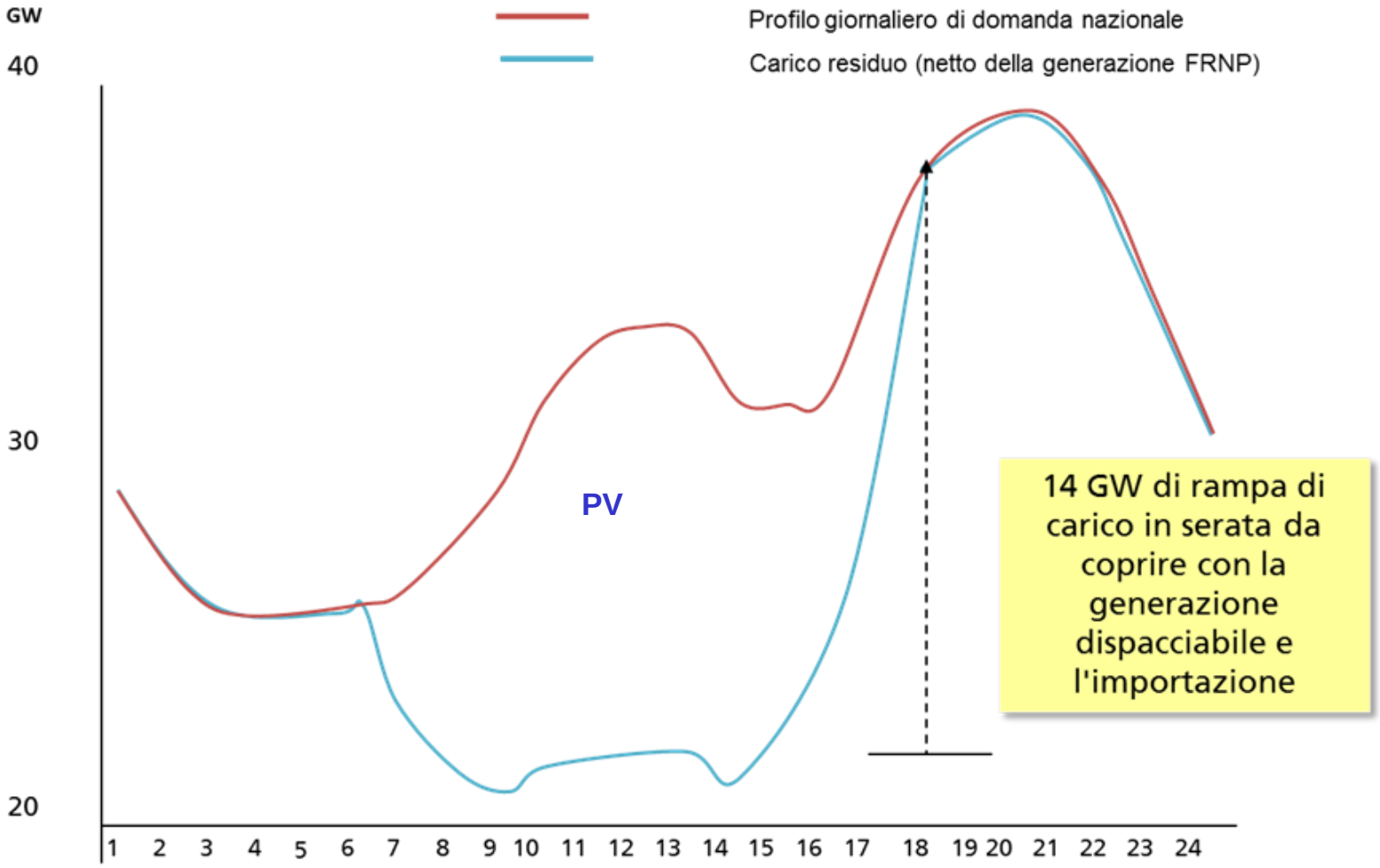


TRANSITION: Renewables to continue to grow rapidly



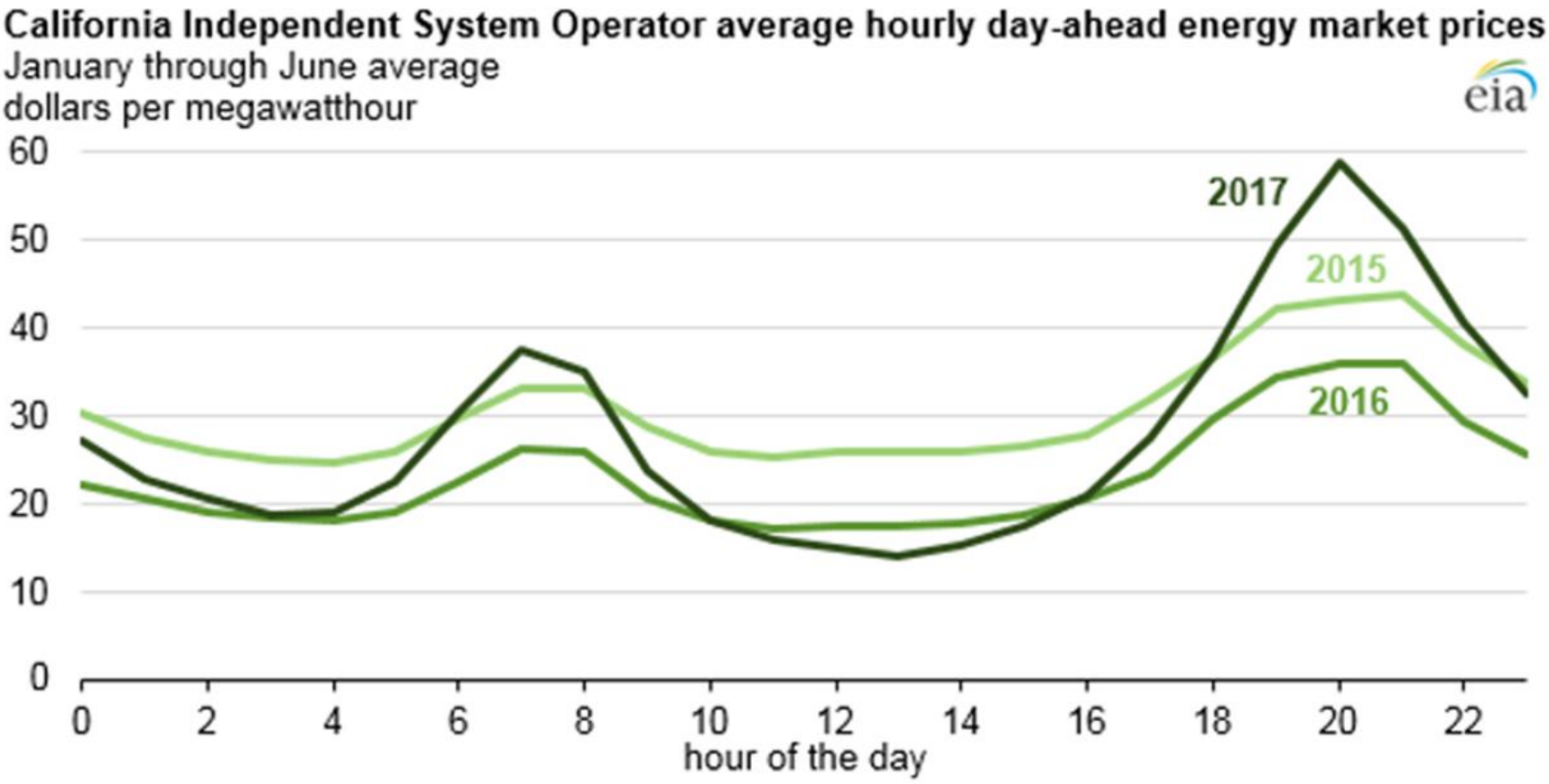
Typical power demand profile

On a sunny summer day in Italy, with supply needs from non-renewable sources

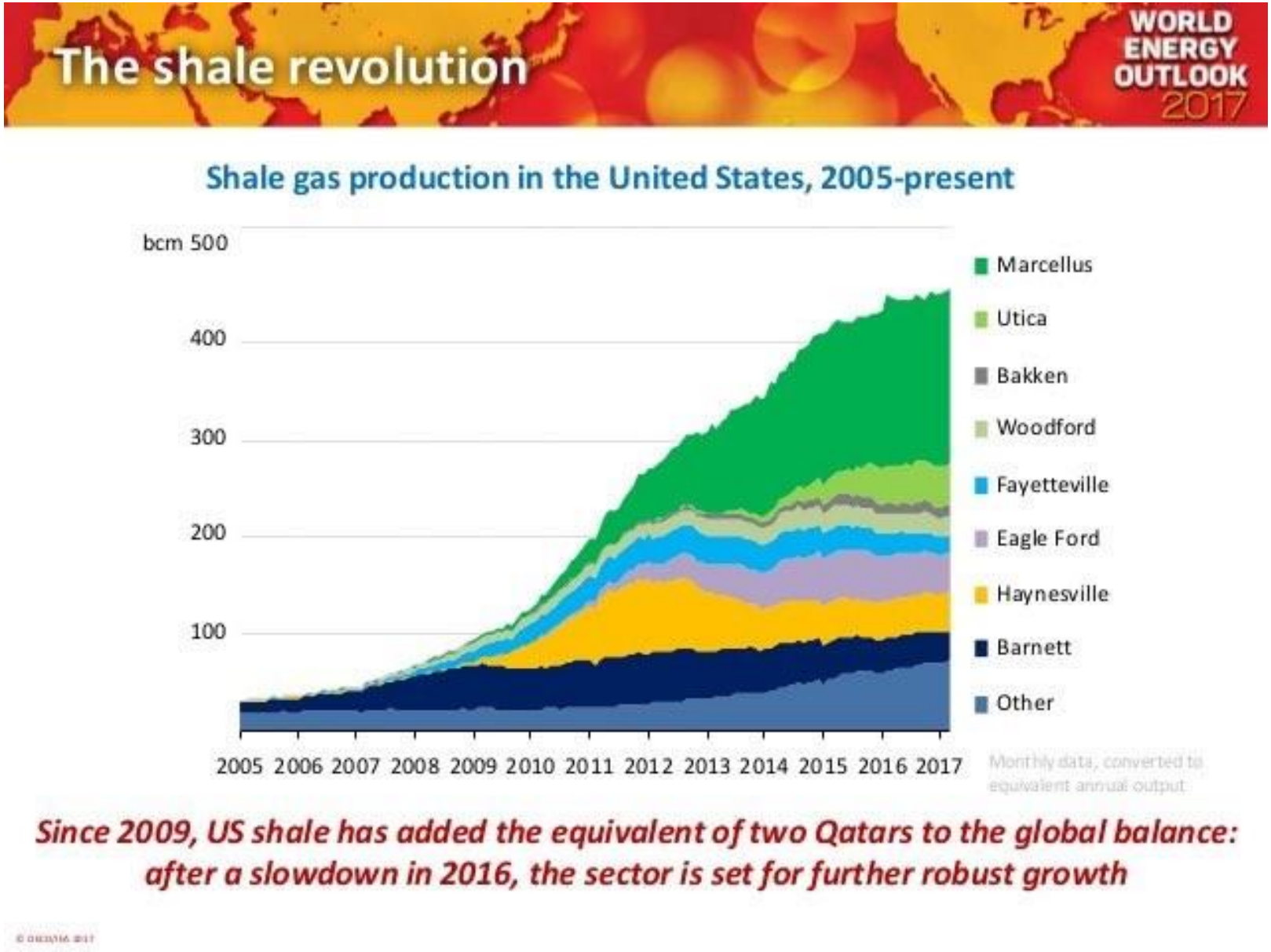


(Source: Terna 2017)

Power prices in California

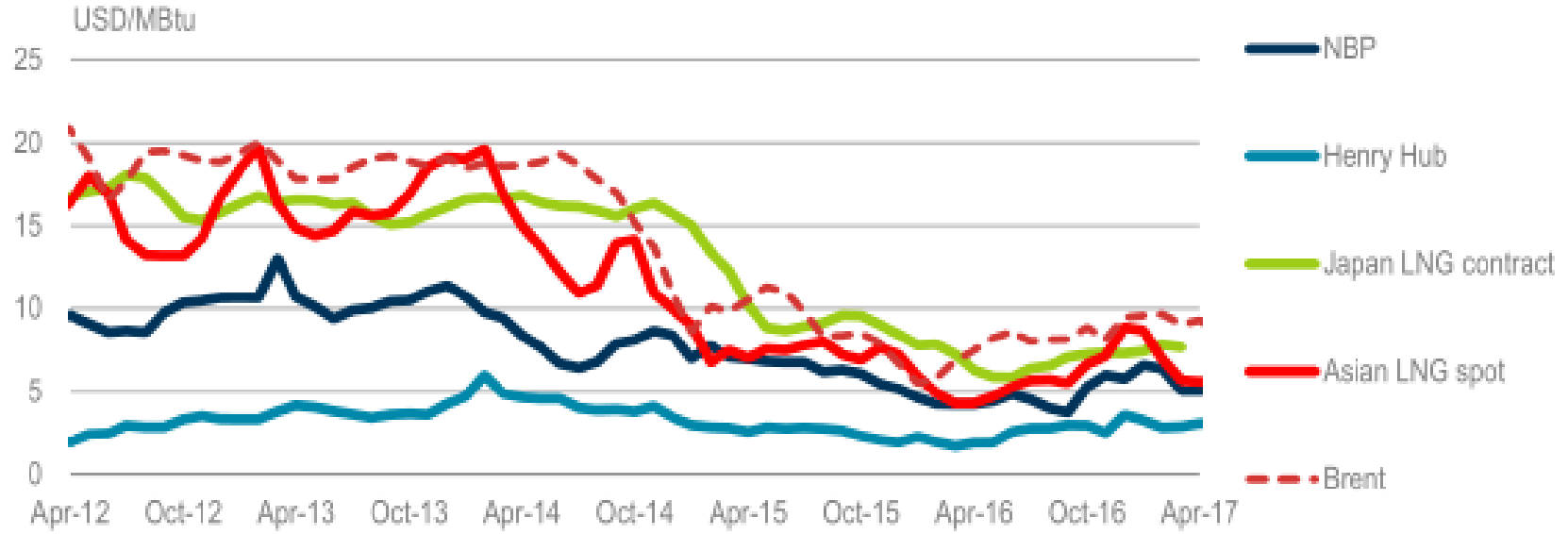


Natural Gas: the Shale Revolution



Gas prices development, 2012-17

Lower gas prices, particularly in Asia, while discouraging the supply-side, tend to increase demand



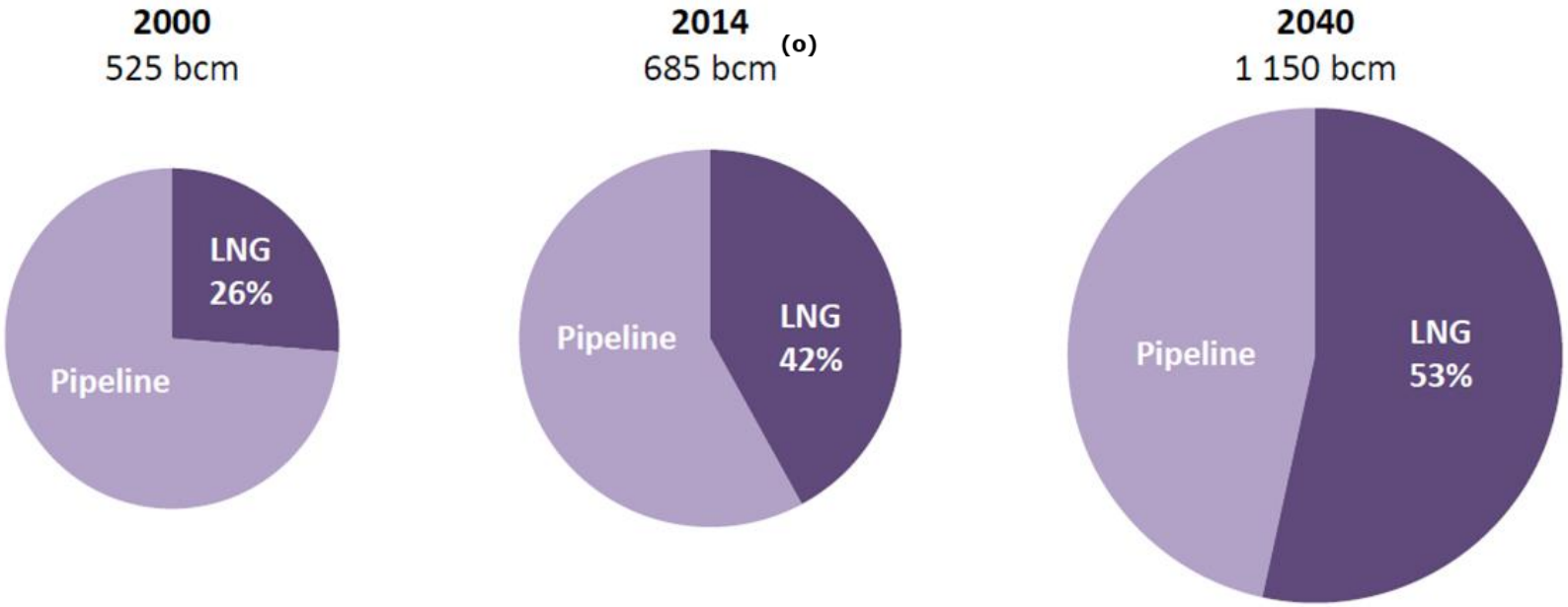
Note: NBP = National Balancing Point (United Kingdom).

Sources: NBP, Henry Hub, Japan LNG contract and Brent data: Bloomberg Finance LP; Asian LNG spot data: ICIS (2017), *ICIS LNG Edge*.

Source: IEA (June 2017)

Growing importance of long-distance gas trade

‘The LNG revolution’



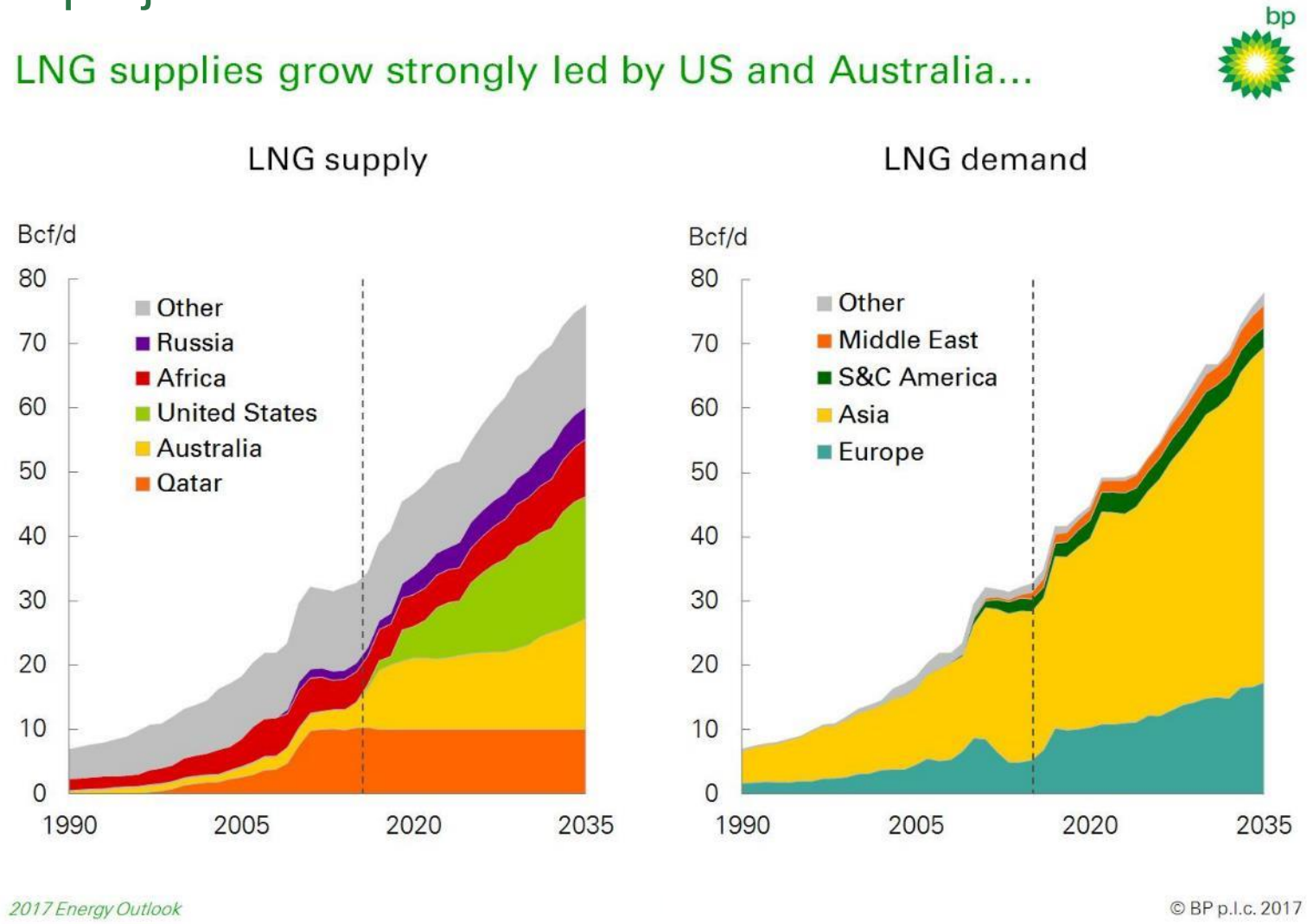
(o) ~ 20 % of global gas demand
- EU28 gas consumption

Source: IEA (June 2017)

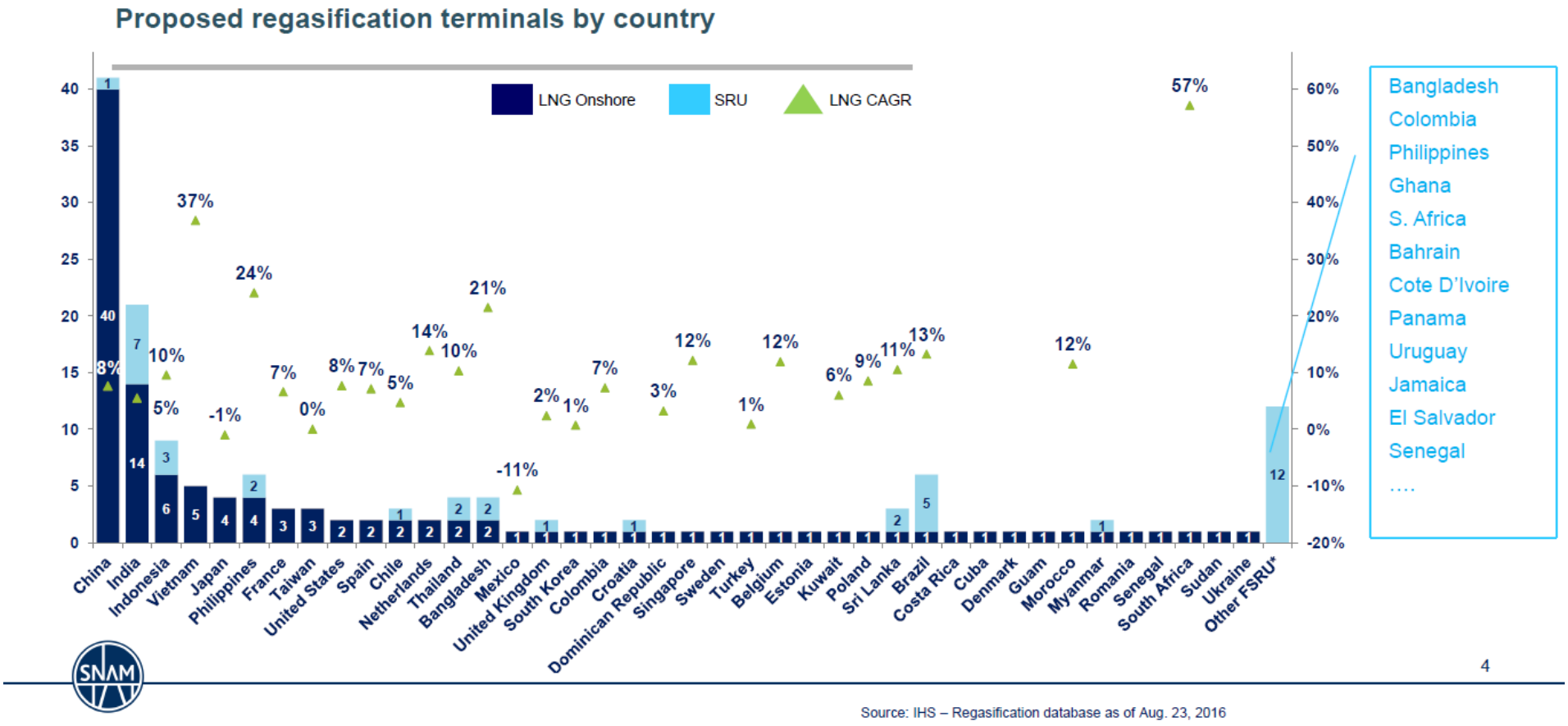
LNG continues being a major growth industry

Short-term glut, but lower LNG prices and spot market flexibility favor broader usage

More smaller projects



A growing number of countries interested in receiving LNG



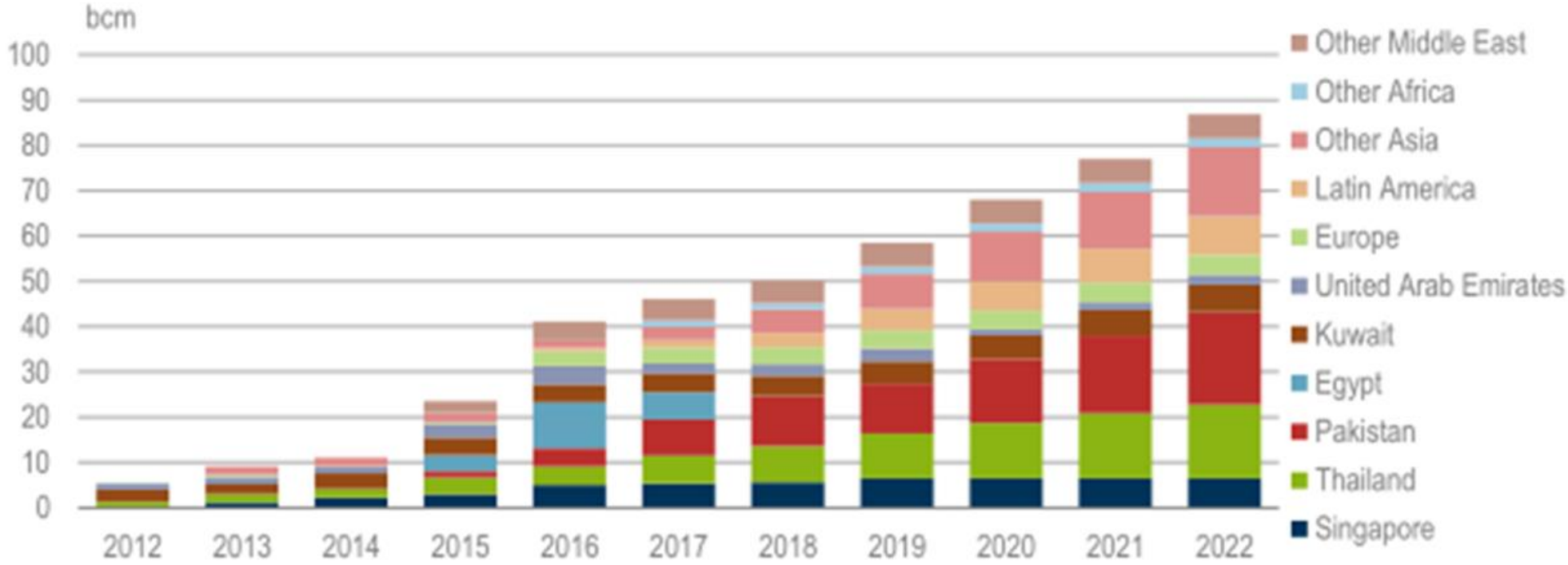
Source: IHS – Regasification database as of Aug. 23, 2016

Countries importing LNG have doubled in last 10 years to 39

Low LNG prices, ease of building FSRUs and regas terminals, flexible spot markets

Growth from small and new LNG importers, 2012-22

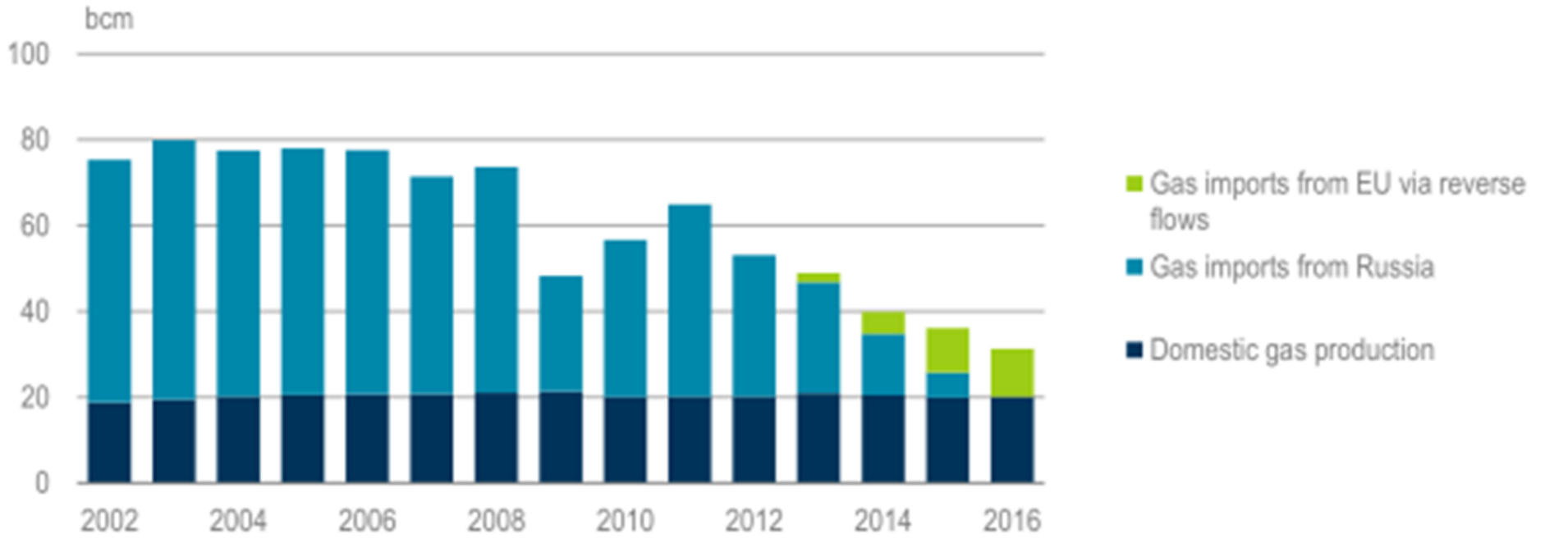
Gradual birth of new, less typical players and contracts



Source: IEA (June 2017)

Geopolitics: First US LNG cargo reaches Lithuania
(August 2017)

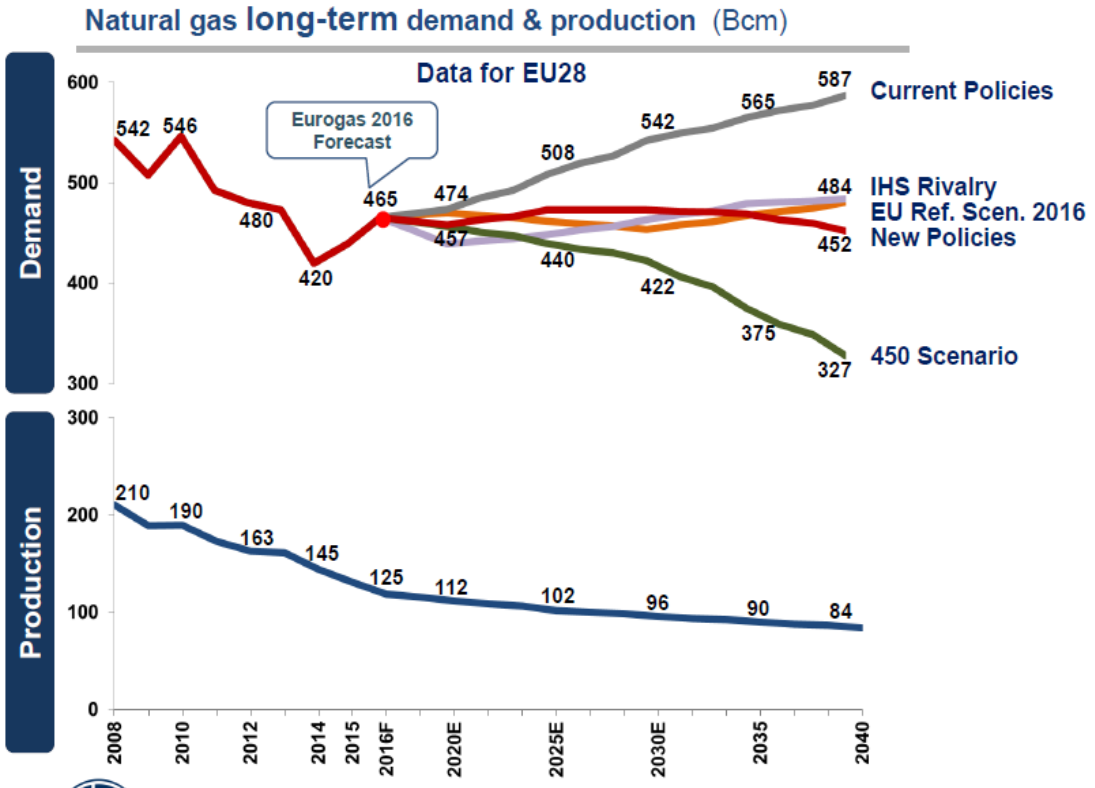
Geopolitics: Ukraine's gas balance, 2002-16



Sources: Naftogaz (2017), *Natural Gas Consumption in Ukraine;* IEA (2017a), *Natural Gas Information* (database); IEA (2017b, *Gas Trade Flows* (database).

Source: IEA (June 2017)

Europe will need ever more gas imports



Growing gap between demand and EU supply

Source: OECD/IEA, "World Energy Outlook 2016"; EU Reference Scenario 2016

5

* Implementation of the only 20-20-20 energy package with the achievement of the targets ** New Policies Scenario hypothesizes the full implementation of the Energy Policies set out at EU level
*** IHS Rivalry assumes EU on track to reach its 2020 targets. 2030 targets at EU level not reached but different trends among Countries (priority is given to national policies)

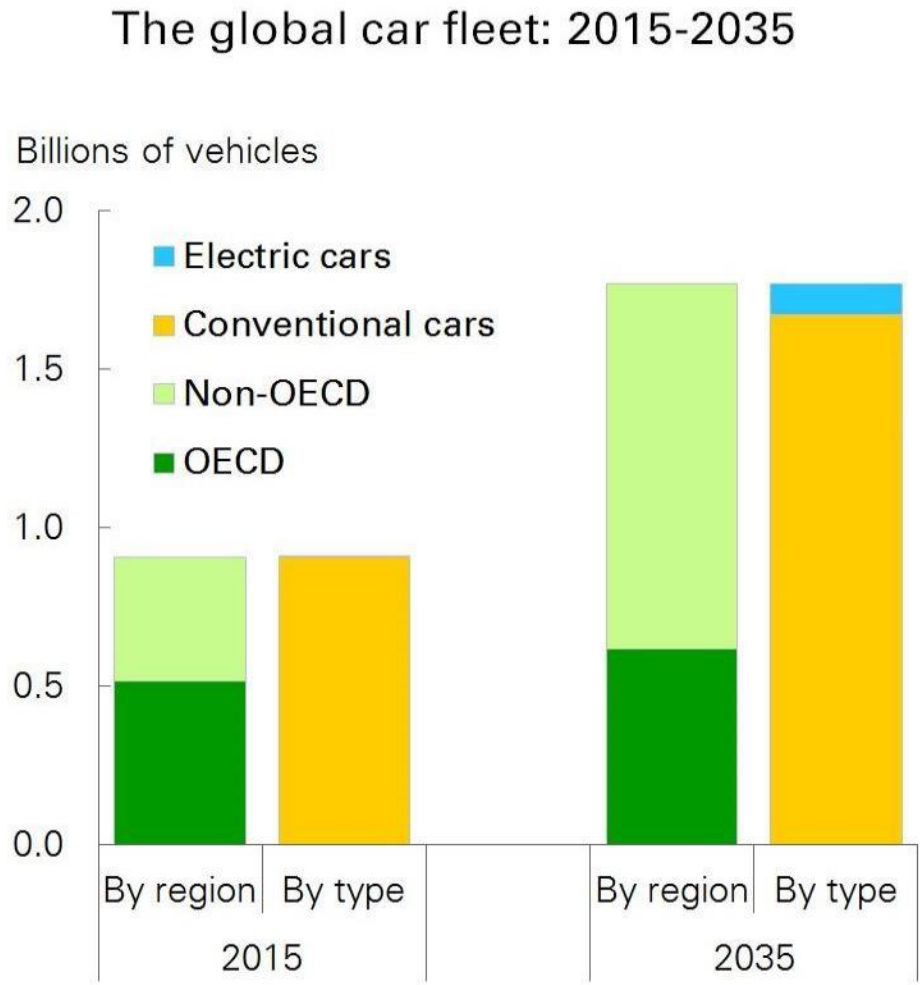
TRANSITION: Electric mobility ???

" This car changes everything"

The car ordered by Ben van Beurden, Shell CEO

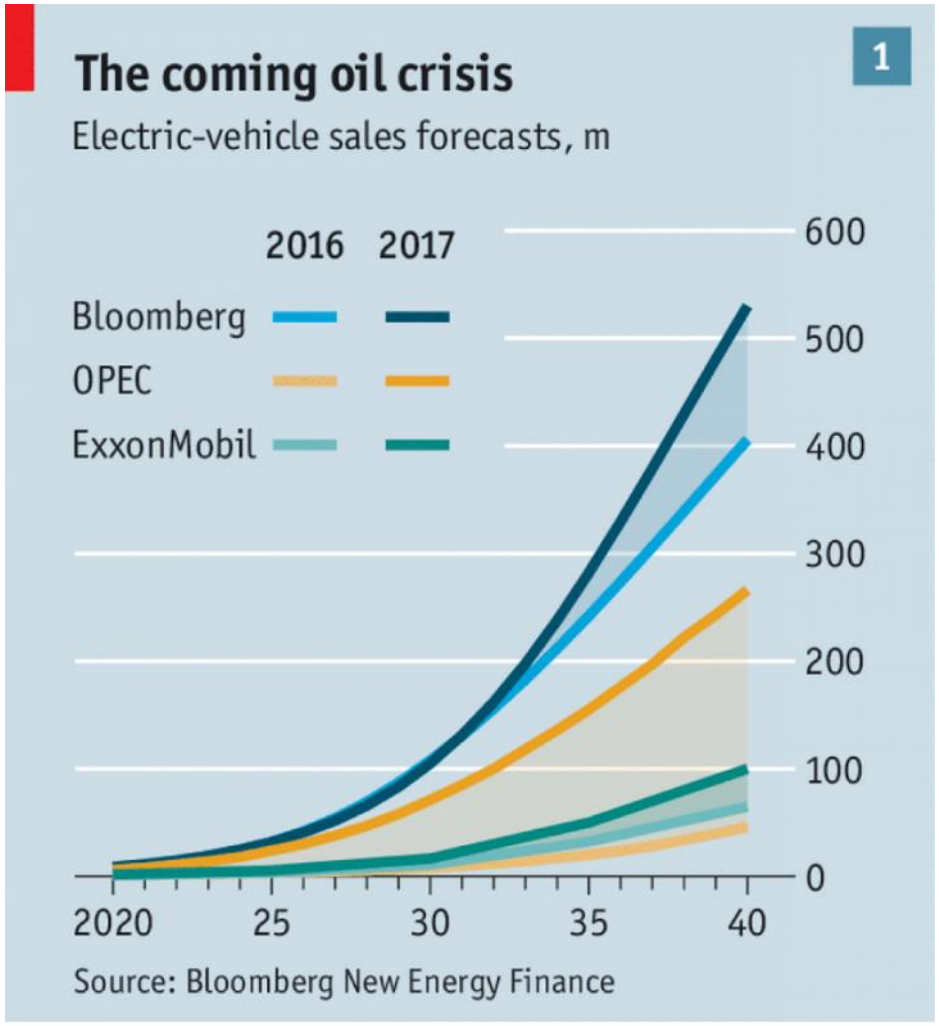
Rising prosperity to boost car ownership in emerging markets

But worldwide, the impact of electric cars will be gradual

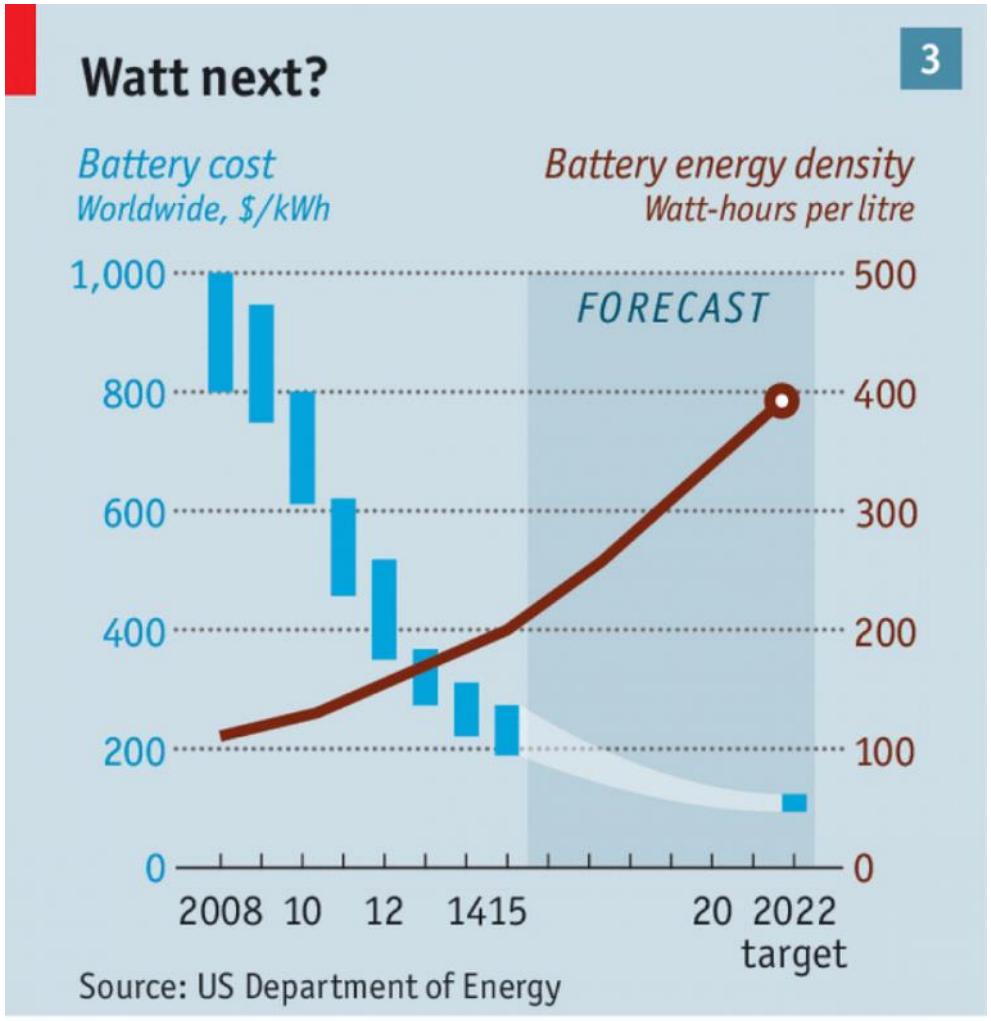


Most electric mobility forecasts are probably understated

Technology breakthroughs will be crucial



Economist.com

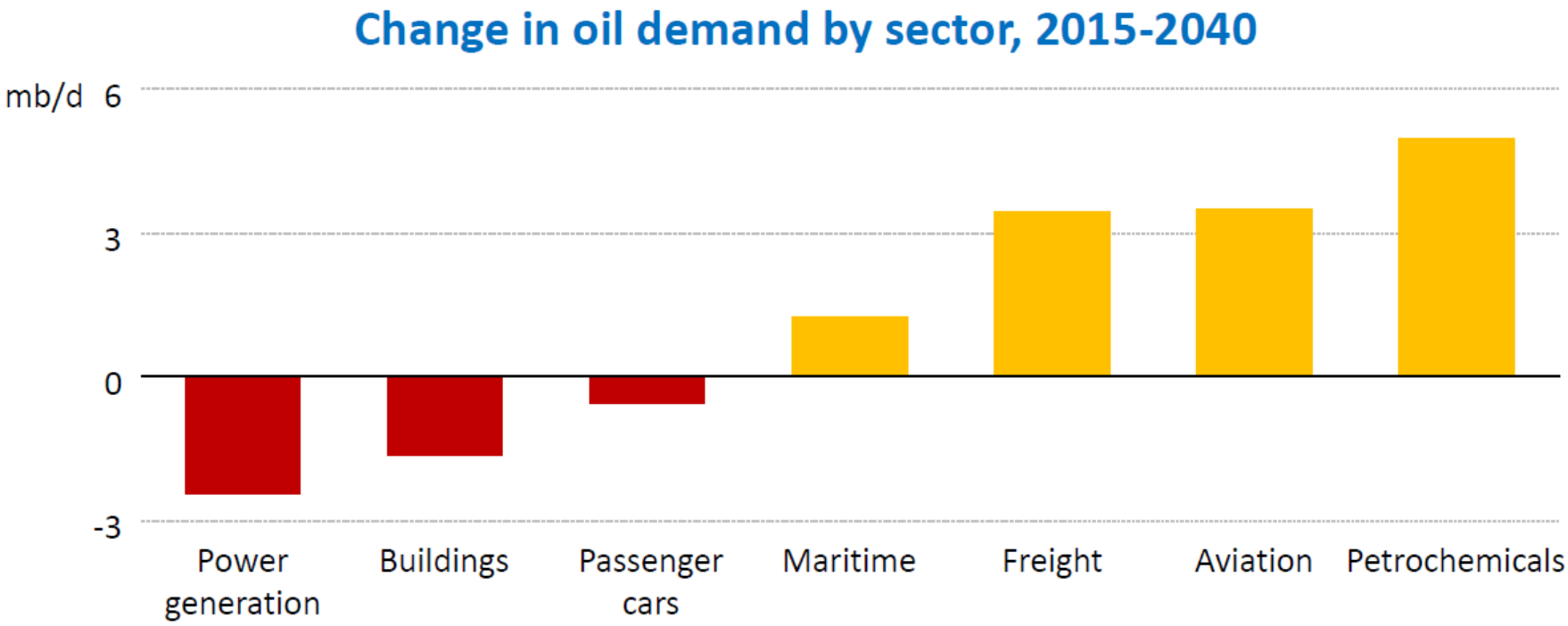


Economist.com

Building the **industrial infrastructure** for electric mobility might offer new opportunities

Oil: No peak in sight ?

Demand growth is slowing, with 'peak oil' to be probably reached at some point in the more distant future

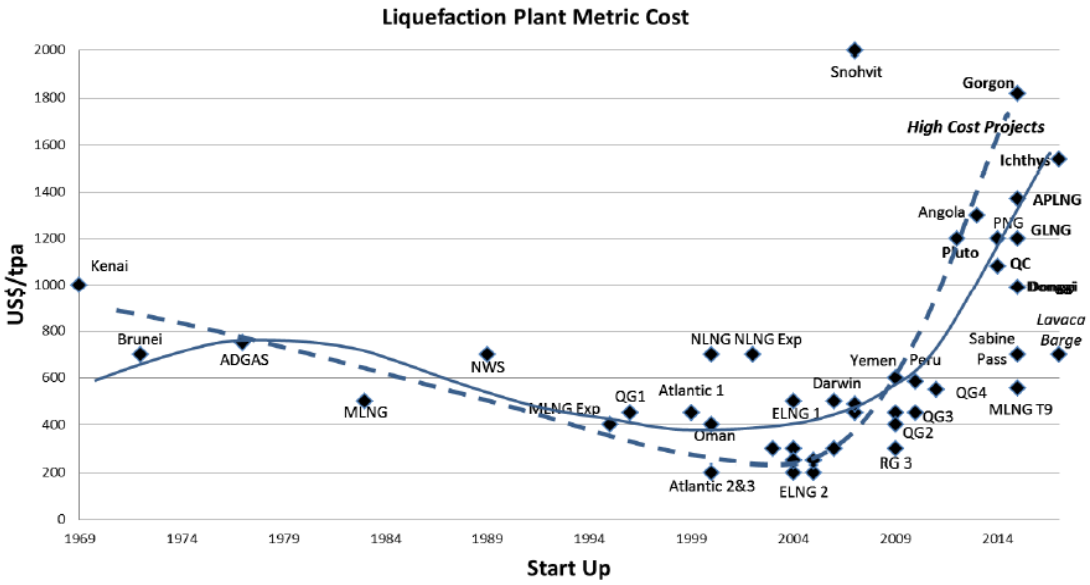


The global car fleet doubles, but efficiency gains, biofuels & electric cars reduce oil demand for passenger cars; growth elsewhere pushes total demand higher

Improving / overhauling the new project delivery process

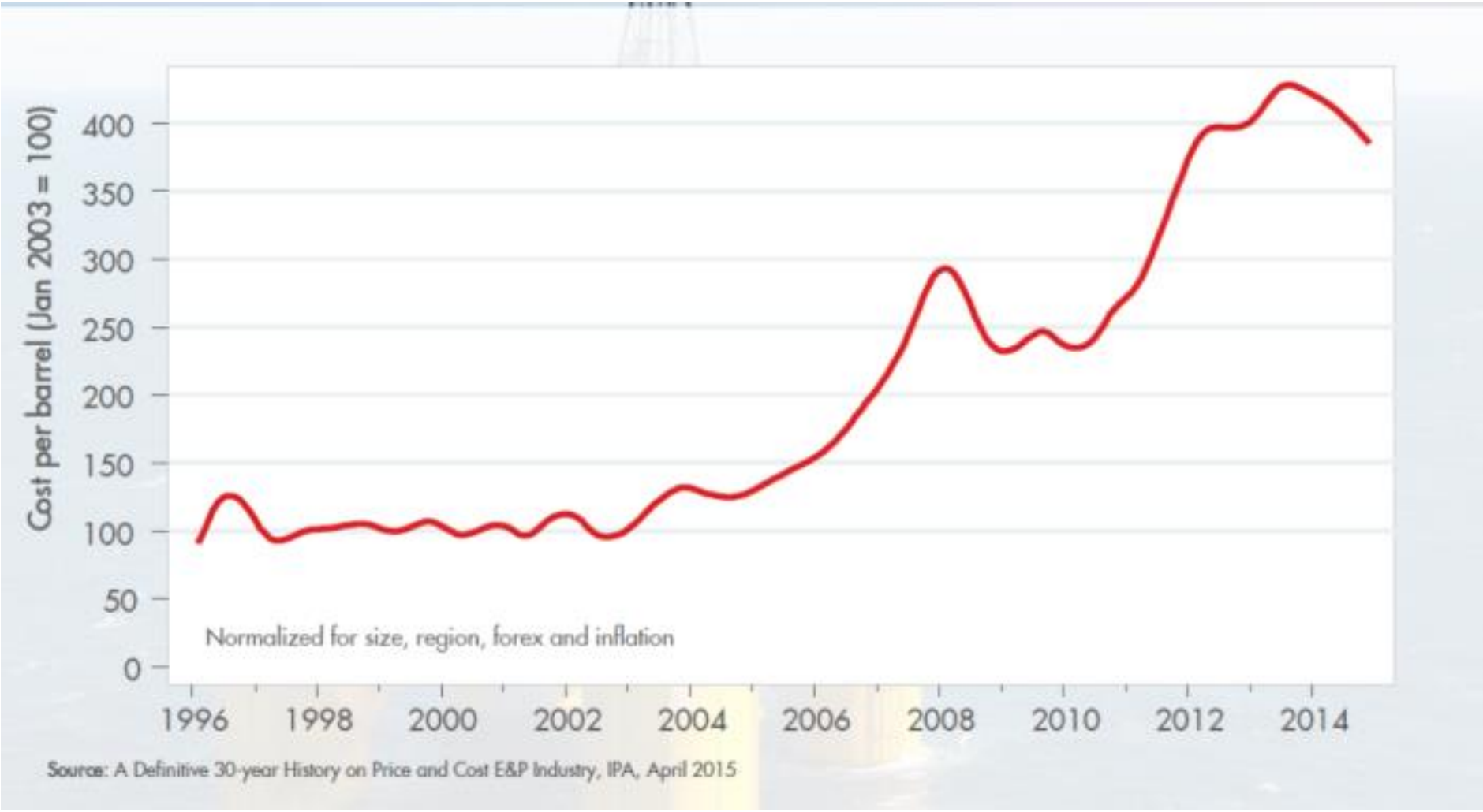
Our industry has been plagued by rising project execution costs

Example: LNG liquefaction plants capital cost escalation (US $)



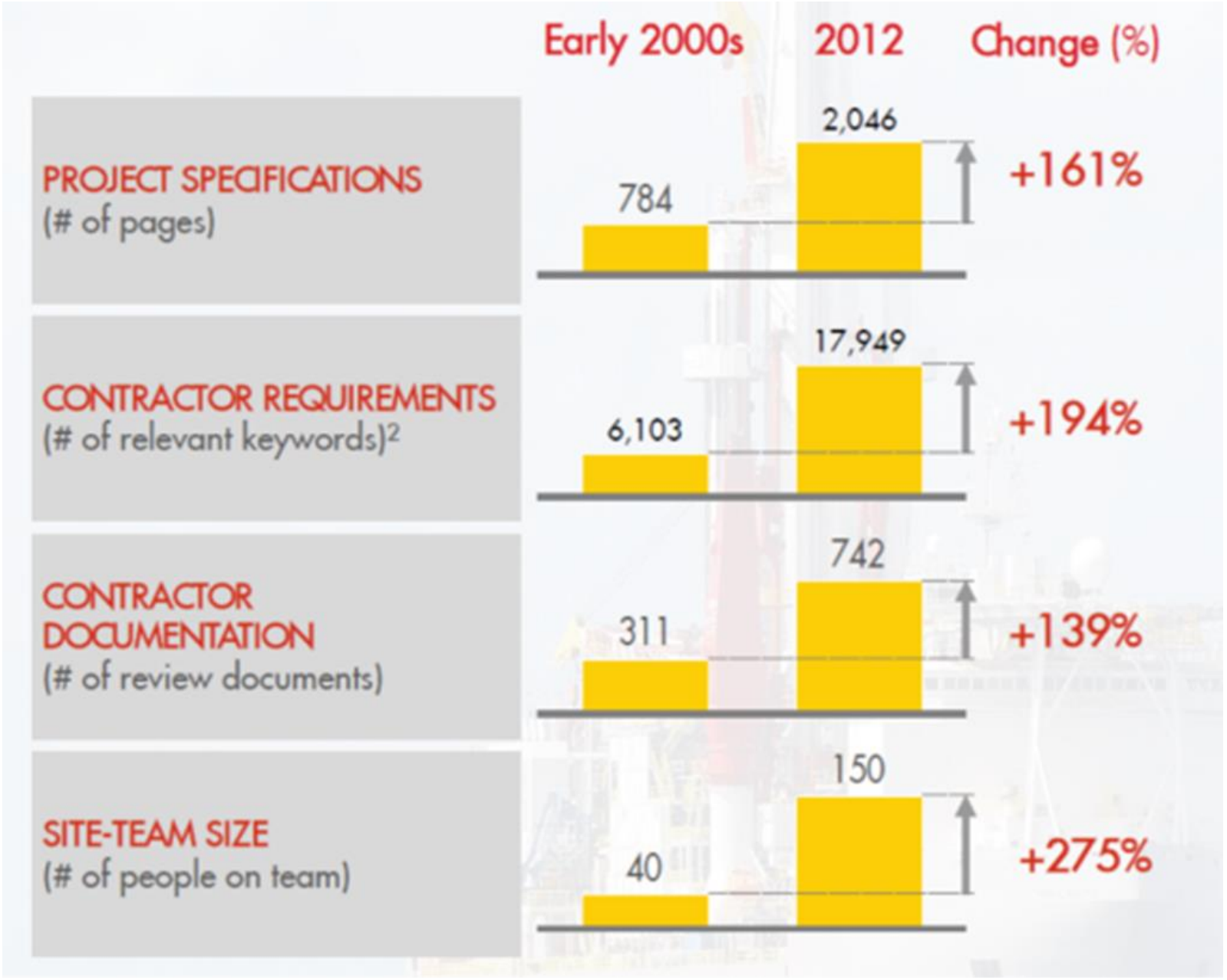
- More complex and remote environments
- Tight skilled labor market
- Mostly fast-track project execution
- Major loss of efficiency and productivity

Increased capital intensity



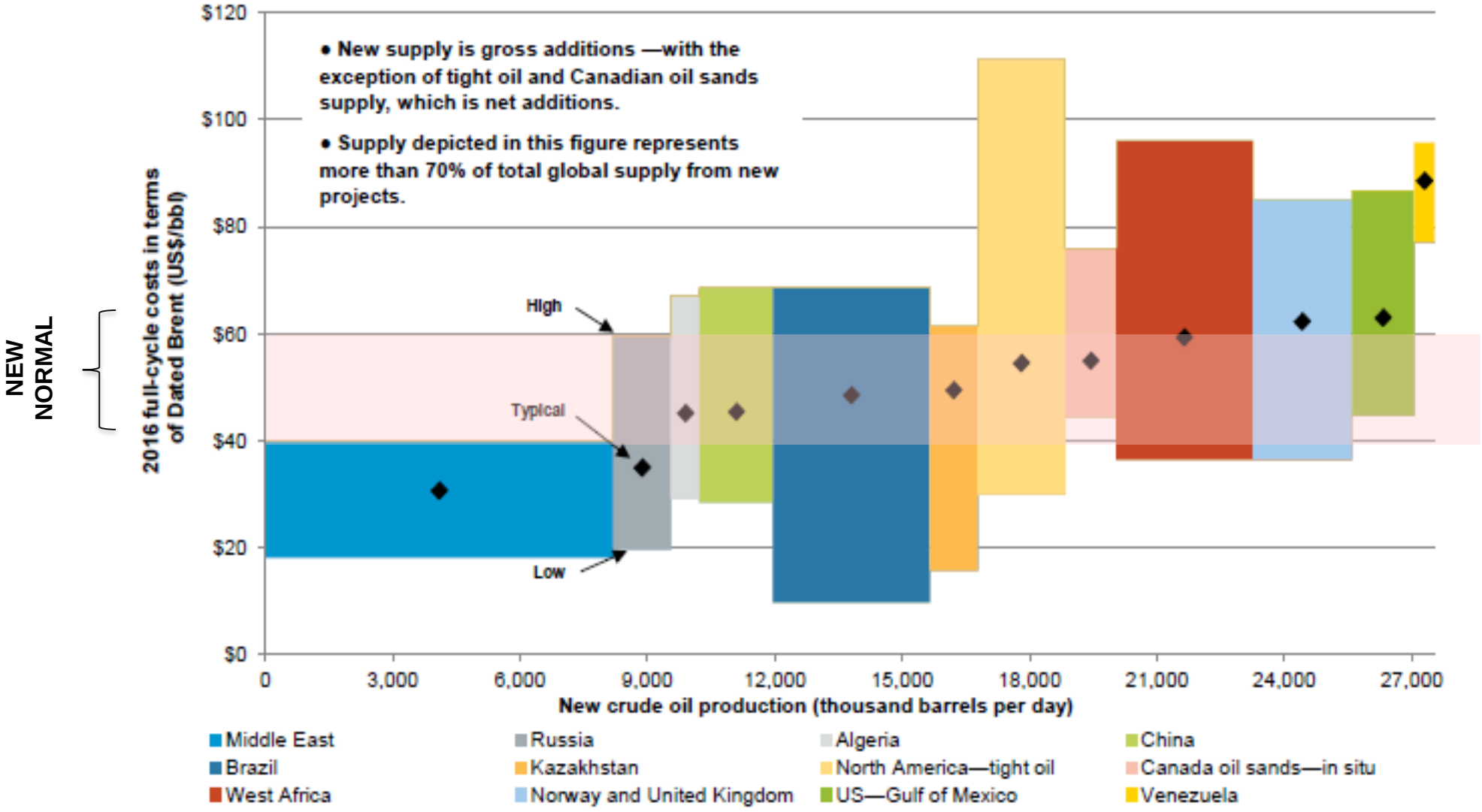
Declined productivity

Pushing more paper



The Execution Challenge:
only lowest-cost projects will see the light (cost curve by market)

Indicative cost curve of global crude oil supply from new projects in select areas to 2030

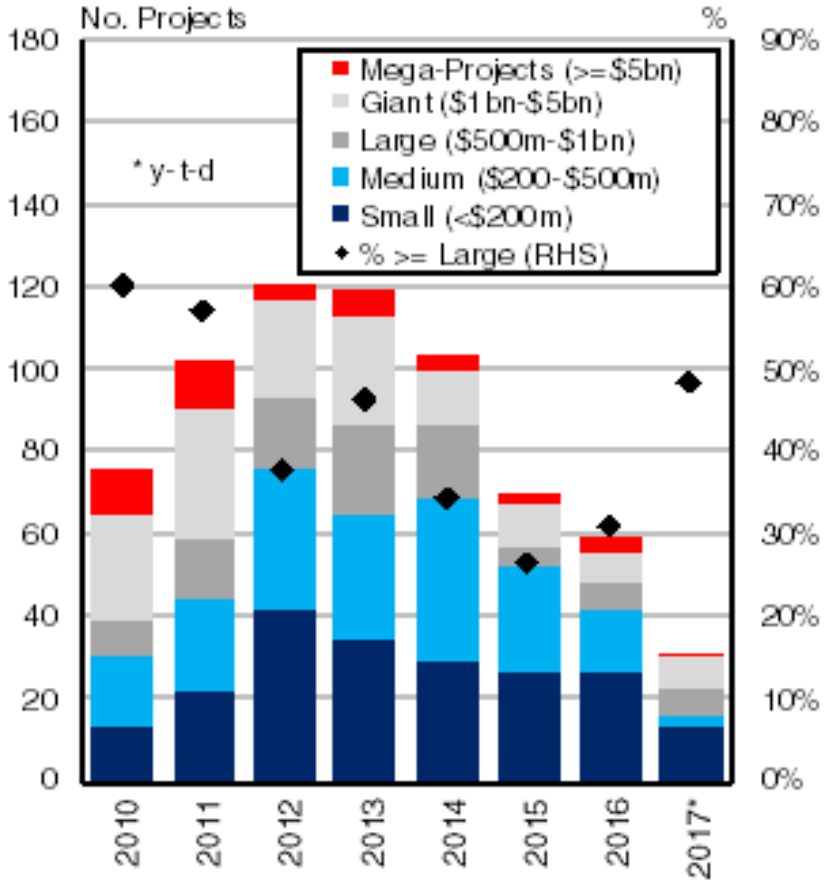


Source: IHS

Is the era of mega-projects over?

Fewer projects, smaller projects…

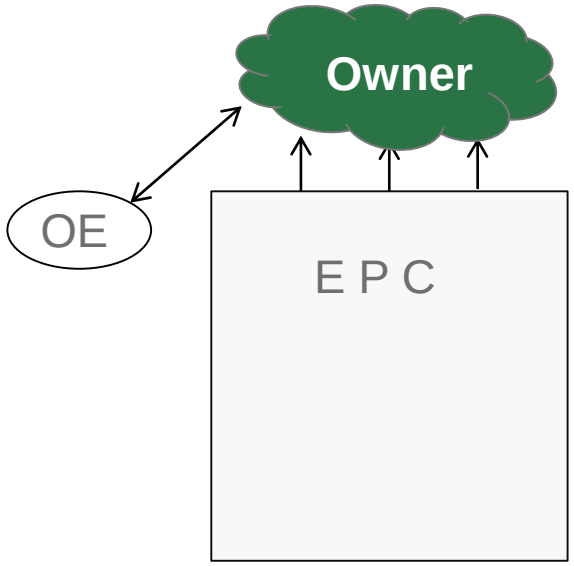
Offshore projects sanctioning profile by Capex size



Source: Clarkson

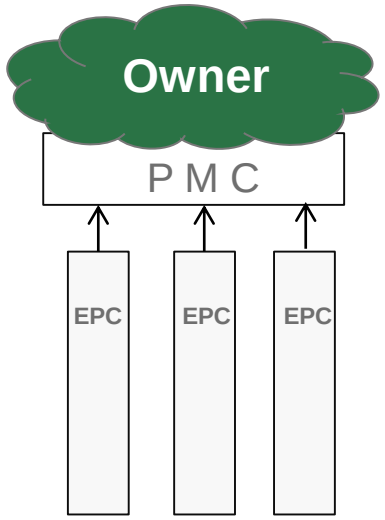
Back-to-the-future: evolving Owners' approach to large project execution

Earlier



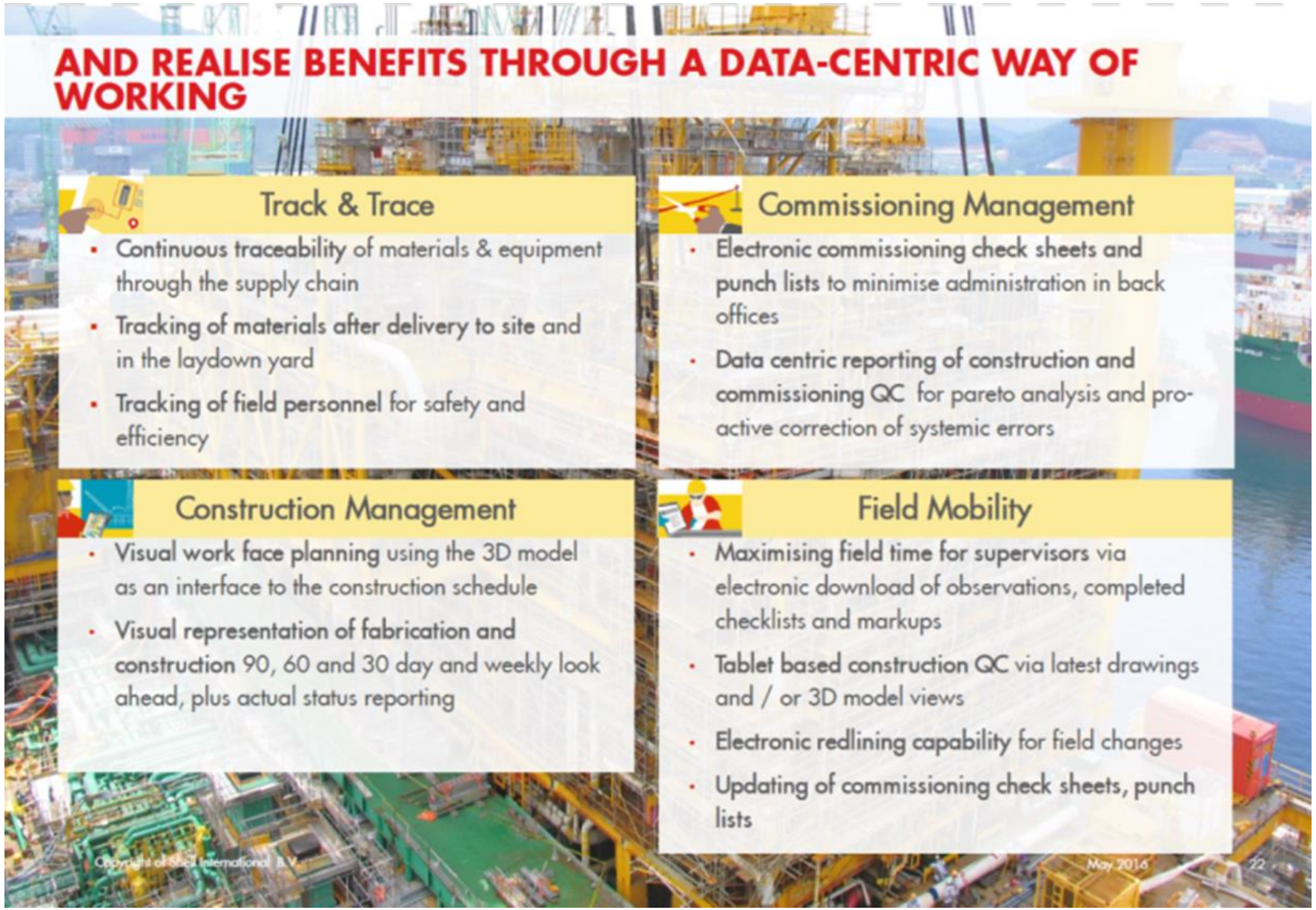
- Large projects
- Huge contracts (up to 5 B€)
- Often single EPC package

Today



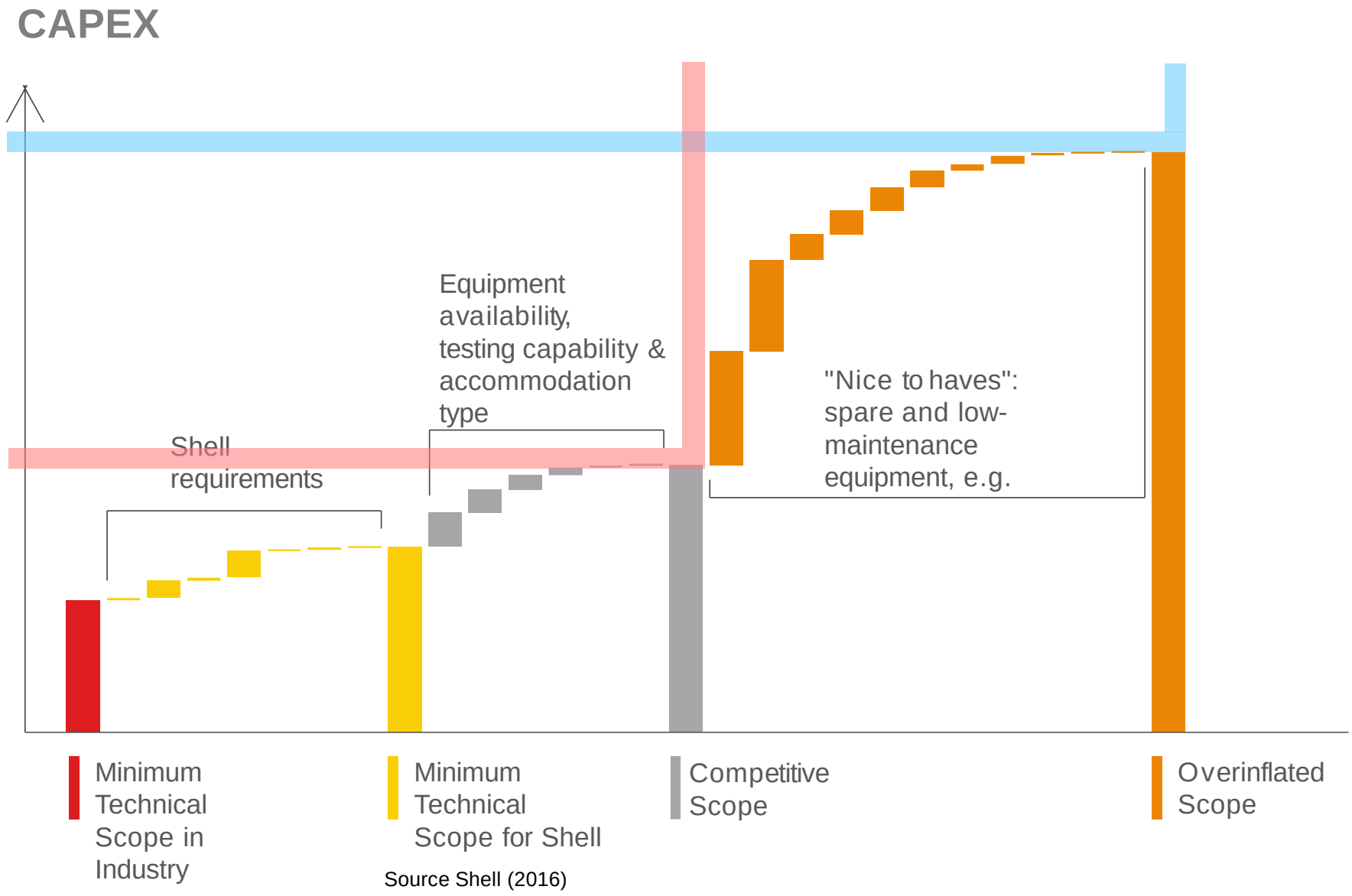
- Smaller projects, smaller contracts (0,5 - 1B€)
- Multiple EPC packages
- Larger Owners' direct involvement (Increasing dis-intermediation of EPC players?)
- More risk transfer to EPC players and suppliers

Data-centric ways of working are becoming the norm – but might lead to new industry business models



End-users now accept design simplification and more standardization

Example: Shell



Source Shell (2016)

Key challenges for the EPC General Contractors and Manufacturers

E&C Industry

- **Reduce costs**, dramatically, and ‘right size’ operations
- **Overhaul supply chains** and mechanisms
  - from “**transactional**” to “**collaborative**” relationships
- Identify and emphasise the fundamental critical factors of **competitive advantage**
- Develop and adopt **new technologies**
  Often a differentiating/winning feature
- **Optimize “Local Content”** and associated strategies
- Enhance **“partnerships”** - even **“mergers”** ???

Need a ‘Low-for-ever’ mindset

The Digital Revolution

BAIN DIGITAL

New ways of coordinating, optimizing and upgrading systems across companies, customers and products

Advanced communications

- Improve comms and provide positional (PNT) assurance
- Leverage photonic crystals and other technologies

Disruptive cloud computing

- More rapid data ramp-up and ramp-down
- Shared computational power

Internet of Things (IoT)

- Digital interconnection of objects (e.g., M2M)
- Sensors, actuators, and distributed control

Autonomy

- Leverage intelligent, flexible robots
- Closer collaboration with human workers

Additive Manufacturing

- Innovative process builds layers of materials
- Decentralizes manufacturing process

Visualization and Augmented Reality

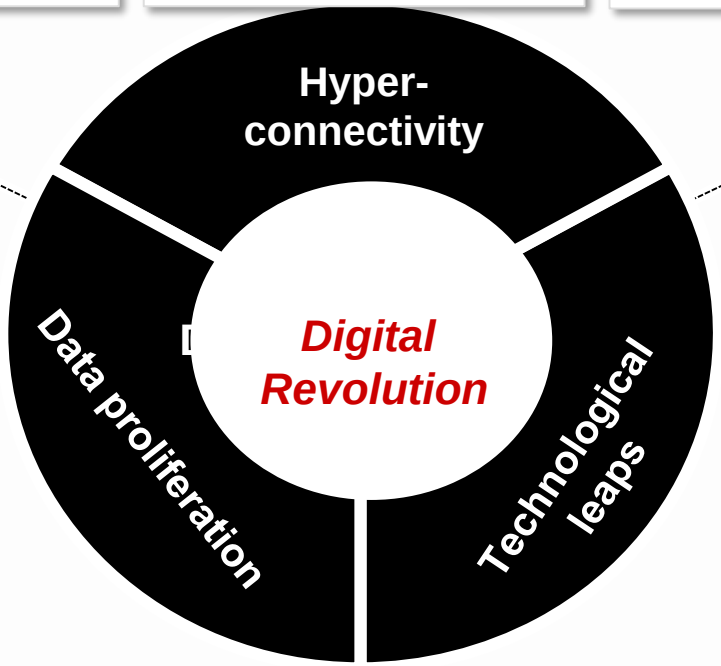
- Simulates physical presences in real or imagined environments
- Augmented reality

Data Science and Advanced Analytics

- Collection & analysis of vast amounts of data
- Visualisation, availability, and storage

Cyber Security/Design for Veracity

- Security measures to guarantee confidentiality, integrity, and availability of data



New data assets being created, collated and structured to enable insights through advanced analytics

Rapid technological advancements with greater computing power and software capabilities

The digital revolution in Oil&Gas industry

BAIN DIGITAL

PLANT DIGITALIZATION

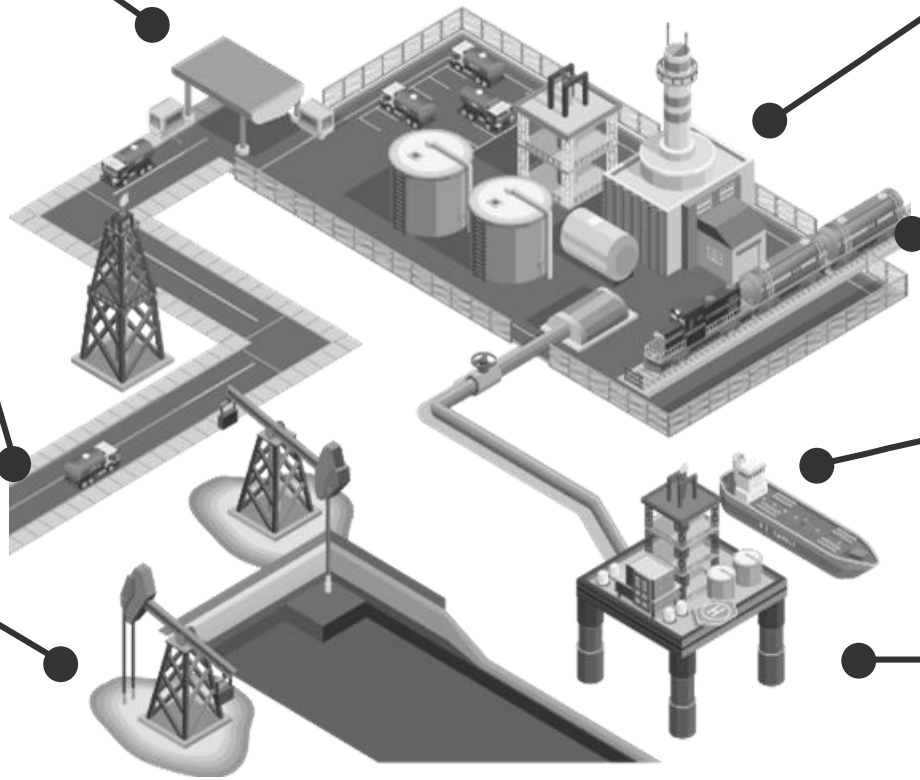
- Advanced analytics for flow simulation and optimization
- Autonomous machinery using IoT and sensors

DIGITAL SUPPLY CHAIN

- Cloud-based logistics and load-sharing platforms
- Digital tools to quickly and accurately determine pricing
- RFID tagging to optimize routes

PREDICTIVE MAINTENANCE

- Sensors, transmitting operational status and performance
- Smart algorithms to optimize maintenance schedules



OIL & GAS EXAMPLE

MRO INVENTORY MANAGEMENT

- Accurate levels of stock
- Unused inventory is sold off before it becomes obsolete

AUTONOMOUS MACHINES

- Machines operating without need for human control
- Robots performing dangerous or difficult tasks

CONNECTIVITY/ DIGITAL PLANNING

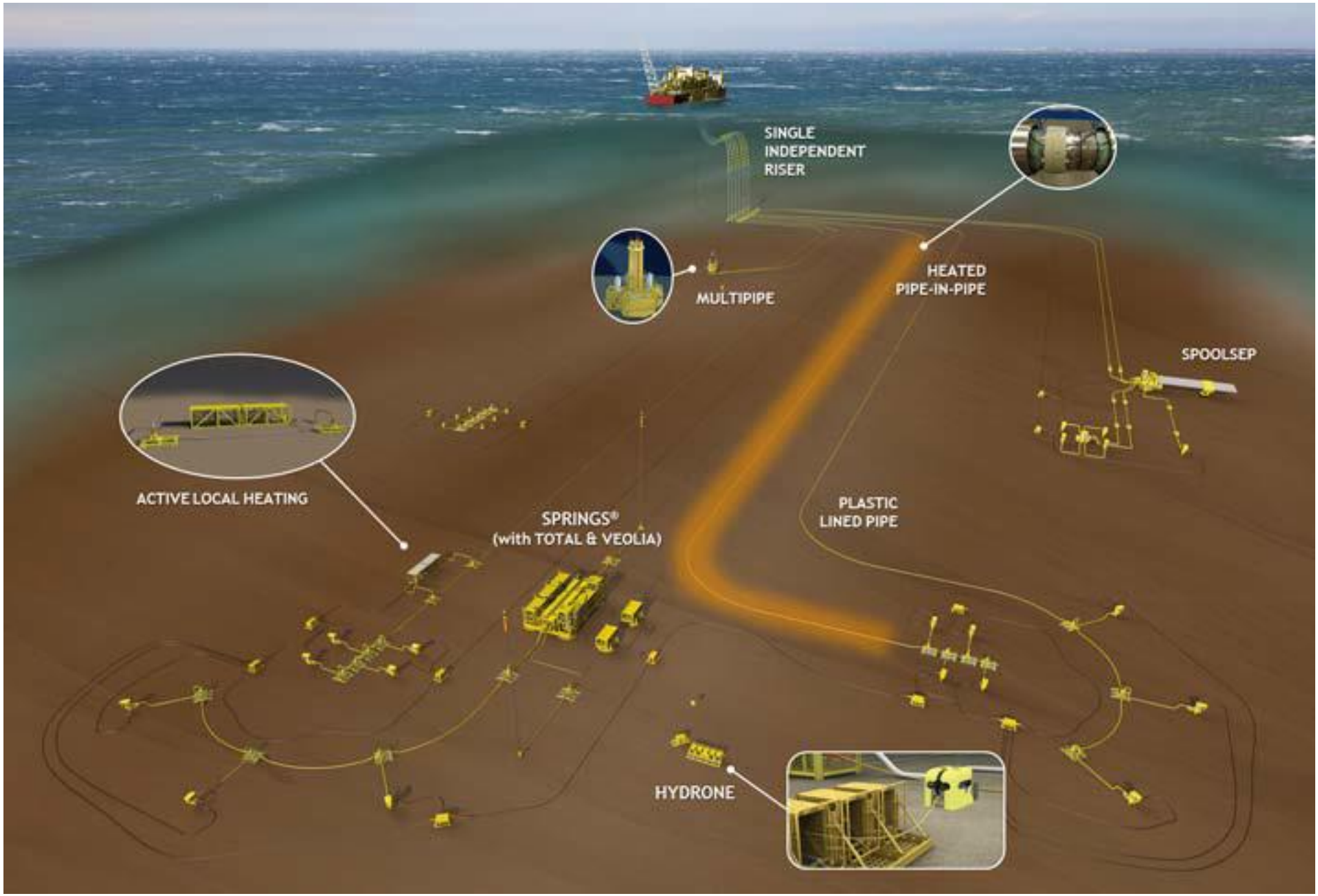
- Virtual reality worker support
- Document management and control
- Digital training
- Connected workers

ADVANCED DRILLING

- Automated drilling
- Real-time drilling analysis

YUMI Robot ABB

New, innovative process systems



Industry consolidation

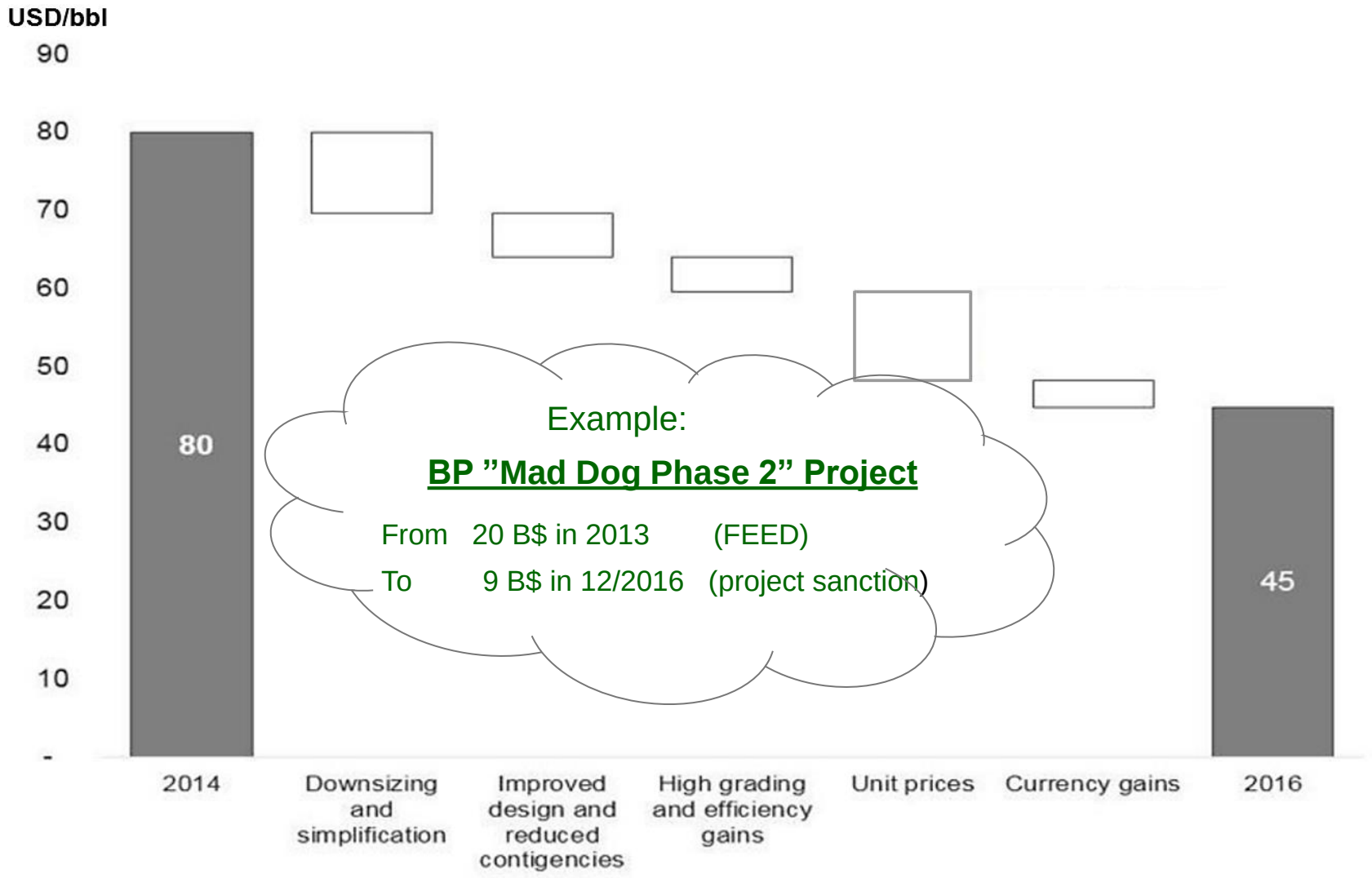
A lesson for us too?

- Reduce **costs**
- Increase **global reach** and **client base**
- Achieve new business **synergies**
- Broaden **portfolio** of **skills**
- '**Spread the bets**' and improve **resilience** at times of great uncertainty

- Schlumberger + Cameron
- Technip + FMC
- GE Oil & Gas + Baker Hughes
- Amec + FW + Wood Group
- Jacobs + CH2MHILL
- Praxair + Linde
- ….

Massive cost reduction: it can be done!

Breakeven improvement of “best-in-class” offshore developments



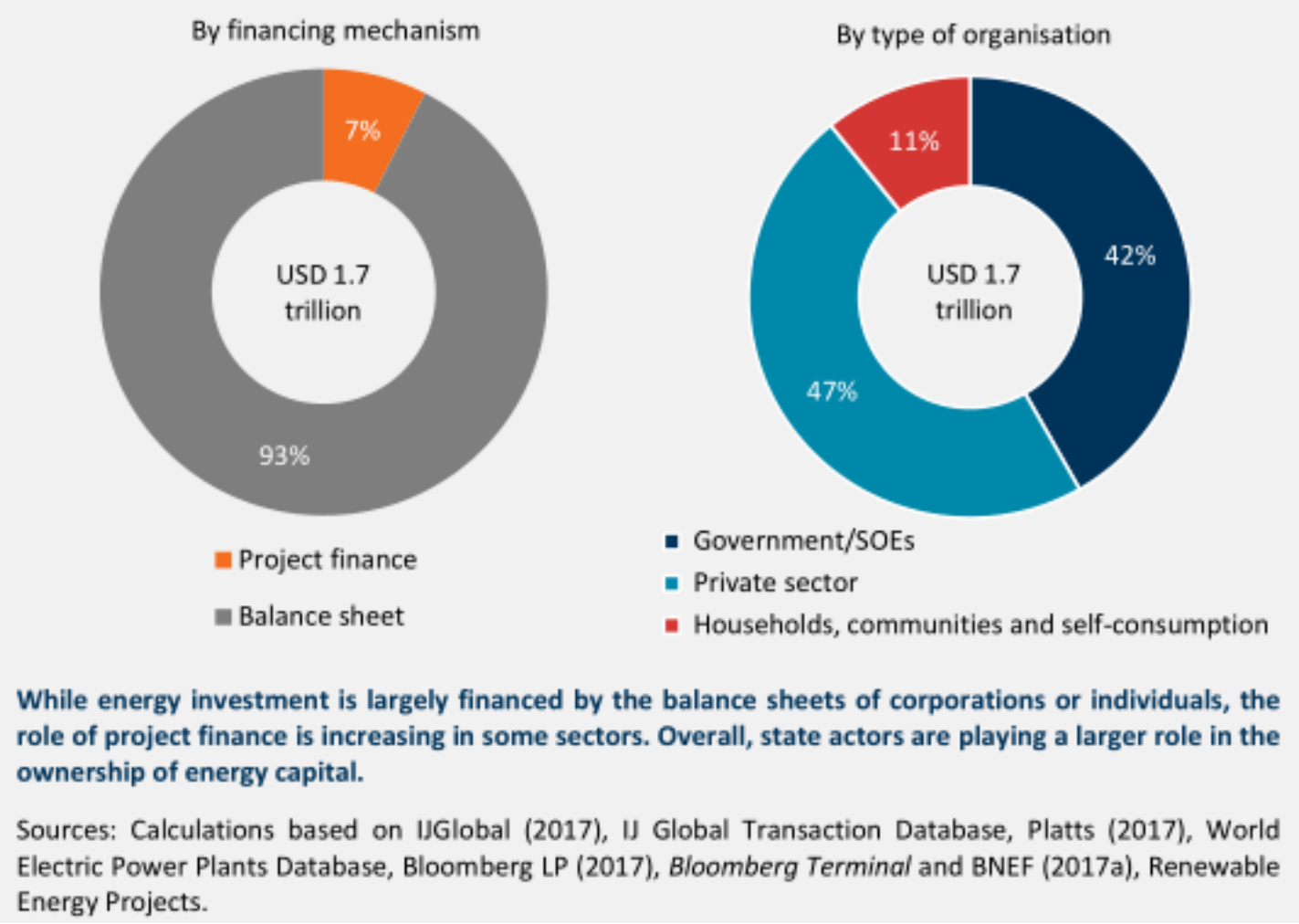
Source: Rystad Energy Research and Analysis

New market niches/services for EPC general contractors

- Diversification into **OPEX**, **services**, **O&M**
- **Brownfield** projects (incl. tie-backs, life extension)
- Large **wind-farms**, offshore
- Offshore platform **decommissioning**
- Enhanced provision of ECA and other **financing**; also BOT, BOO schemes

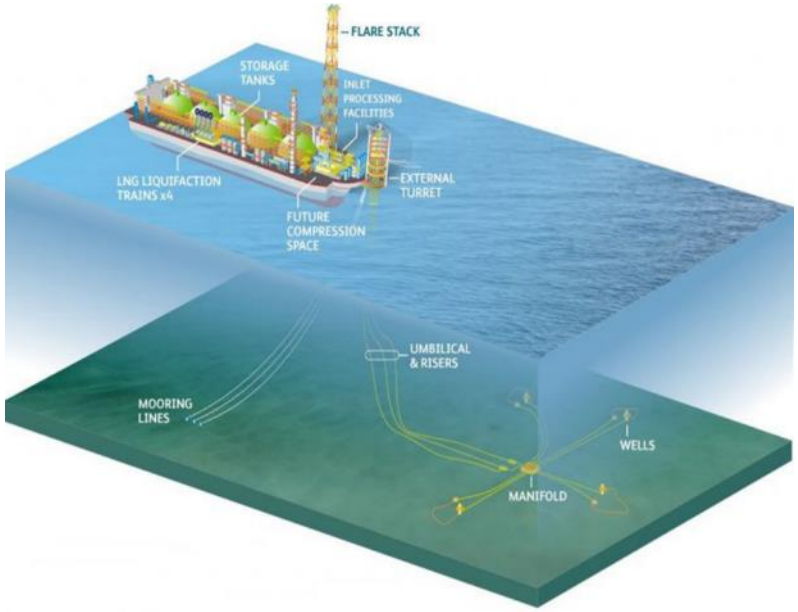
Increasing need for project financing schemes

Even where earlier it was not necessary



Source: (IEA June 2017)

Conclusions - Market Context



- Following oil price stabilization, (very) gradually **returning propensity to invest**
- **Emerging** and **unconventional markets** could offer good opportunities
- **"Lower-for-ever" mindset** needed to keep project costs low and attractive
- Need to develop and adopt
  - **breakthrough technologies,**
  - **new execution approaches,**
  - **more collaborative supply chains**

and focus on **key sources of** real **competitive advantage**

AGENDA

MARKET CONTEXT

OUTLOOK ON INVESTMENTS

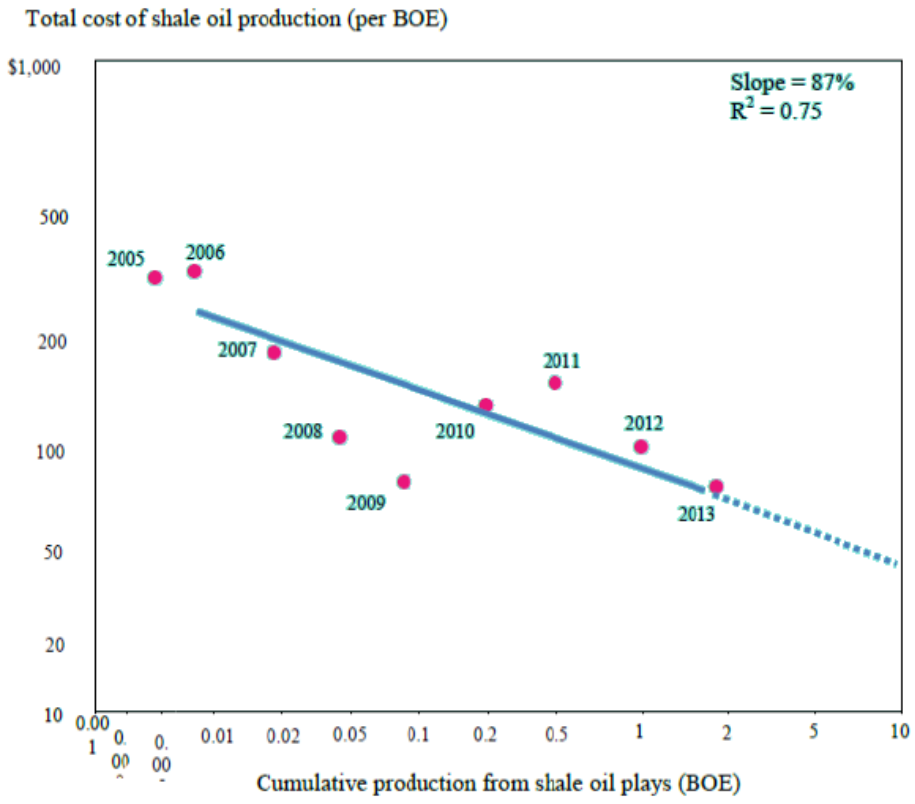
IMPACT ON THE VALUE CHAIN

UPSTREAM OIL&GAS

Tight Oil became the **market balance**: **Innovation & Technology** can change the game

- Oil prices might move up in the short-run, but **shale production can keep a lead on prices over the long-term**
- **Advances in Technology**
  - Horizontal drilling
  - Multi-stage hydraulic fracturing
  - Proppants
  - Data analytics
- The US oil industry has the potential to **adjust (or "swing") output quickly** and significantly in response to oil prices
- Reduced costs of exploration & production based on "fracking" is generating interest for **new projects in China**, willing to minimize its "energy import bill"

Tight oil industry experience curve

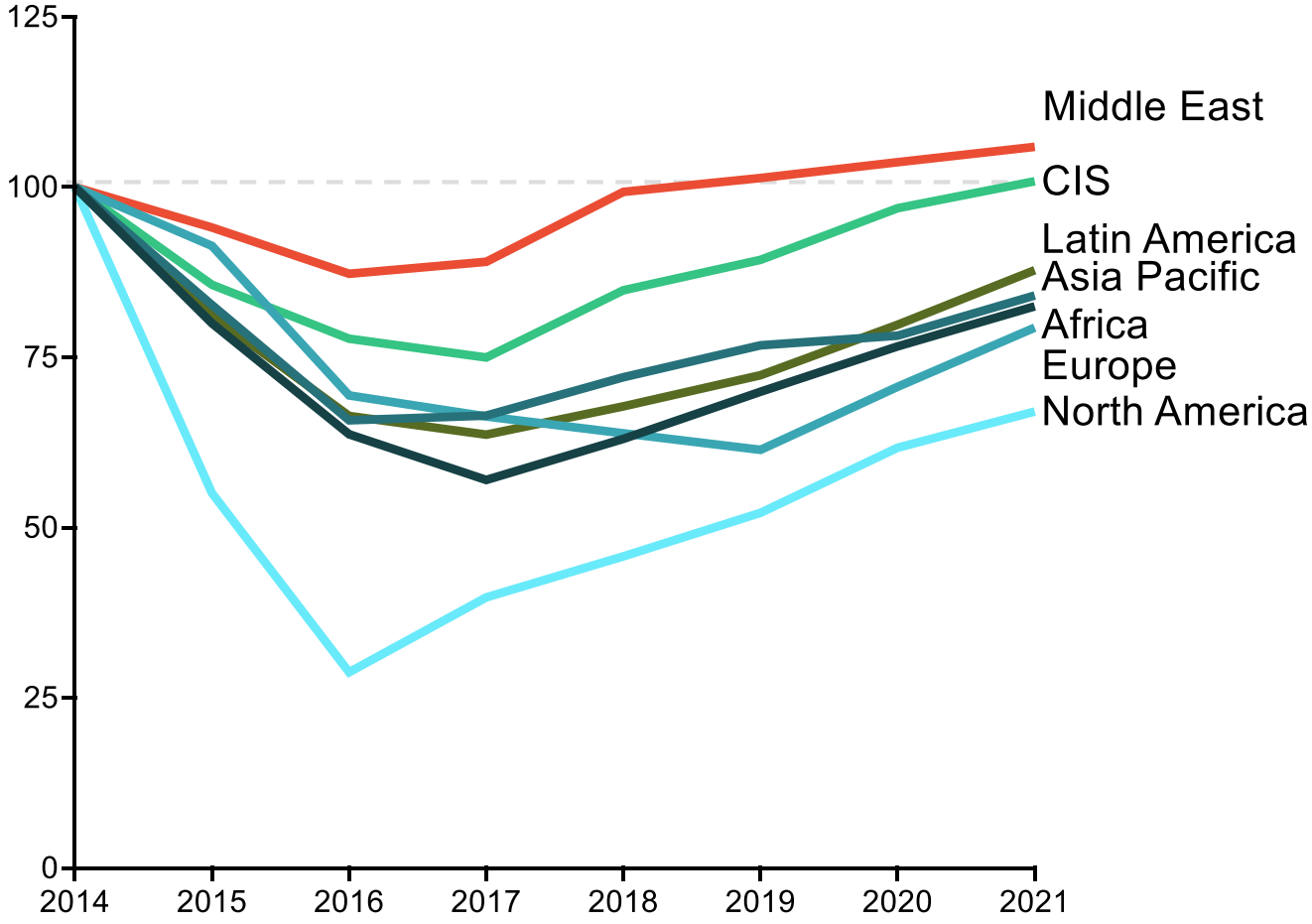


Source: Transmar

Middle East is confirmed as the most **resilient** area during the downturn

- Key drivers:
  - **Quicker return** of the investment
  - Need to **replace depletion** to sustain global market share as producers
  - Access to **capital**
- **~22%** of the value of the new investments launched in Upstream in ’15/’17ytd comes from the Middle East

E&P Capex in conventional Geographic Areas
Spending Variations: 2014 = 100



Note: North America is excluded for the relevance of the unconventional production
Source: elaborations based on IHS data

Growth of **tie-backs, brownfield expansions, EOR**

Major FIDs taken over 1H17

Month	*Country*	*Project*	*Company*	*Cost ($B)*	*Type*
Feb-17	Israel	Leviathan Ph 1A	Noble	3.8	Greenfield
Feb-17	US	Mad Dog 2	BP	9.0	FPU
Feb-17	**US**	**Kaikias Ph 1**	**Shell**	**0.2**	**Tie-back to Ursa**
May-17	**Canada**	**West White Rose**	**Husky**	**1.6**	**Tie-back to SeaRose FPSO**
Jun-17	Mozambique	Coral FLNG	Eni	5.4	Coral development FLNG
Jun-17	**Trinidad**	**Angelin**	**BP**	**0.5**	**Tie-back to Serrette**
Jun-17	India	KG-D6*	BP	6.0	Greenfield
Jun-17	Guyana	Liza Ph 1	Exxon	4.4	FPSO
Jun-17	Norway	Njord	Statoil	1.9	Field Redevelopment
Jun-17	**Norway**	**Bauge**	**Statoil**	**0.5**	**Tie-back to Njord A**

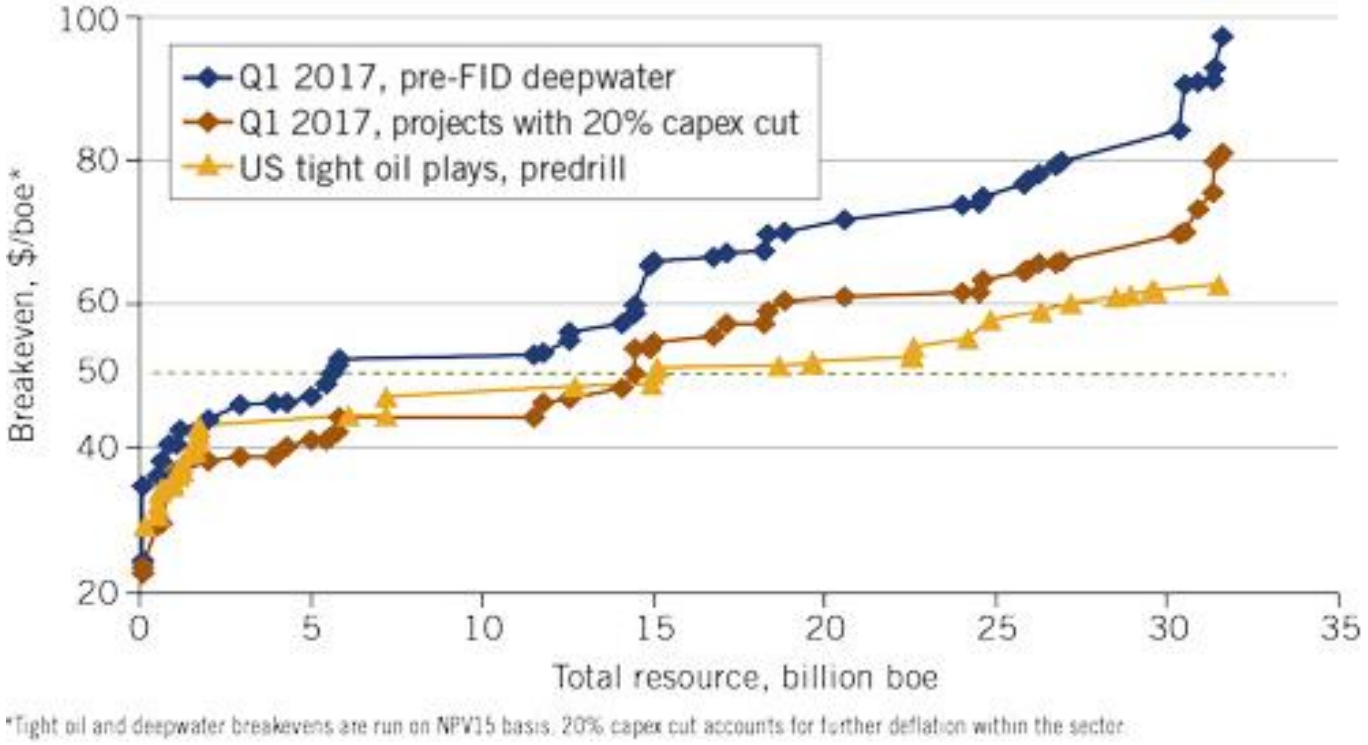
- Focus on **delivery payback in a shorter period of time**
- Significant use of subsea tie-backs to ensure:
  - **minimized new infrastructure cost**
  - **less execution risks**
  - **short lead times**
  - **capital discipline -** smaller tie-back fields more attractive

Source: Business Monitor International, SupplHi Projects Database

Only best in class large **Deepwater** projects survive

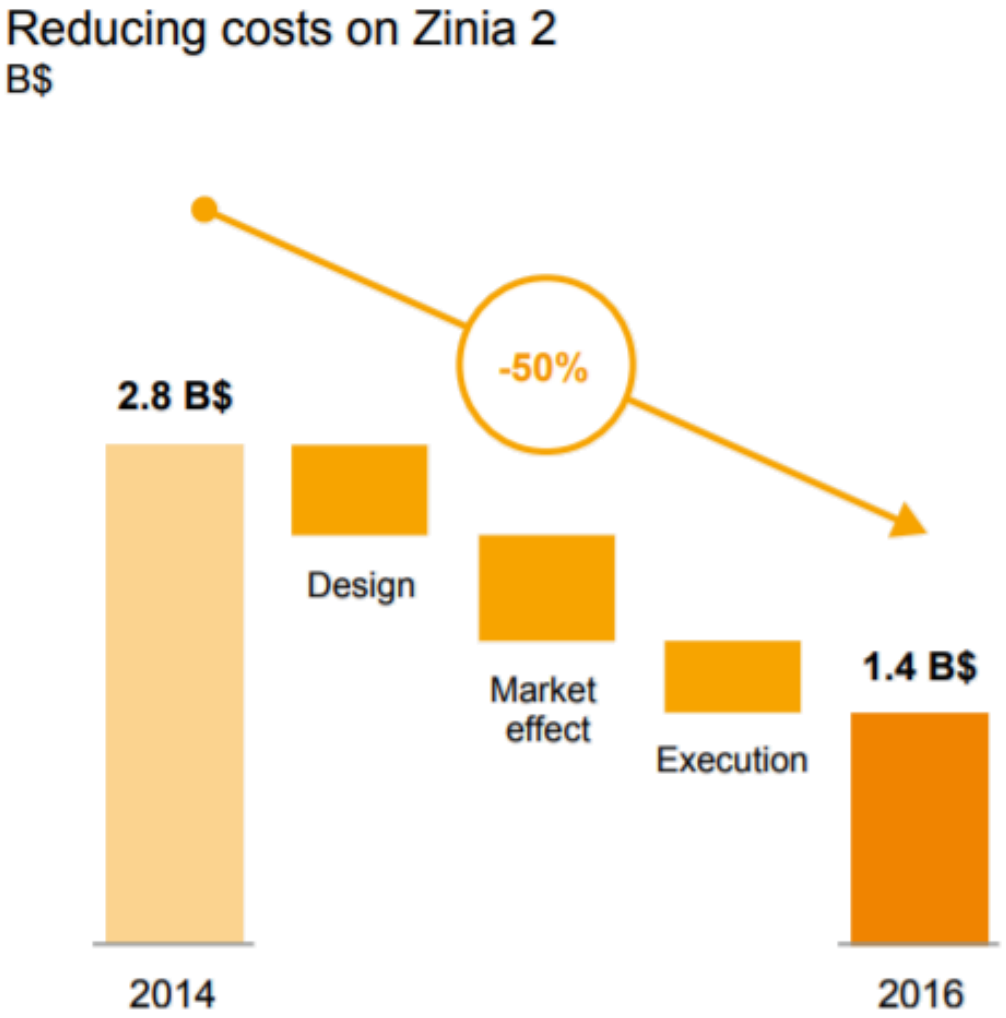
- **Deepwater costs continued to fall in the last years** and breakeven economics get closer to tight oil
- Risk-premium required to make deep-water long-cycle projects attractive: only **projects offering clearly superior economics** (best in class assets) will go ahead

Deepwater Project costs



Source: Oil & Gas Journal based on Wood Mackenzie

Marginal deep offshore fields made profitable



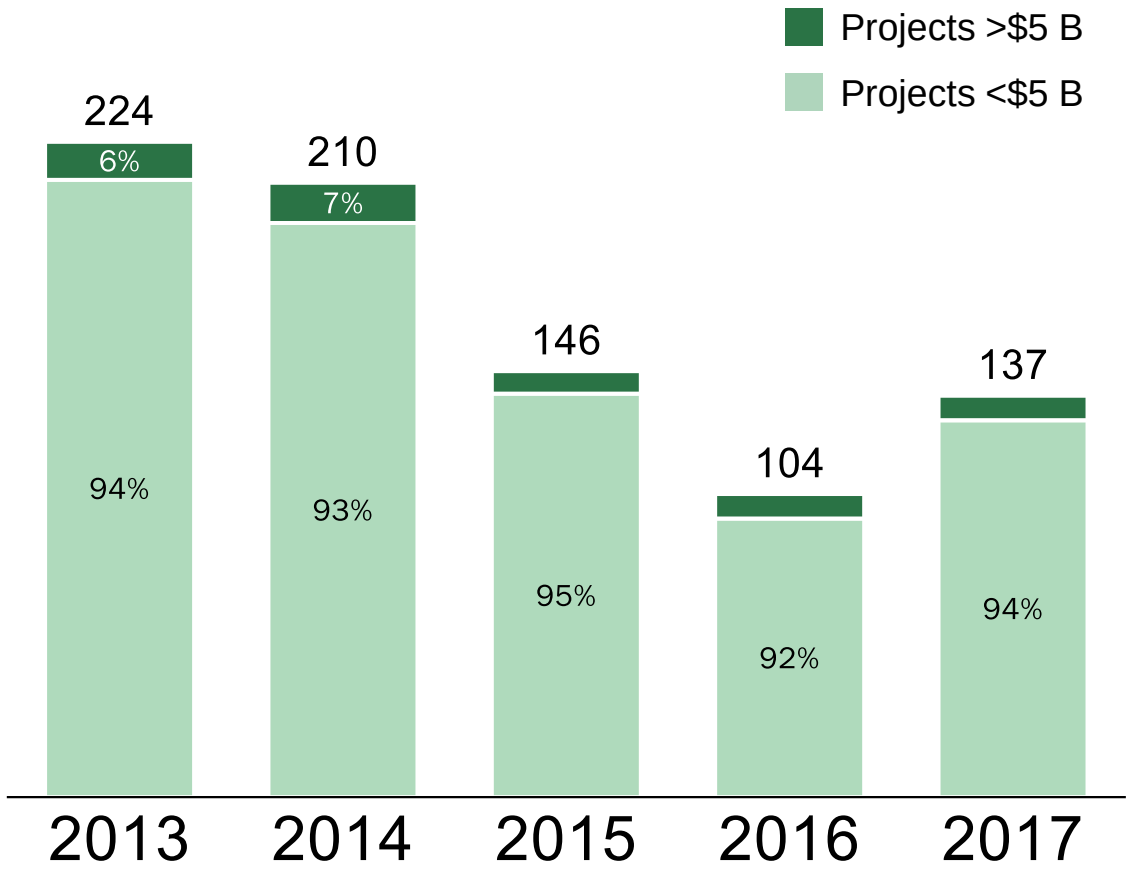
Source: Total

- **Simplifying subsea layout / standardization**
- Taking advantage of market effects through **deflation** and **renegotiation / new tenders**
  - E.g. drilling up to 50%, marine logistics up to 30%, …
- Optimizing **project execution** and drilling
- Improving **fiscal terms** ahead of FID
- **Phased developments**

Is the era of **Upstream Jumbo projects over**?

- **Global FIDs were affected by the low oil price environment**, but are **starting to recover in 2017**
  - New sanctioned fields will bring smaller volumes online than historical projects
- In the last years, the fall in oil price **hit larger projects more than smaller projects**
  - 2017 has been more promising for **larger projects.** However, many of such projects **were conceived pre-downturn** and were going to obtain FID in 2014

Number of new projects awarded in Upstream

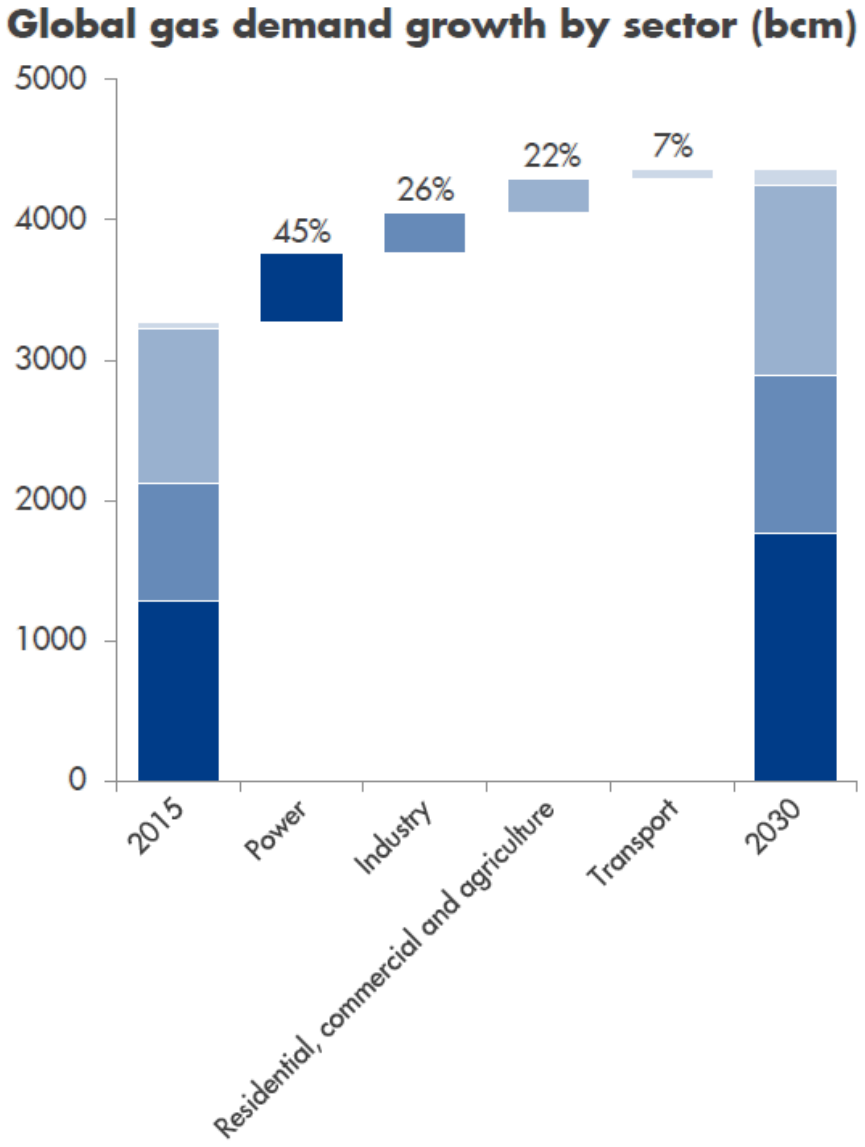


Source: SupplHi Projects Database

MIDSTREAM OIL&GAS

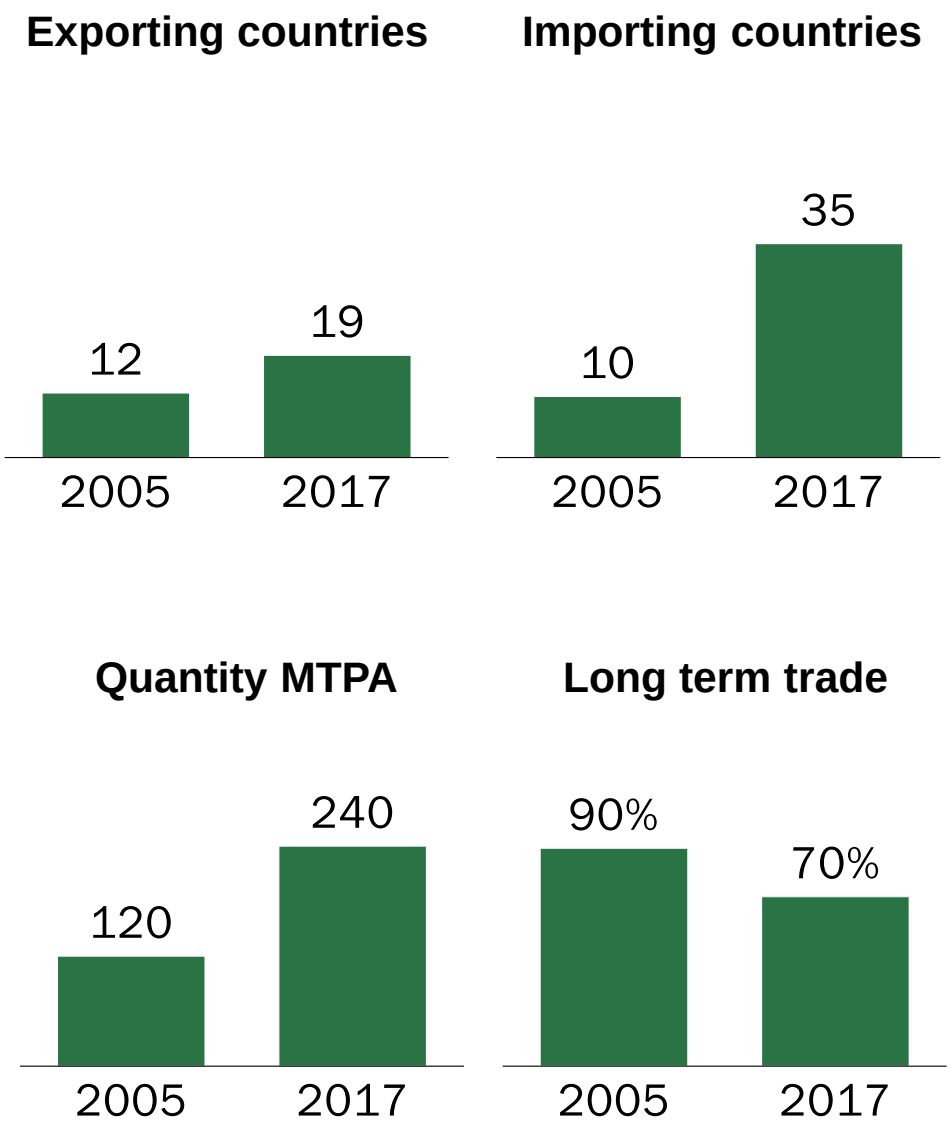
We are in the **Gas Era**

- Clear trend of **increasing gas consumption**, due to:
  - availability of gas to generate **electric power** in several countries (gas used for peak's management – e.g. open cycles with 300/400 starts per year) – renewables require a stabilizer behind
  - new **petrochemical plants** based on gas feed
  - introduction of gas engines also for **marine transportation** (ECA areas and beyond)
  - diffusion of the **Small LNG** and use for **land transportation**



Source: Shell interpretation of Wood Mackenzie Q4 2016 data

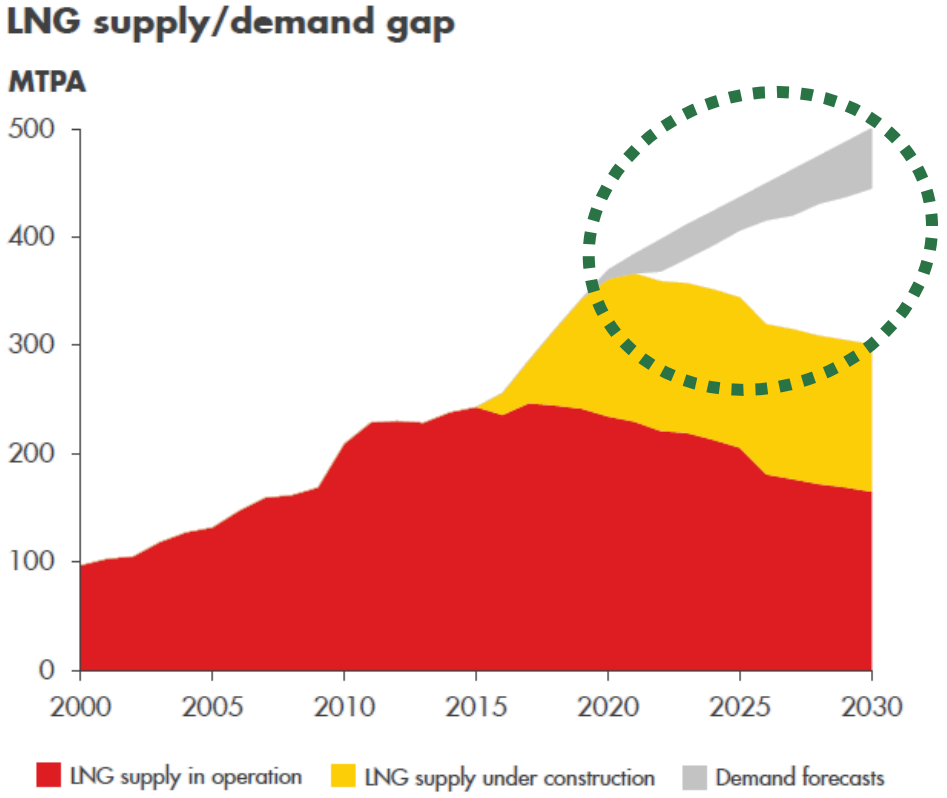
Gas means **LNG**



- The LNG market has evolved significantly in terms of both **complexity** and **sophistication** over the **last 10 years**
  - **doubled in size**
  - moved from a market dominated by long-term trade with strict destination clauses to one also strongly influenced by **spot sales**, tenders, and gas benchmark-linked trade
  - increase in **re-trades and destination swaps**
- **Challenges in funding** large **pipelines** projects: geopolitics, “transportation fees“ for the crossed countries, definition of long-term supply contracts, …

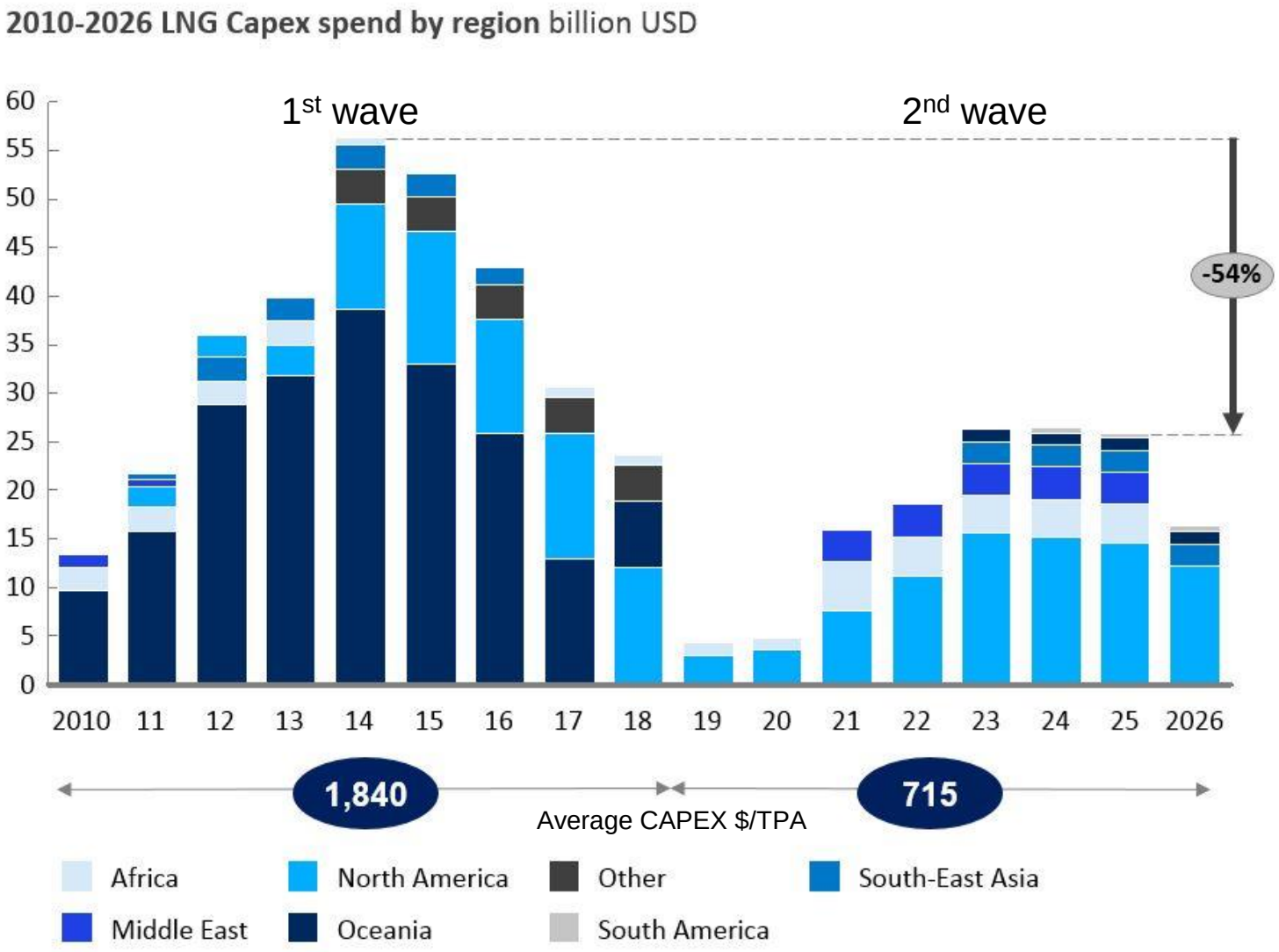
LNG Liquefaction perceived **oversupply** is still with us

- "***1 train of LNG every 8 weeks***" till 2020
  - **New FIDs required to meet demand growth after 2020**
  - **rivalry between producers** (Russia, USA, Qatar,…) is accelerating some planned investments
- **ON/OFF market**: the launch of a new project "kills" other 2/3 prospects that are competing
- **North America LNG has a different business model** compared to traditional large LNG plants
  - Large projects in Australia were integrated with large Upstream developments
  - North American "pure" LNG mid-size projects with **financial investors**



Source: Shell

The overall LNG Liquefaction CAPEX is expected to **halve in the next decade**

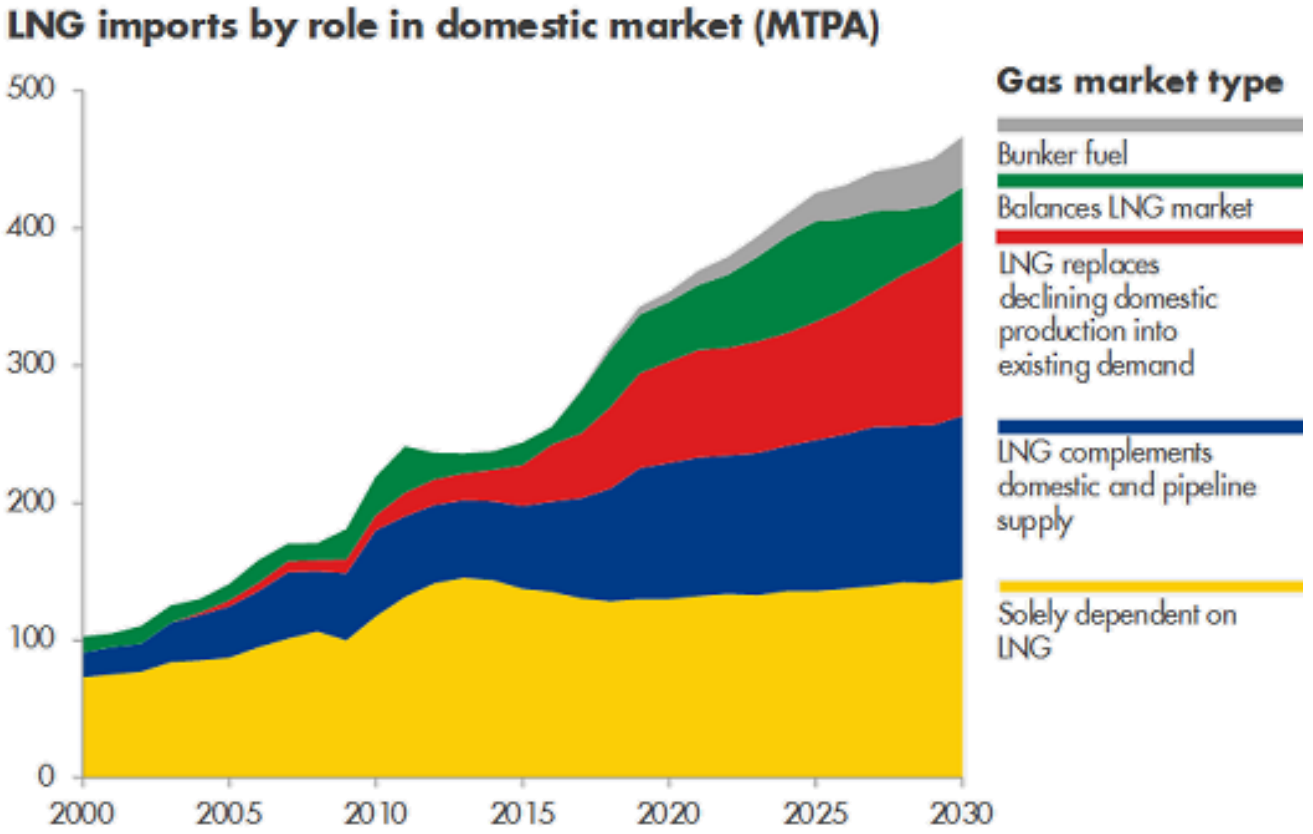


- **Fewer LNG projects will be built** to rebalance the market in 2030
- Most future development will be in the US, where far **lower construction costs** are anticipated, compared to Australia (which dominated Wave1)
- Emerging **mid-scale onshore LNG** trains as **expansion projects for mature sites**

Source: McKinsey Energy Insights' Global Gas Model, Rystad Energy

Changing driver of LNG **Regasification** demand growth

- The **lower price of LNG** will favor the **“new entry” of developing countries** in the LNG regasification terminals
- Markets for gas utilization have been shown to be growing particularly in **Asia**
  - China, Korea, as traditional markets
  - Pakistan, Bangladesh, Philippines as new sources of demand
- **Bunker fuel as new demand**



Source: Shell

FLNG is a “proven” but marginal trend

FLNG projects, completed and approved /under development

Project	Country	Operator	Contractors	Status	MTPA LNG	Start up year
Caribbean FLNG	Colombia	Exmar	Wison Engineering / Black & Veatch	Completed	0.5	2016
Kanowit PFLNG 1	Malaysia	Petronas	TechnipFMC / DSME	Completed	1.2	2016
Prelude FLNG	Australia	Shell	TechnipFMC / Samsung Engineering	Completed	3.6	2017
Cameroon LNG	Cameroon	SNH	Golar LNG / Keppel / Black & Veatch	EPCI Ongoing	1.2	2017
Fortuna FLNG	Equatorial Guinea	Ophir Energy	Golar LNG / Keppel / Black & Veatch	EPCI Ongoing	2.2	2018
Kanowit PFLNG, Phase 2	Malaysia	Petronas	JGC / SHI	EPCI Ongoing	1.5	2019
Lloyds Energy Near Shore FLNG	Russia	Lloyds Energy	KBR /DSME	EPCI Ongoing	2.5	2020
Coral South FLNG	Mozambique	Eni	TechnipFMC / JGC / SHI	Recently Awarded	3.4	2020

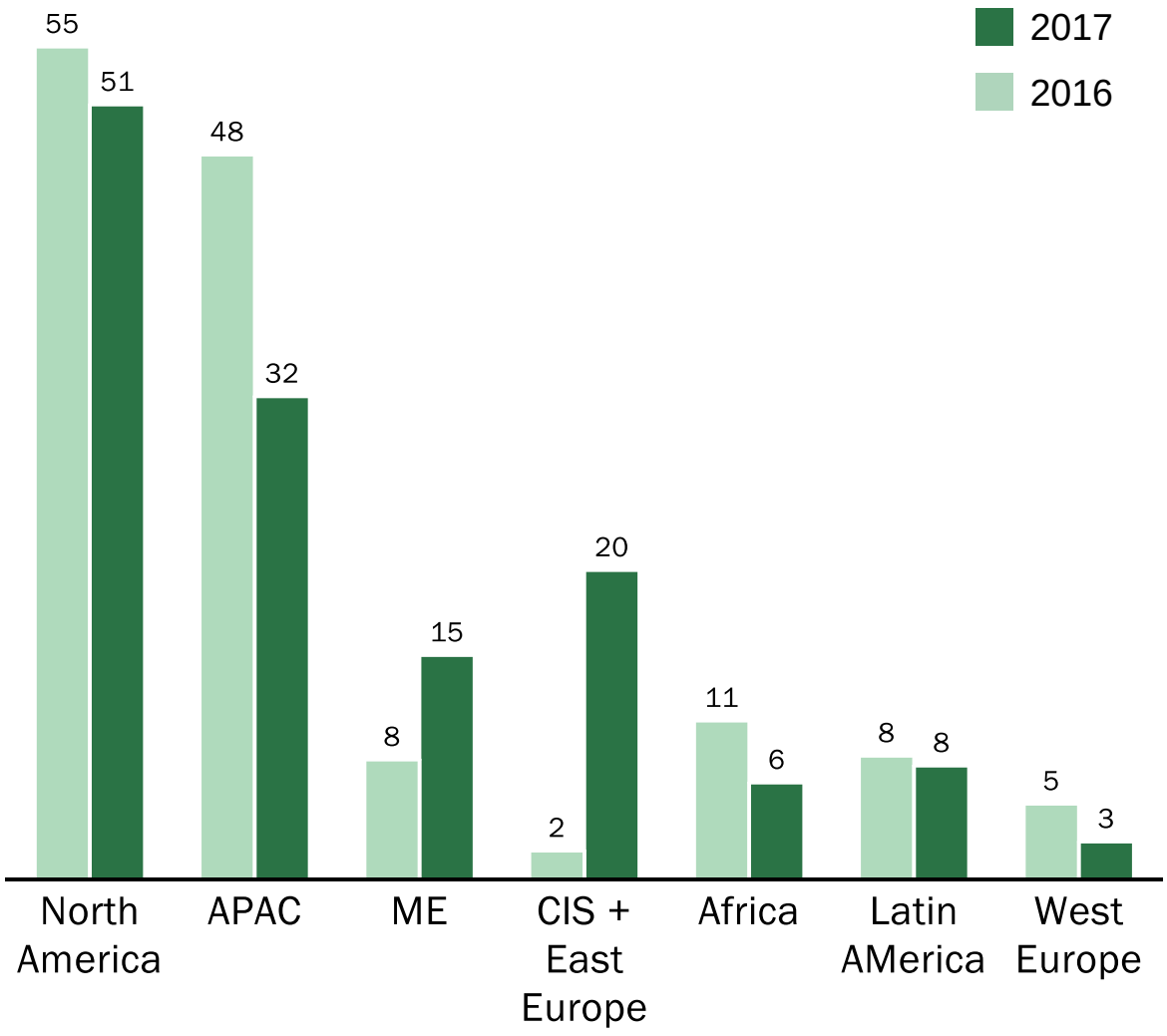
- FLNG is a "proven" **viable alternative for monetization of relatively small quantities of associated gas** that cannot be flared or reinjected
  - **large capacity FLNG**
    - there are some **prospects emerging**
    - several companies are looking at new solutions to **reduce the unit cost of delivered LNG**, which is a condition for these projects to go ahead

Source: SupplHi Projects Database

North America **Onshore Pipelines** still predominant, followed by **APAC; strong increase in CIS**

- Major **pipeline construction project delays** are being seen in the **US** and **Canada**
- Pipelines in **Mexico** still have a positive outlook given the 75% increase in demand for natural gas over the next 15 years as Mexico's economy continues growing and the country switches to natural gas-fired power generation

Planned and Under Construction Onshore Pipelines, Thousands km

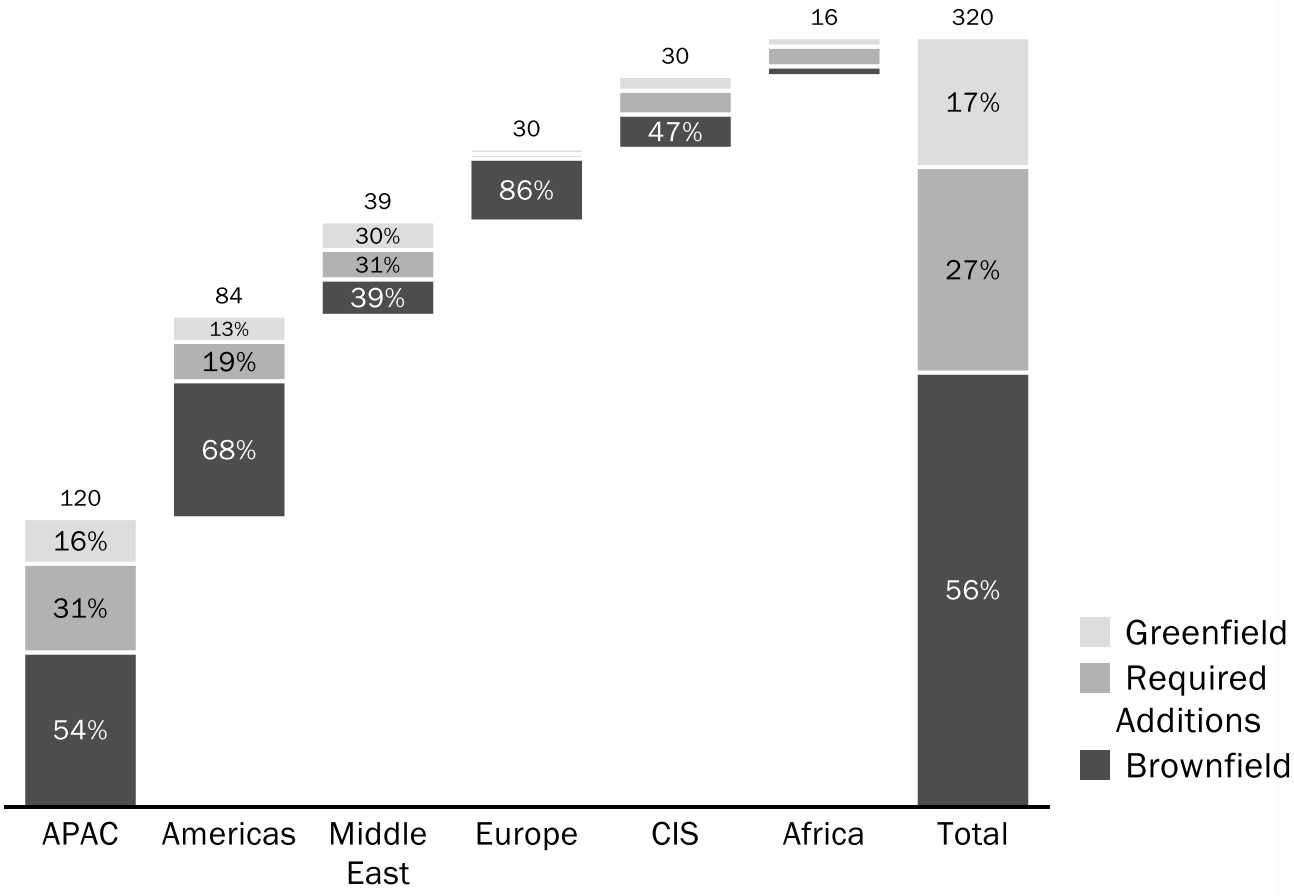


Source: P&GJ's 2016 Worldwide Construction Report, clippings

DOWNSTREAM OIL&GAS

$320 Billion in global refining investments through 2020, **mainly brownfield**

Expected CAPEX in Refining, 2015-2020, Billion USD



- Opportunities in **North America** driven by crude slate changes and environmental regulations
- **APAC and ME** are expected to deliver ~70% of total distillation capacity increase
- **Europe** has led the way in rationalizations
- Additional CAPEX from **clean fuels upgrades to old, "dirty" assets**
- Potential upside from **MARPOL** (2020 or 2025…?) for **residue conversion and refinery upgrades**

Notes: "Greenfield" projects are new units for increase of distillation capacity; "Required Additions" are new conversion, desulphurization and octane units in existing plants; "Brownfield" are refurbishments / revamping / replacements / projects of existing units.
Source: analysis on OPEC World Oil Outlook, 2015

Focus on **Refurbishing** & **Revamping** projects

CLEAN FUELS LEGISLATIONS

- **Clean Fuels legislation** is a major driver everywhere:
  - Less emissions, more stringent product quality
  - More stringent **Marine Fuel Oil specifications (MARPOL)** will require more investments in bottom-of-the-barrel processing
  - Emphasis on **conversion and residue upgrading, desulphurization and octane units**

LOW QUALITY OF CRUDE OIL

- Heavier and more sour oils also require less complex refineries to invest in **conversion units** to stay in the game
- On the contrary, the **light crude oils that come from the US Shale** can cause**:**
  - **West African** producers to displace heavier crudes in the Asian markets
  - To keep **low complexity capacity in the market increasing supply** from refineries that should have been closed

NEW CONFIGURATIONS

- New refinery configurations to **improve product quality and margins**
  - Availability of **cheap gas** to influence future refinery configurations
- **Flexibility for broader crude choice,** declining residual fuel oil markets
- **Ongoing switch from Diesel to Gasoline** (the export refineries are building units to export Euro 5 and Euro 6 to Europe)

EU Regulations are setting the pace and getting tougher

- **Euro 6 emission standards** in place since late 2014 for diesel and gasoline (Sulphur < 10ppm)
- **Sulphur Emission Control Areas** (SECA) expanding in EU sea: sulphur content limited to 1000 ppm (vs 3500 ppm in other areas)
- The **Refining BREF** issued by the **Industrial Emission Directive (IED)** sets maximum emission levels for solid and gases in refineries that will be costly to implement, especially for new and modernized capacity
- The **Renewable Energy Directive (RED)** mandated that at least 10% of all energy in road transport fuels be produced from renewable resources by 2020

FUEL SPECS TO LOWER EMISSIONS

REFINERY HSE REQUIREMENT

USE OF BIOFUELS

Envisioning the "**Refinery of the Future**"

FOCUS ON THREE PRIMARY OPERATIONAL GOALS

AGILITY

Quickly switch between fuels and petrochemicals to take advantage of market demand and opportunities

RELIABILITY

Top-performing refineries will operate with virtually **no downtime**

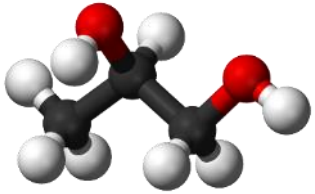
SHARED DIGITAL INTELLIGENCE

Automated and simplified processes, enabling expertise and **decision-making to be shared across multiple facilities**

Petrochemical industry is **changing fundamental paradigms**

New Investments driven by low feedstock geographies

- The “shale era” and shifting OPEC policy have added more uncertainty to the energy forecast
- The primary shift in the coming years is **from naphtha to ethane** driven by the wave of North American crackers



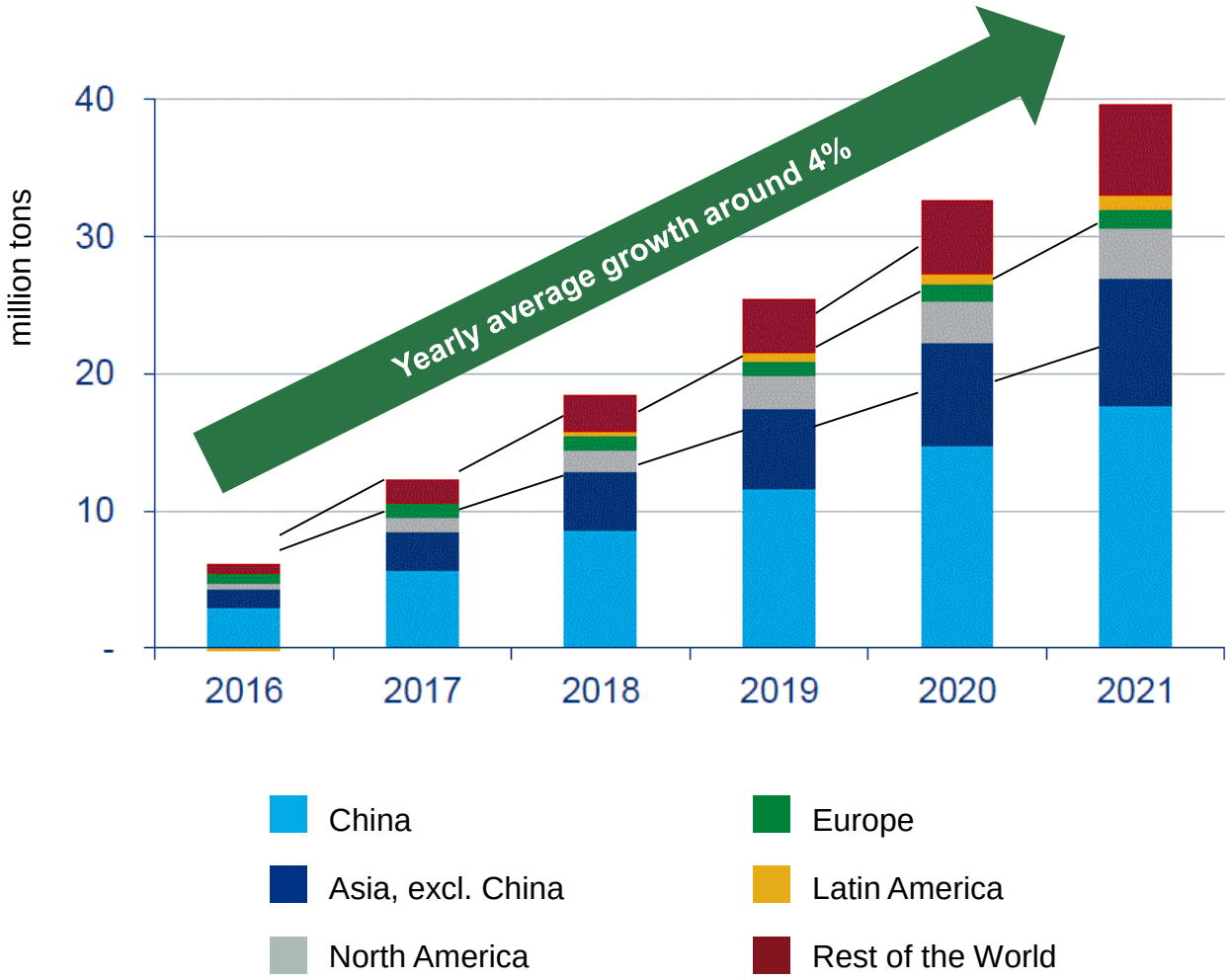
Evolving technologies

- **“On-purpose” technologies** (i.e. PDH) offer competitive alternative to refinery and Steam Cracking
- **“Disruptive” technologies** (i.e. Gas-to-Olefins) still **to be proven**
- **Bio-PetChem**

China

- **Coal Chemicals** continue growing, MTO and PDH struggling
- Still growing market, but **continues significant imports for chemicals and plastics**

Cumulative **Polyolefins' demand** growth relies on rising incomes in Asia, particularly **China**

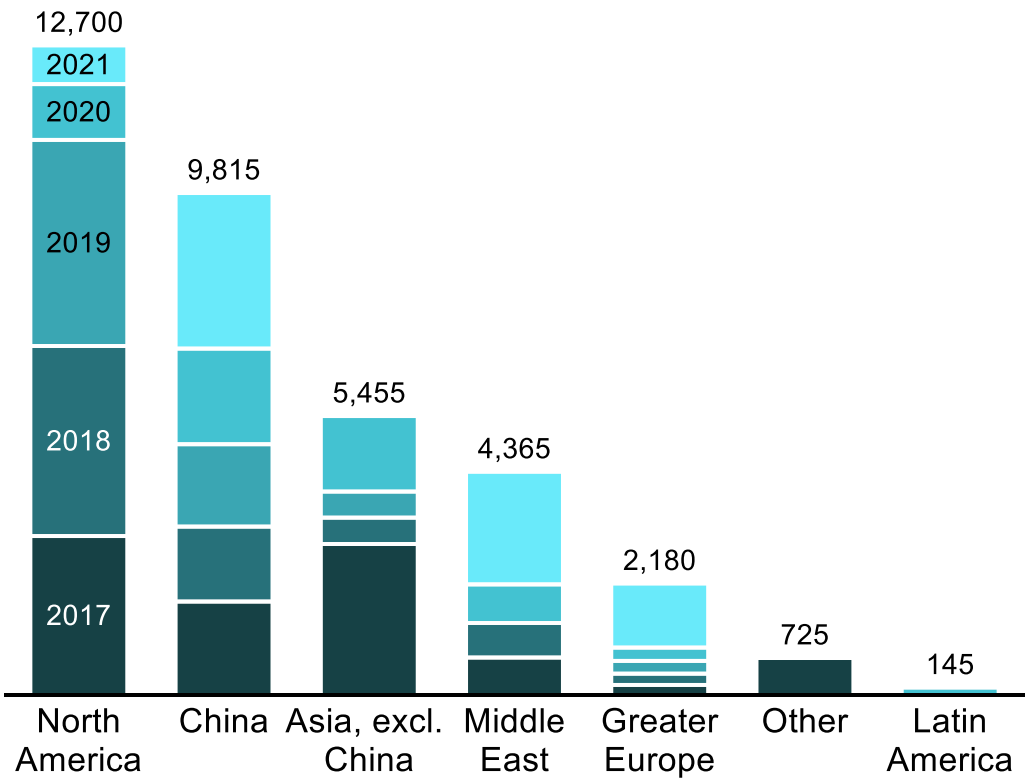


- Countries with **large populations and rapidly expanding economies**, such as **China**, **India** and **Indonesia**, have the biggest future growth potential in Polyolefins
  - e.g. India currently consumes ~4 kg of PE for person, expected to increase significantly during the next 25 years to ~13 kg per person
- PE producers in **NA** and the **ME** continue to benefit from their **advantaged ethane feedstock cost position**

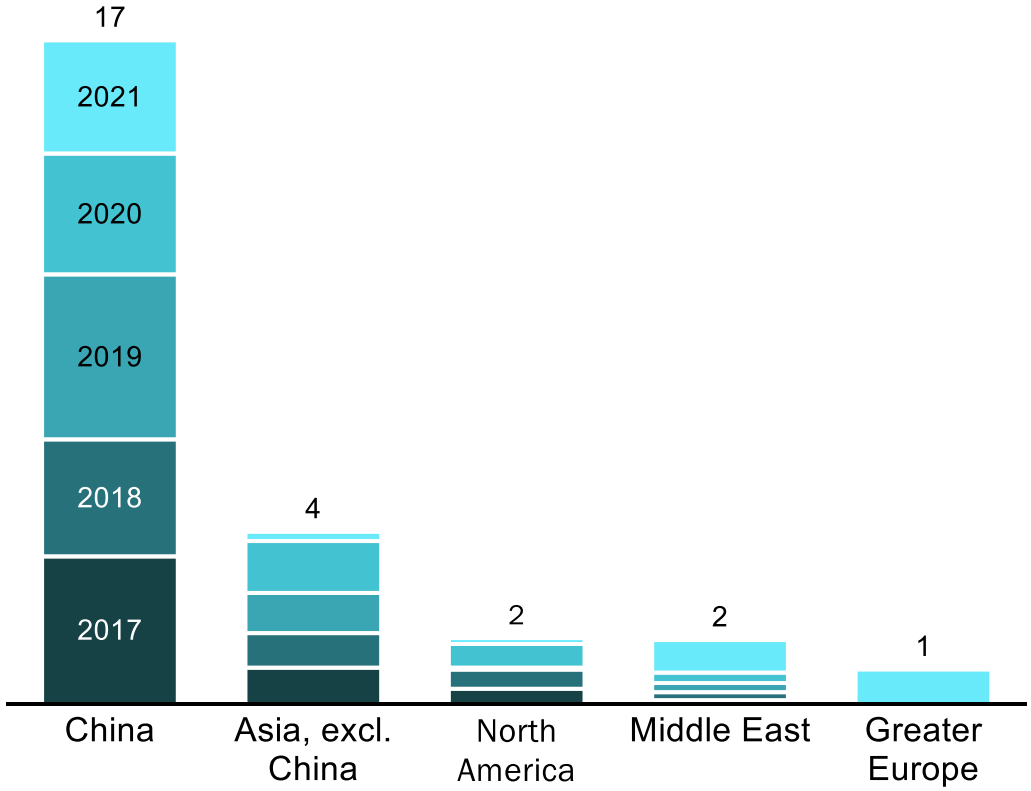
Source: IHS Markit, PCI Wood Mackenzie Long-Term Polyethylene Service

North America and China are the key regions for **PetChem additions** over the coming years

Ethylene Capacity Additions, thousand metric tons



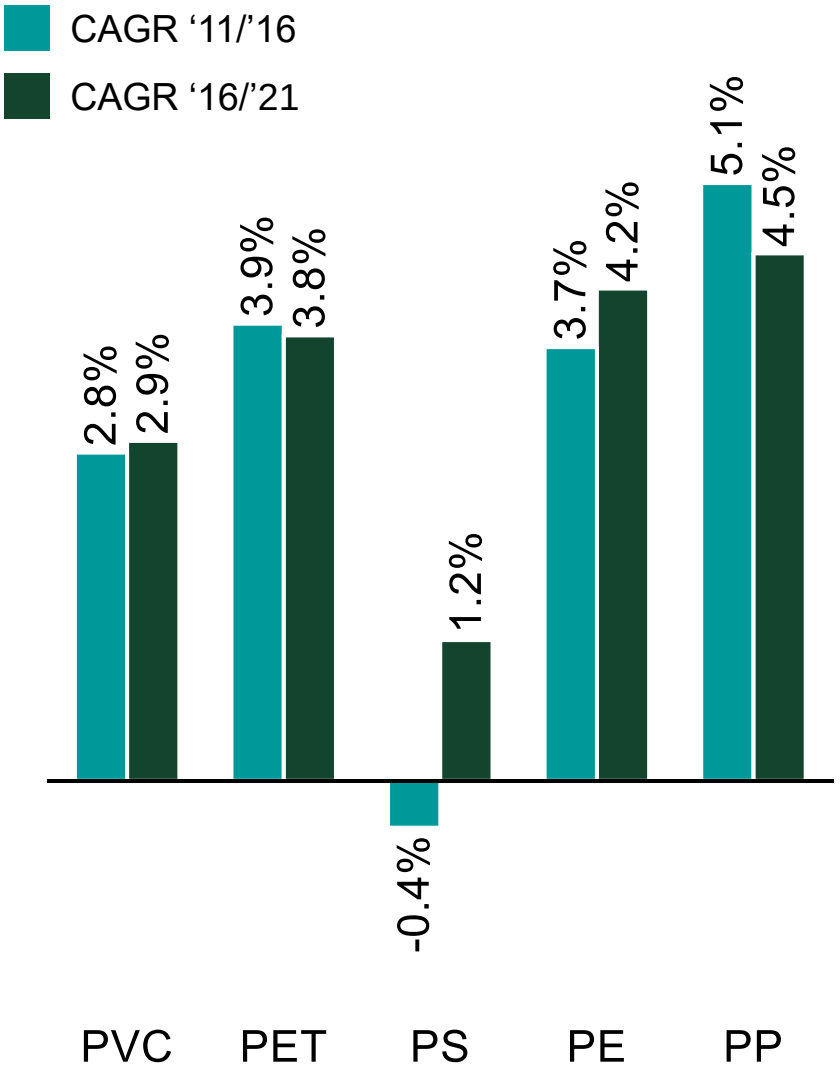
Propylene Capacity Additions, million metric tons



Propane DeHydrogenation (PDH) becomes a **key technology** for supplying propylene, often relying on imported propane

Source: PCI Wood Mackenzie

Global **Polyethylene (PE)** demand will remain **healthy**

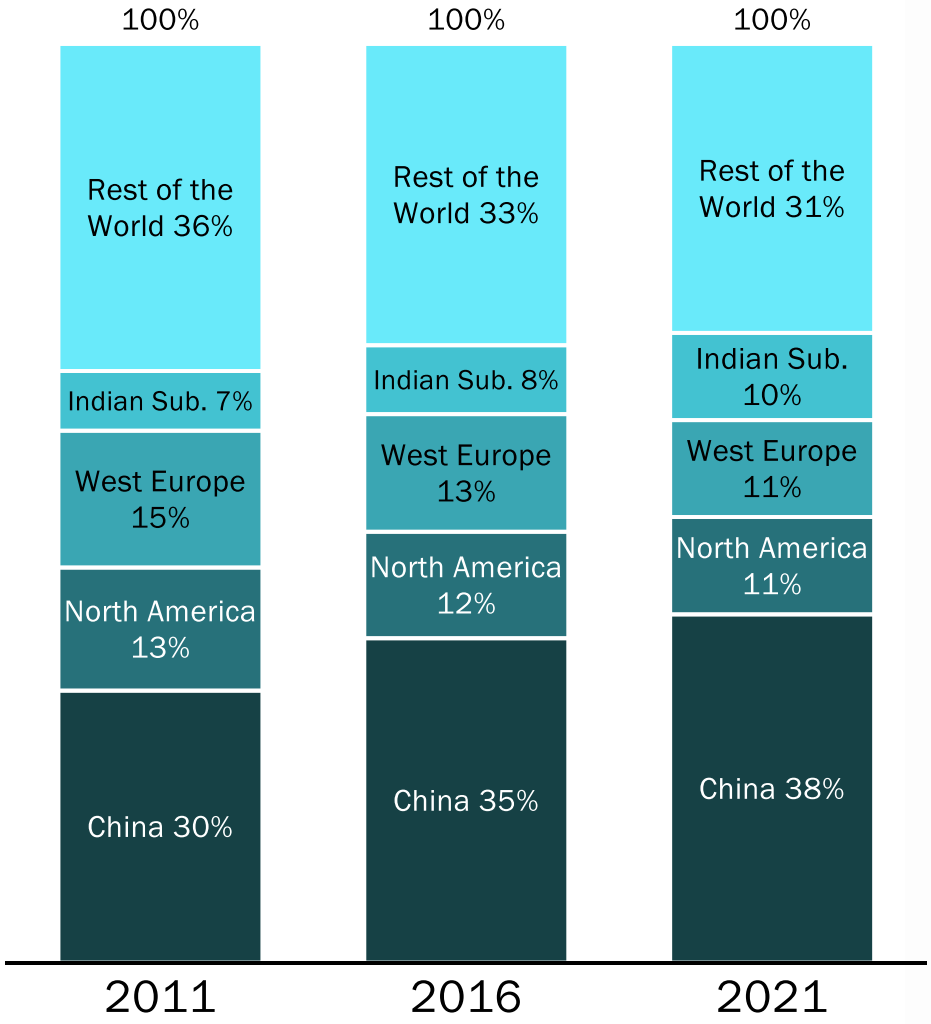


- Global PE capacity will grow by about 30% in the period 2015-2021
  - **most of that new capacity will be located in North America, China, and Middle East**
- It is expected that **global PE demand** will remain healthy with an estimated growth rate of 4.2 % led by LLDPE and followed by HDPE and LDPE respectively
  - Continued strong demand growth in **China**
  - More moderate growth is anticipated in the more developed economies as we have **West Europe and N. America** growing at 1.2 % AAGR and 2.5% respectively

Source: IHS Markit

Polypropylene (PP) Chinese demand is growing to 38% of global demand by 2021

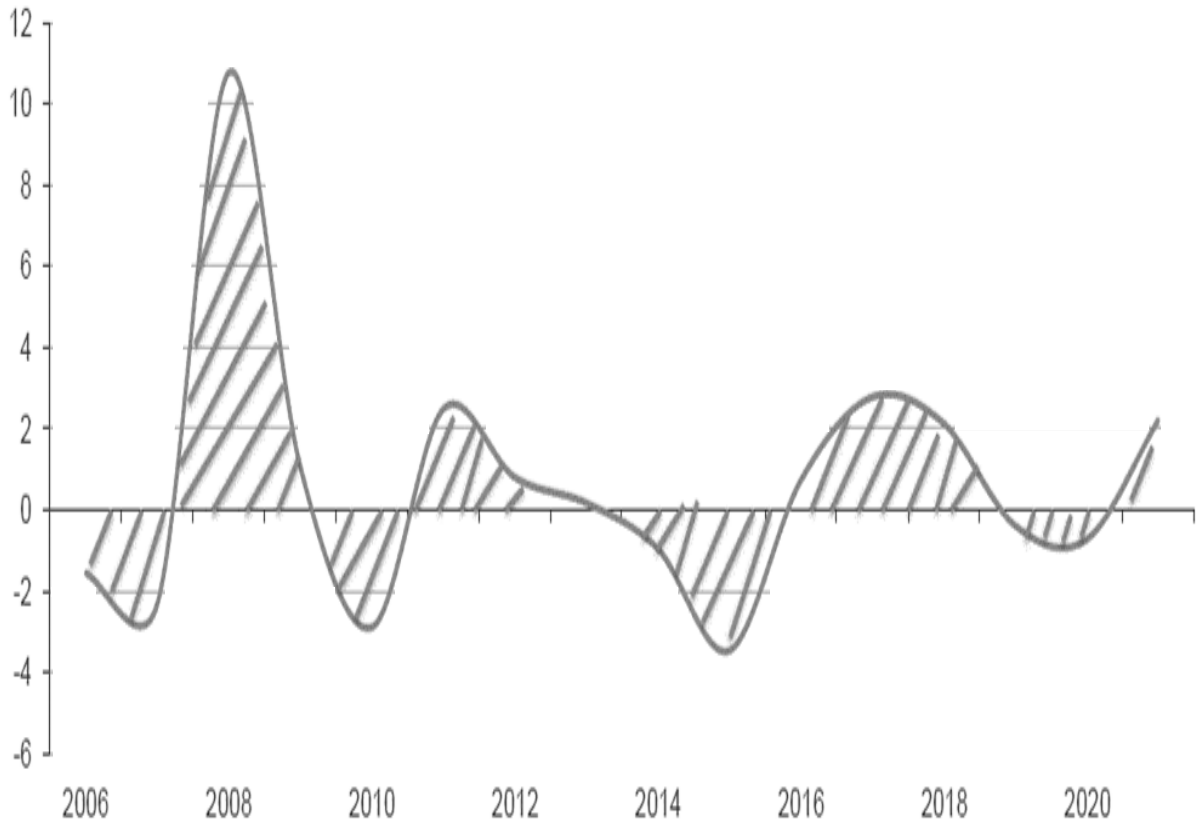
PP demand share by region



- **Demand has well exceeded global capacity additions for 3 consecutive years** and is a big part of why PP producers around the world have been **enjoying strong margins**
  - PP demand is on a roll after recovering with the economy in 2012
  - 2015 saw a tremendous demand bump thanks to very competitive prices around the world versus other materials
- **The industry is under significant over build pressures for 2017 and 2018**
- **Chinese demand** is going from 30% of the world's demand to 38% by 2021

Source: World Analysis Polypropylene

Current **investment cycle peak** in Petrochemicals looks **sustainable**

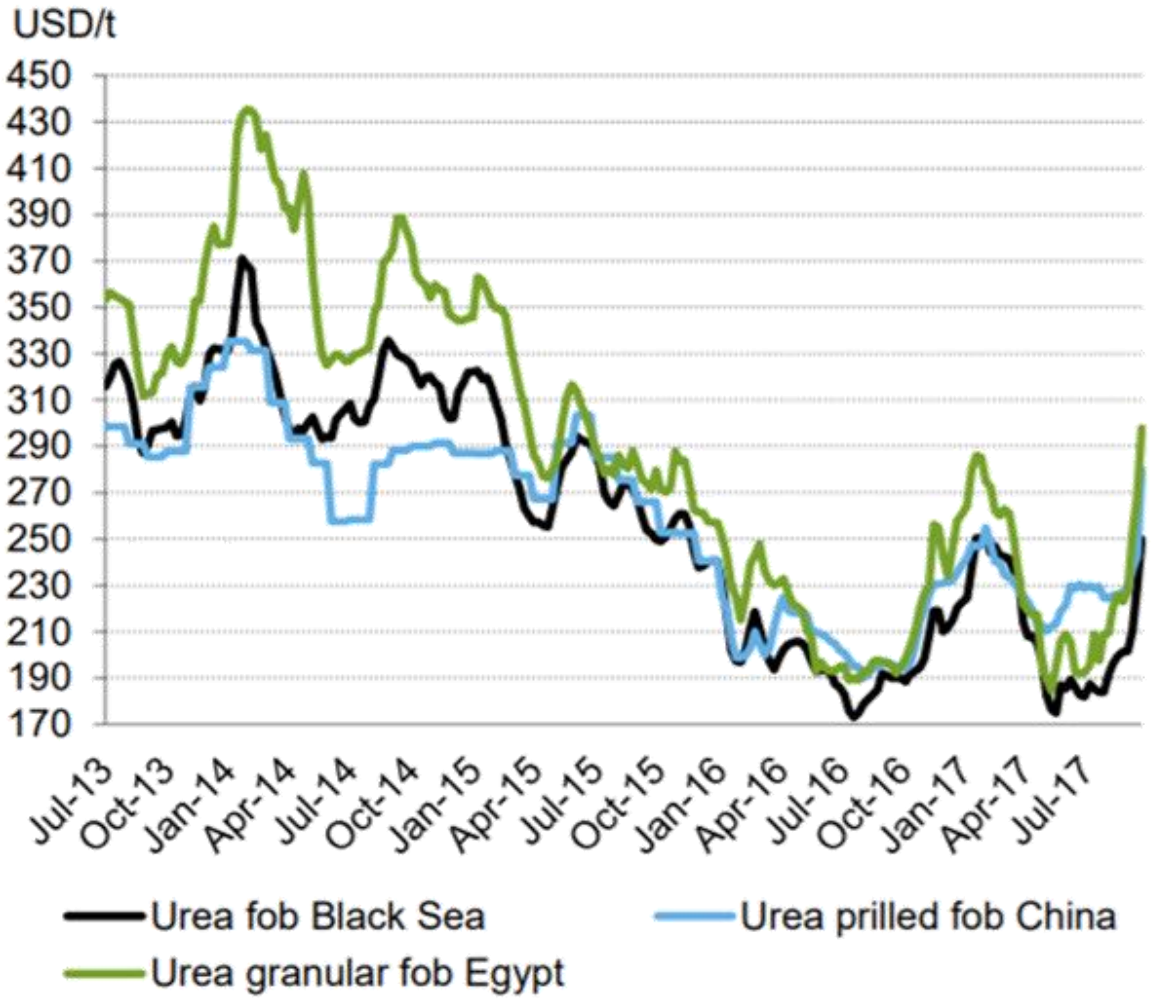


Source: PCI Wood Mackenzie

- **Current investment cycle peak is much less pronounced than that of 2008** – global supply / demand is more in alingment
  - Oil price collapse has helped the petrochemical industry **avoid significant over-investment in US steam crackers**
  - The **oil demand** becomes increasingly reliant upon **petrochemicals**

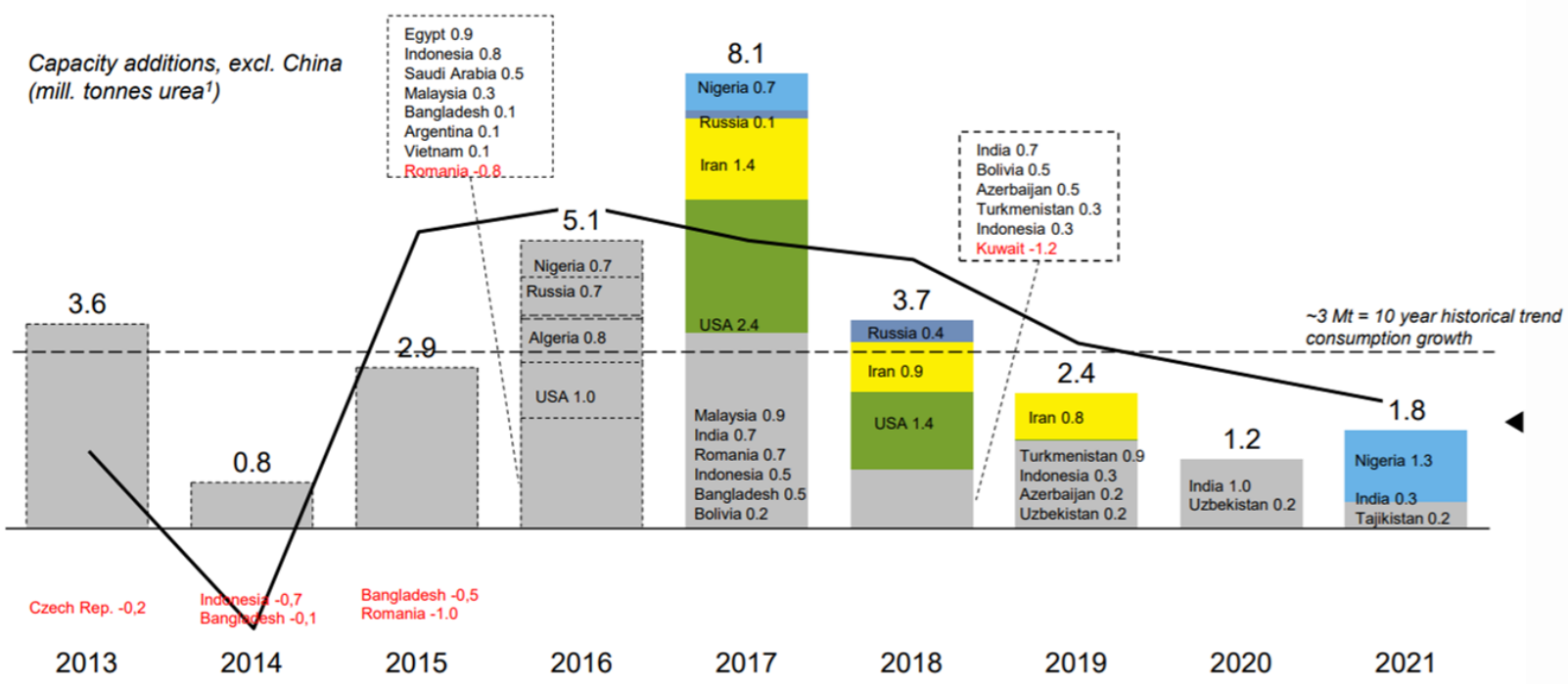
World **UREA operating rates** on a **steep decline,** pricing on a gradual recovery

- Because of the **overcapacity** of UREA after 2010, the **price and operating rate has been decreasing**
- **Major capacity additions recently took place in China** (over 10 million tons capacity during over the last 5 years)
- **Chinese urea production** suffering from increased production costs, domestic demand lower this season



Source: Yara investor presentation, Sep17

Strong UREA over-supply outside China

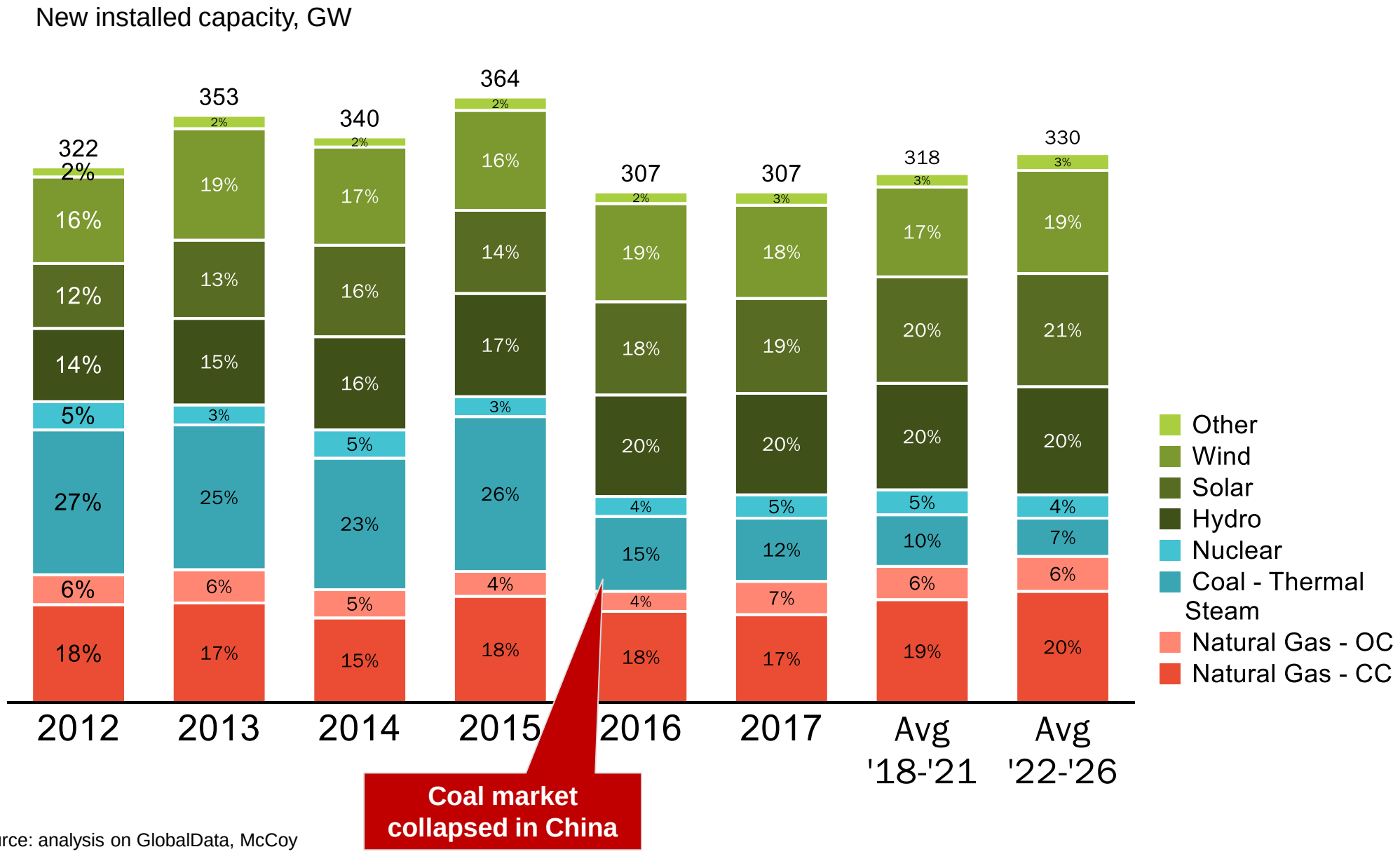


- **New capacity will be further added mainly in the US, Middle East and Africa**
  - The **US is increasing capacity** with competitive feedstock for urea
  - The US is starting to decrease its imports, thereby **altering the existing trade flow patterns**

Source: Yara investor presentation, Sep17

POWER

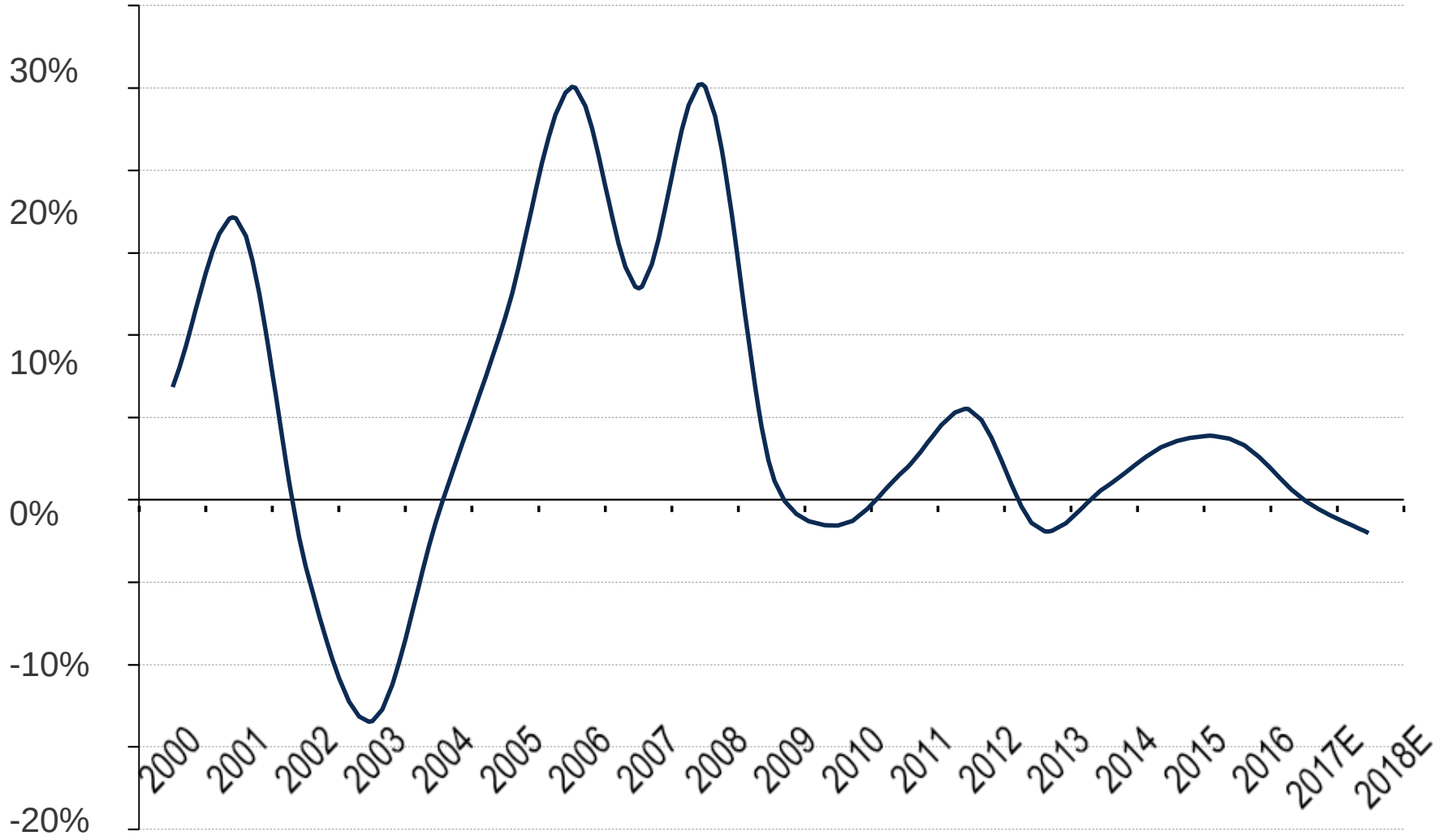
Gas and Renewables will replace Coal for Power Generation



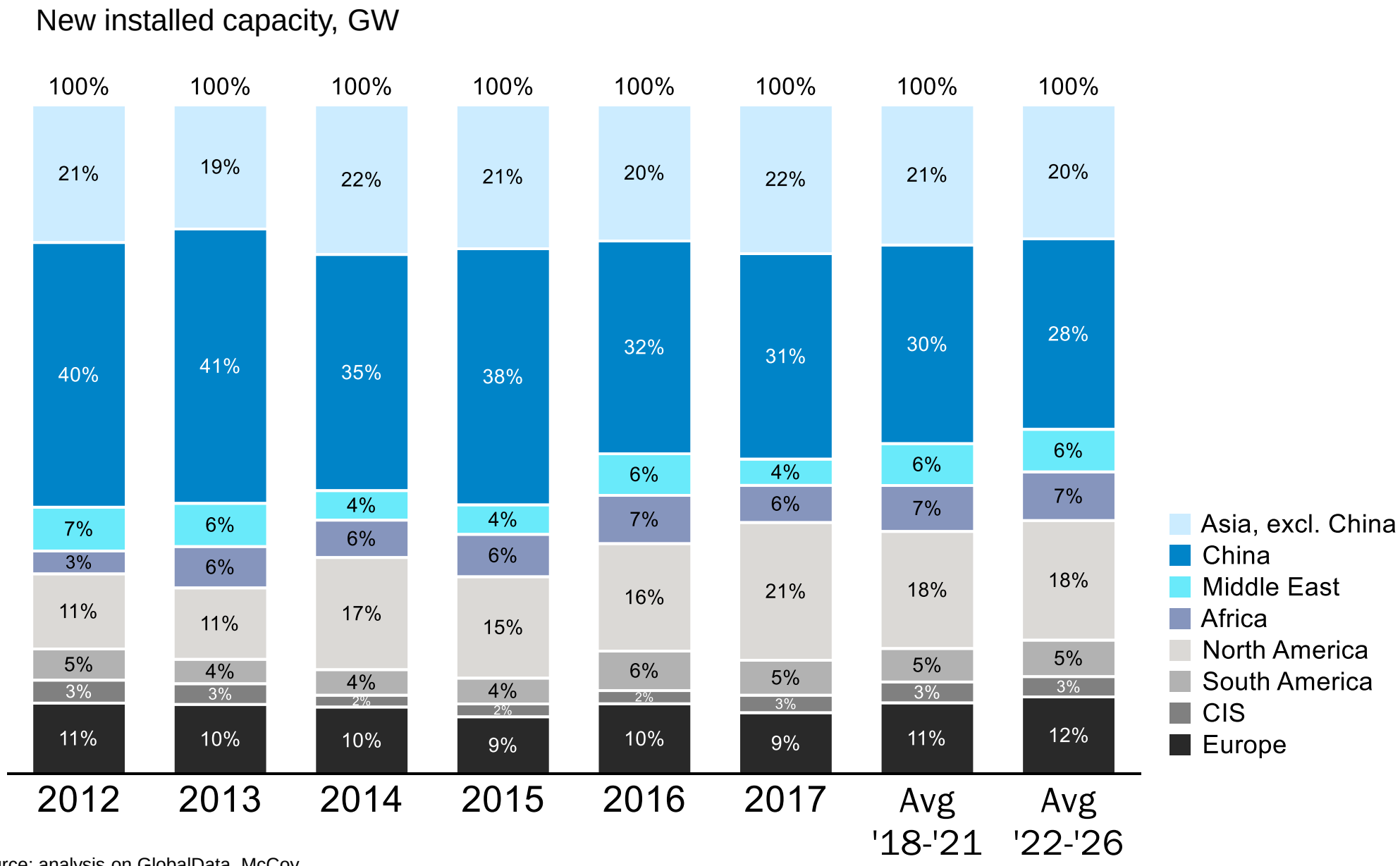
Source: analysis on GlobalData, McCoy

CAPEX by Utilities Co. expected to be flat or slightly negative for the next 2 years

Utilities Capex Growth %



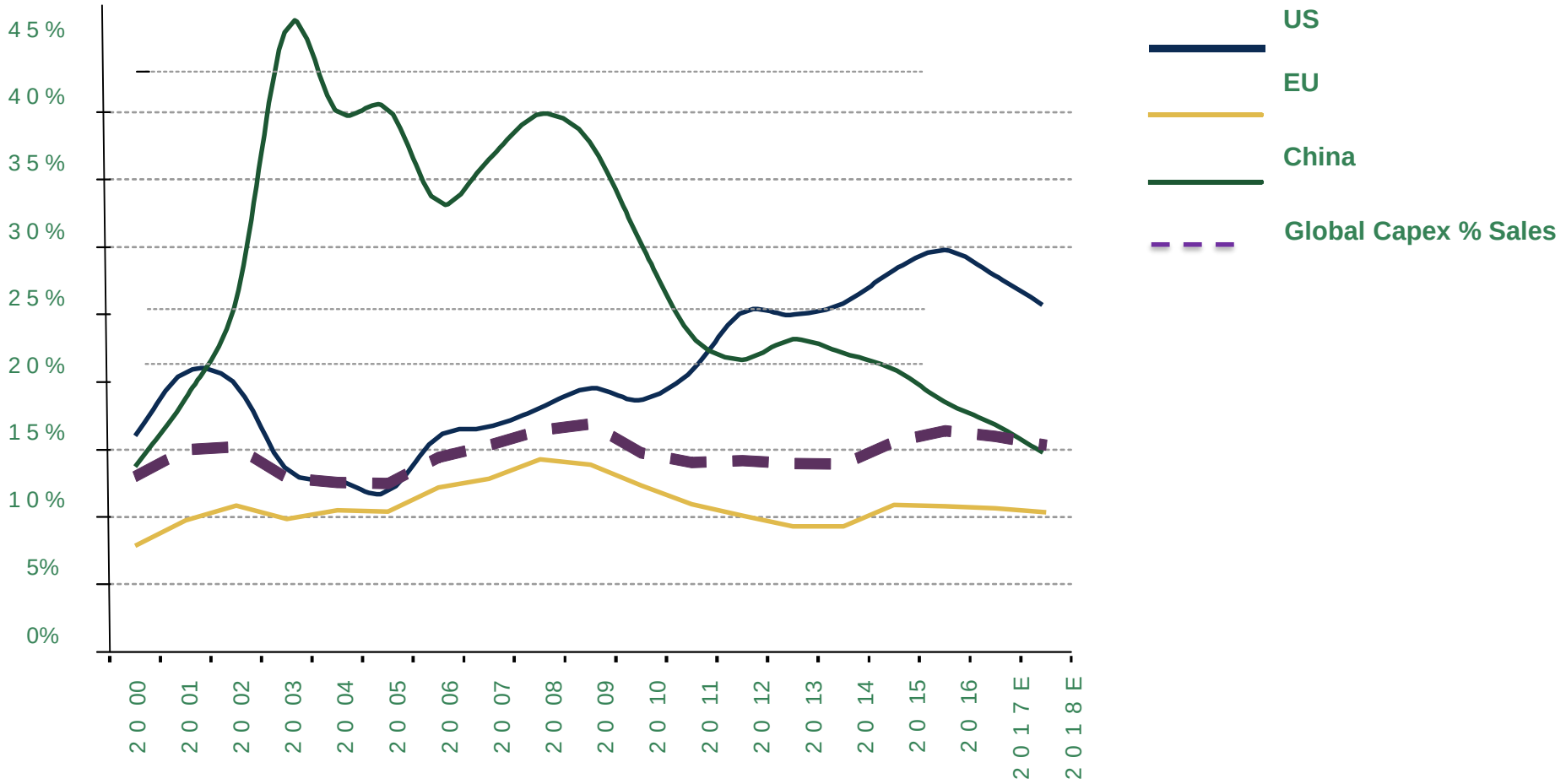
China to reduce incidence on global needs for Power, Africa still largely unexploited



Source: analysis on GlobalData, McCoy

CAPEX by Utility companies: **US at high level**, EU and China at low level

Utility capex as % of sales



Driver in energy demand

Classic main drivers of electricity demand:

- level of **demographic increase** in the countries
- the **growth of economic** activities i.e. the GDP (Gross Domestic Product) trend
- the **environmental** and **energy related government policies**
- the **fuel energy price**

Existing technologies are becoming obsolete

+ ELECTRIC CARS

The European Environment Agency predict that electric cars could comprise **c.10% of total electricity demand by 2050 across Europe**, with around **150GW of extra generation** capacity required

Will Oil&Gas learn from Power?

Oil & Gas pre-turnaround	Power
Jumbo projects	**Smaller** projects
Re-design for specific needs	Increase in **Standardization**
Mainly **greenfield** projects	More **expansions** and **brownfields**
Strong role of the **EPC Contractors**	**Disintermediation** of EPC Contractors
Bring **new capacity online**	Focus on **downtime reduction**
Cost **escalation**	Cost **reduction**
Projects with **long payback periods**	**Fast track** (time-to-EBITDA)
Self-funded projects	**Funding** is key
Traditional processes	**Digital innovation**

Source: SupplHi analysis

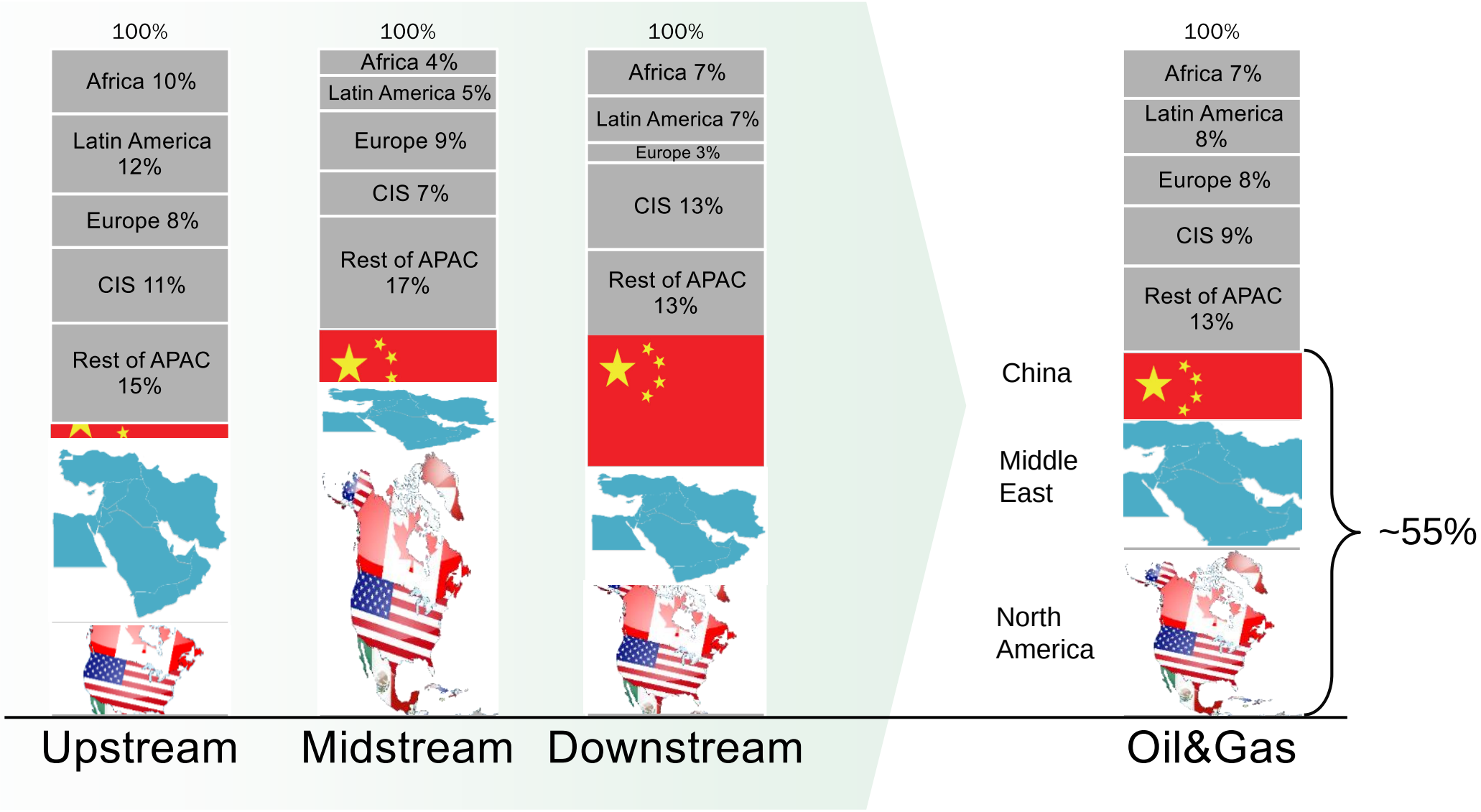
AGENDA

MARKET CONTEXT

OUTLOOK ON INVESTMENTS

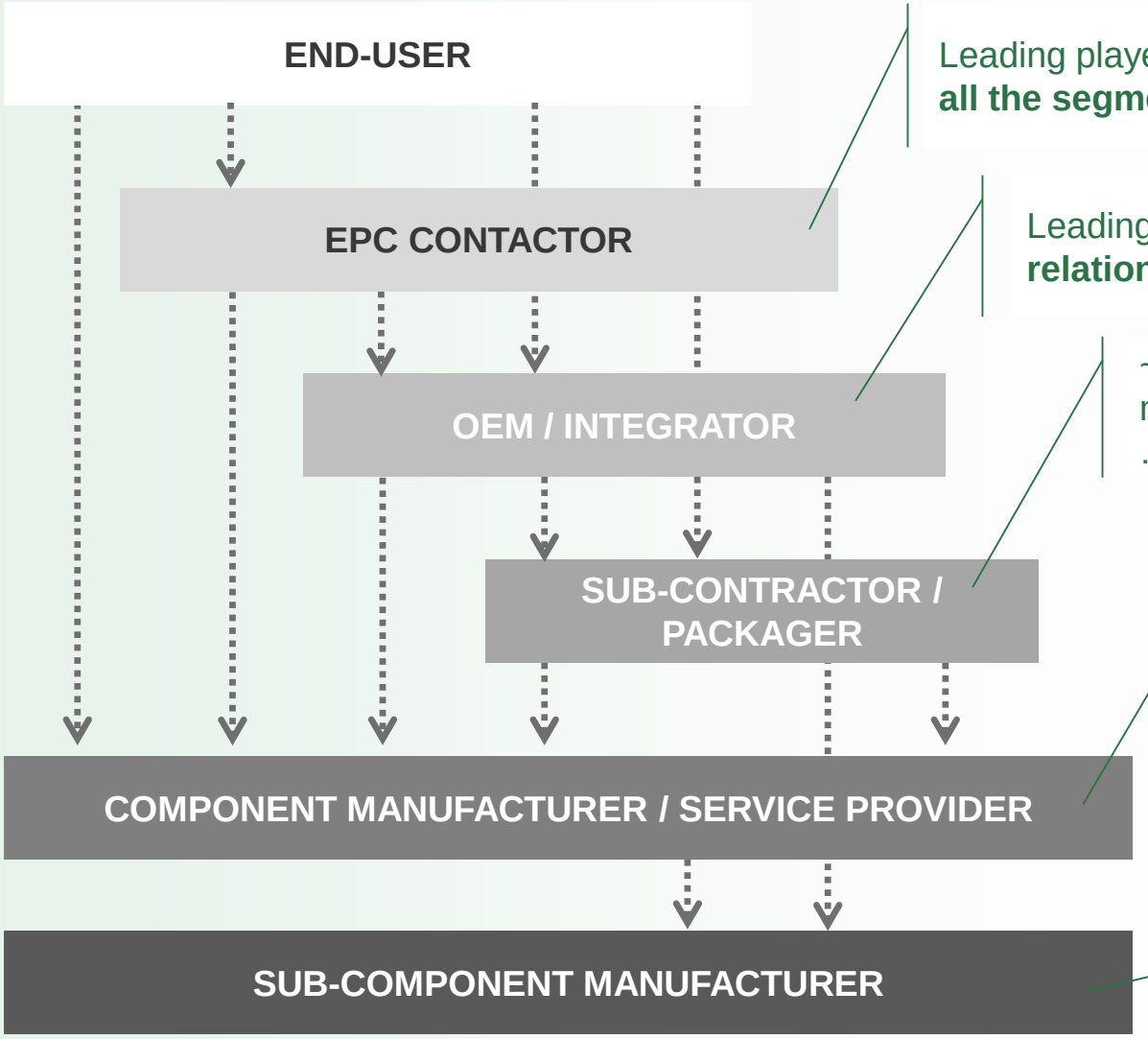
IMPACT ON THE VALUE CHAIN

US + Middle East + China in the next years will make ~55% of the global Oil&Gas market



Note: Split of 2017-2019 Oil&Gas expected CAPEX, not considering Exploration and Drilling CAPEX
Source: analysis on the SupplHi Projects Database

The **Italian Energy Value Chain** is extremely **rich** of **competences**



Leading players at international level, involved in **all the segments** (UP, MID, DOWN / ON, OFF)

Leading international OEMs with **established relationships with the local value chain**

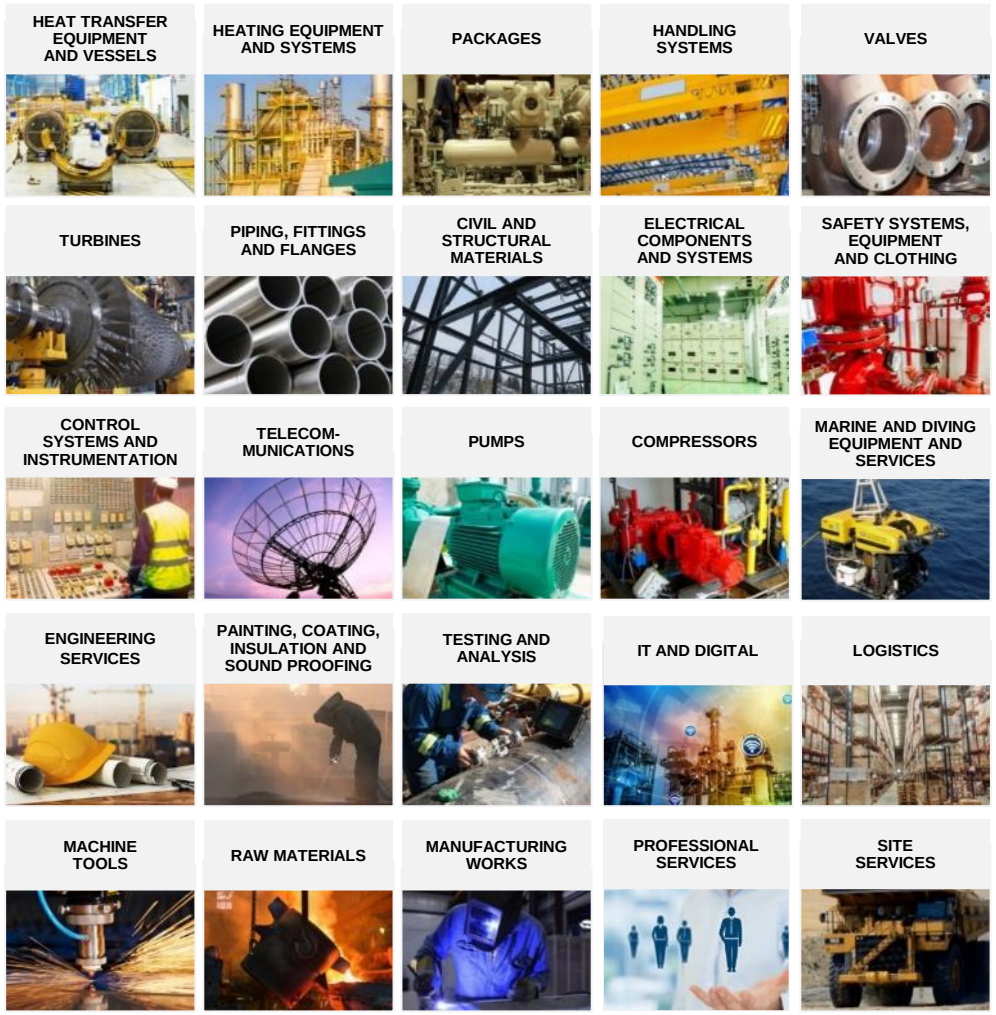
~170 **packagers** with 15/20% global market share (**average size <€10 M**)
…

243 Valves Co.
148 Pressure Equipment Co.
323 Electrical components
317 Engineering Co.
129 Operations & Maintenance Co.
102 Testing & Analysis Co.
201 Professional Services Co.
180 Logistics Co.
…

302 Foundries & Forges
149 Painting & Coating
143 Machine Tools
…

Note: vendors are considered only in the group of categories of prevalence; considered only vendors with references in Oil&Gas and Power industries
Source: www.supplhi.com

Unique **comprehensiveness** that creates **high complementarity**

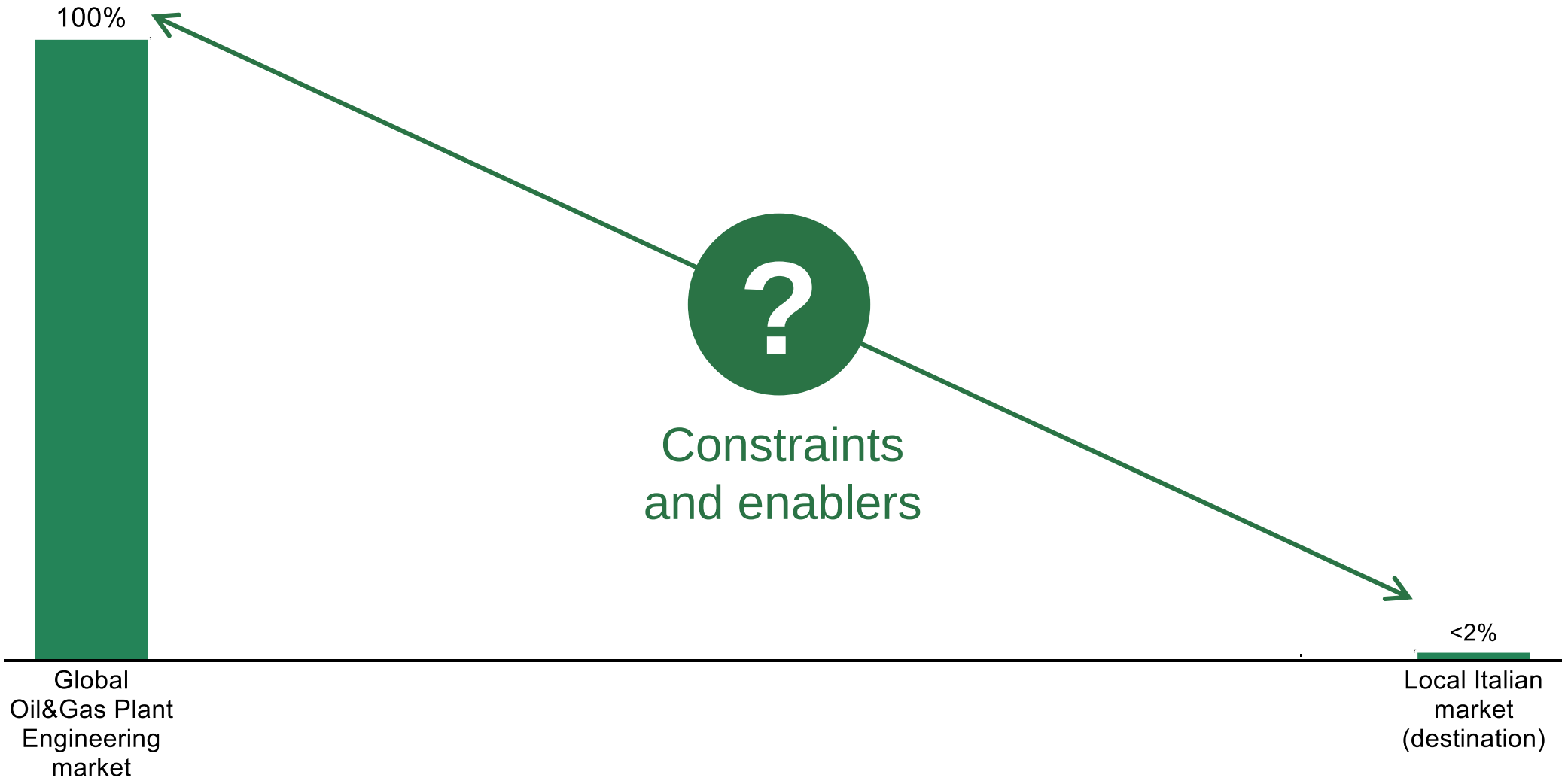


- **3.200+ "core" Italian players** with key references in Energy
- Only 23% of vendors compete in the same categories of supply (out of 2.250 categories) → **high complementary**
- **Lack of knowledge** of the "neighbors" and **cultural barriers** make joint approaches to clients complex
- Need to increase the **sharing of resources**:
  - Commercial
  - Technical
  - Support services
- **ANIMP ongoing pilot with Packages**

Source: www.supplhi.com based on the SupplHi Standard Categorization

What is the **accessible Oil&Gas market**?

Breakdown of the Global Oil&Gas
Plant Engineering market, 2016-2019



Source: SupplHi analysis on the SupplHi Projects Database

Geo-political

Breakdown of the Global Oil&Gas Plant Engineering market, 2016-2019

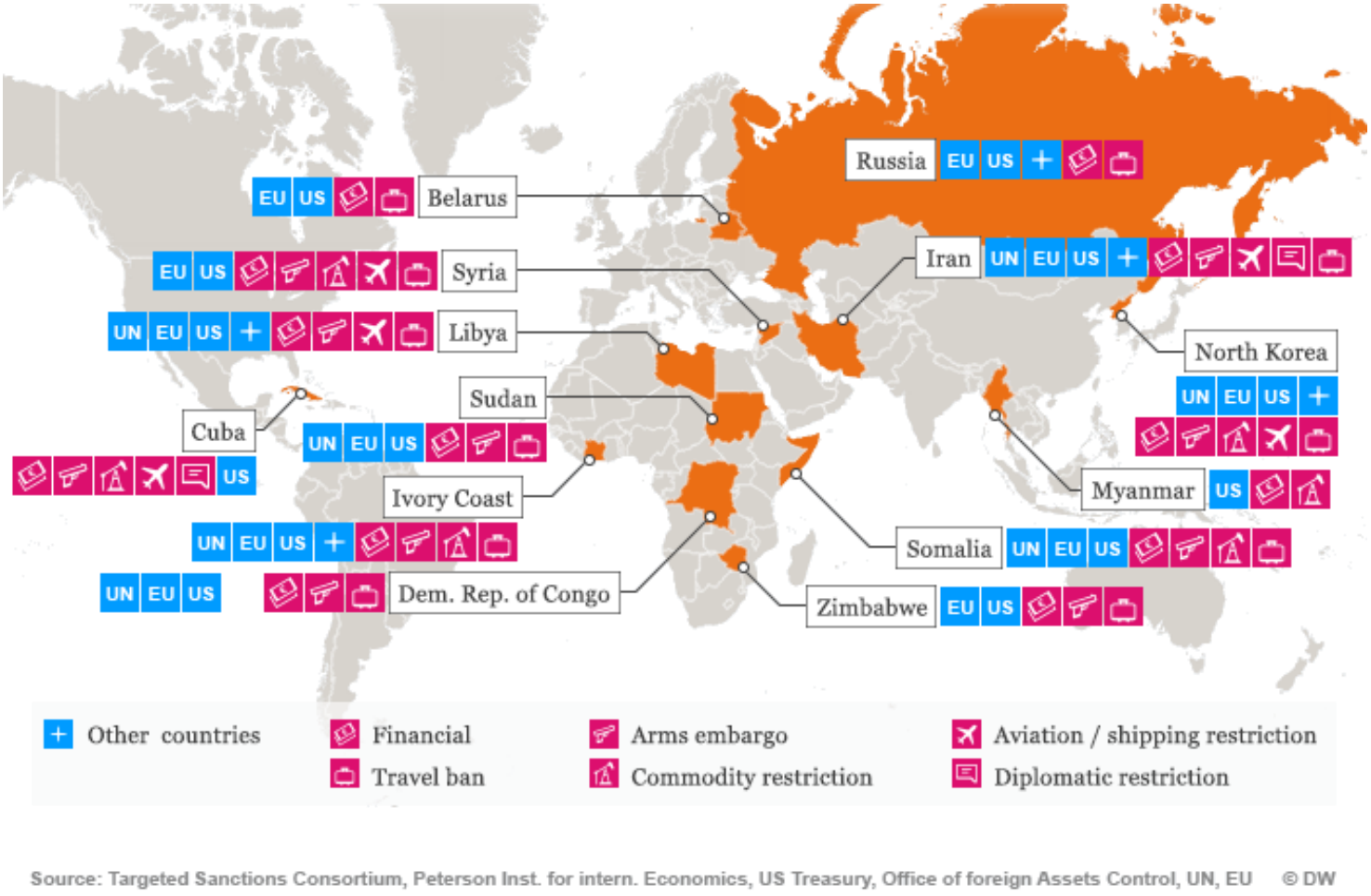
ILLUSTRATIVE

Source: SupplHi analysis on the SupplHi Projects Database

Growing **geo-political** complexity

- Increasingly relevant **geopolitical complexity**:
  - **More "walls" and protectionist measures** (beyond Local Content)
- Sanctions are acting at multiple levels with the **main impact being on the financial system**

Major Western Sanctions, July 2017

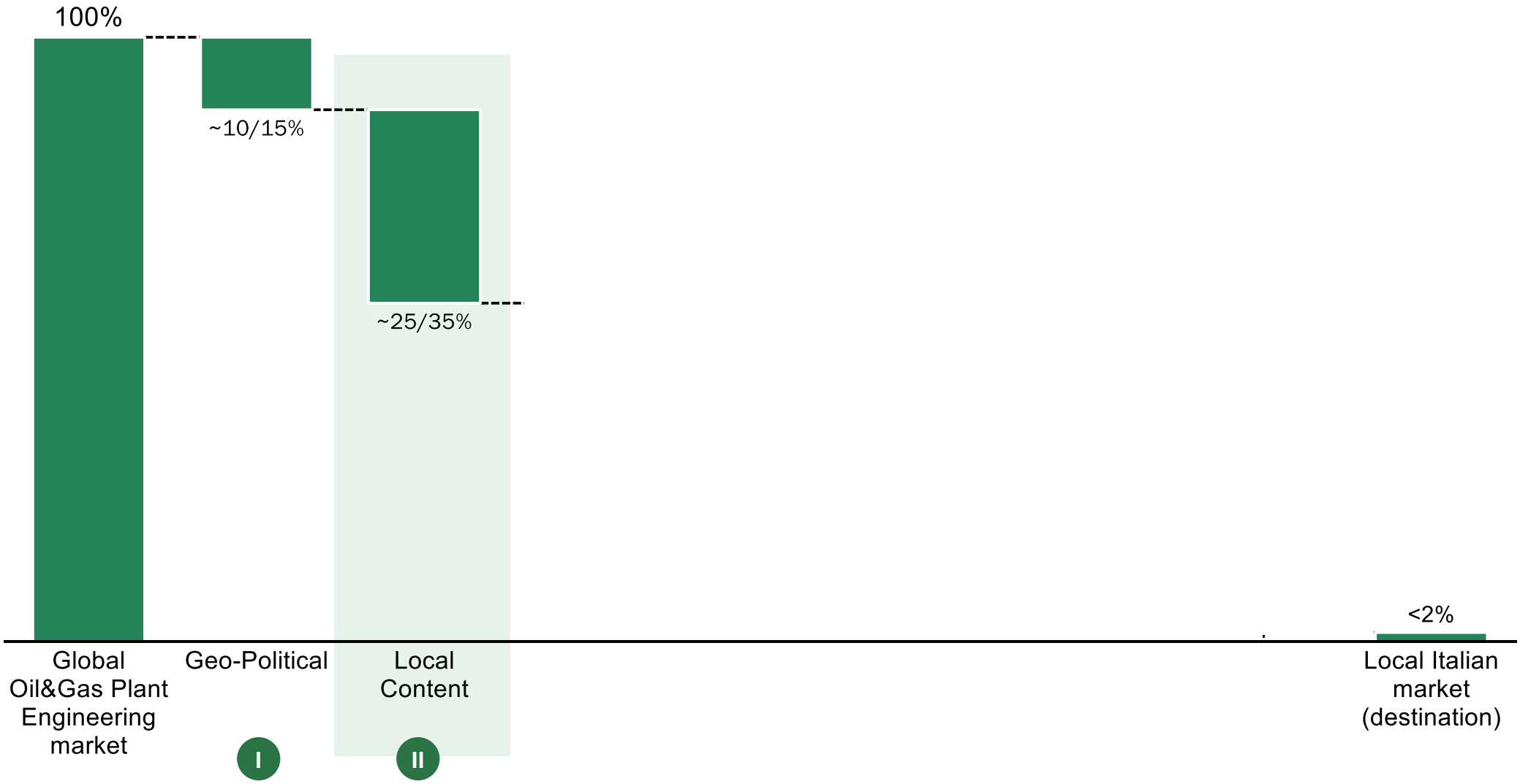


Source: Deutsche Welle, Financial Times

II Local Content

Breakdown of the Global Oil&Gas Plant Engineering market, 2016-2019

ILLUSTRATIVE



Source: SupplHi analysis on the SupplHi Projects Database

On average, in Oil&Gas-rich geographies **~50% Local Content** is required

Examples of Countries with LC policies

- **BRAZIL**
- **GHANA**
- **KAZAKHSTAN**
- **INDONESIA**
- **MALAYSIA**
- **NIGERIA**
- **RUSSIA**
- **SAUDI ARABIA**
- **UAE**
- **USA**
- **…**

In-Kingdom Total Value Add (IKTVA) program launched in Dec15 within Saudi Vision of 2030. IKTVA score formula:

A. Localized goods and services
B. Salaries paid to Saudis
C. Training and development of Saudis
D. Supplier development spending
E. Company revenue (spend from Saudi Aramco only)

%IKTVA=[(A+B+C+D)/E]*100

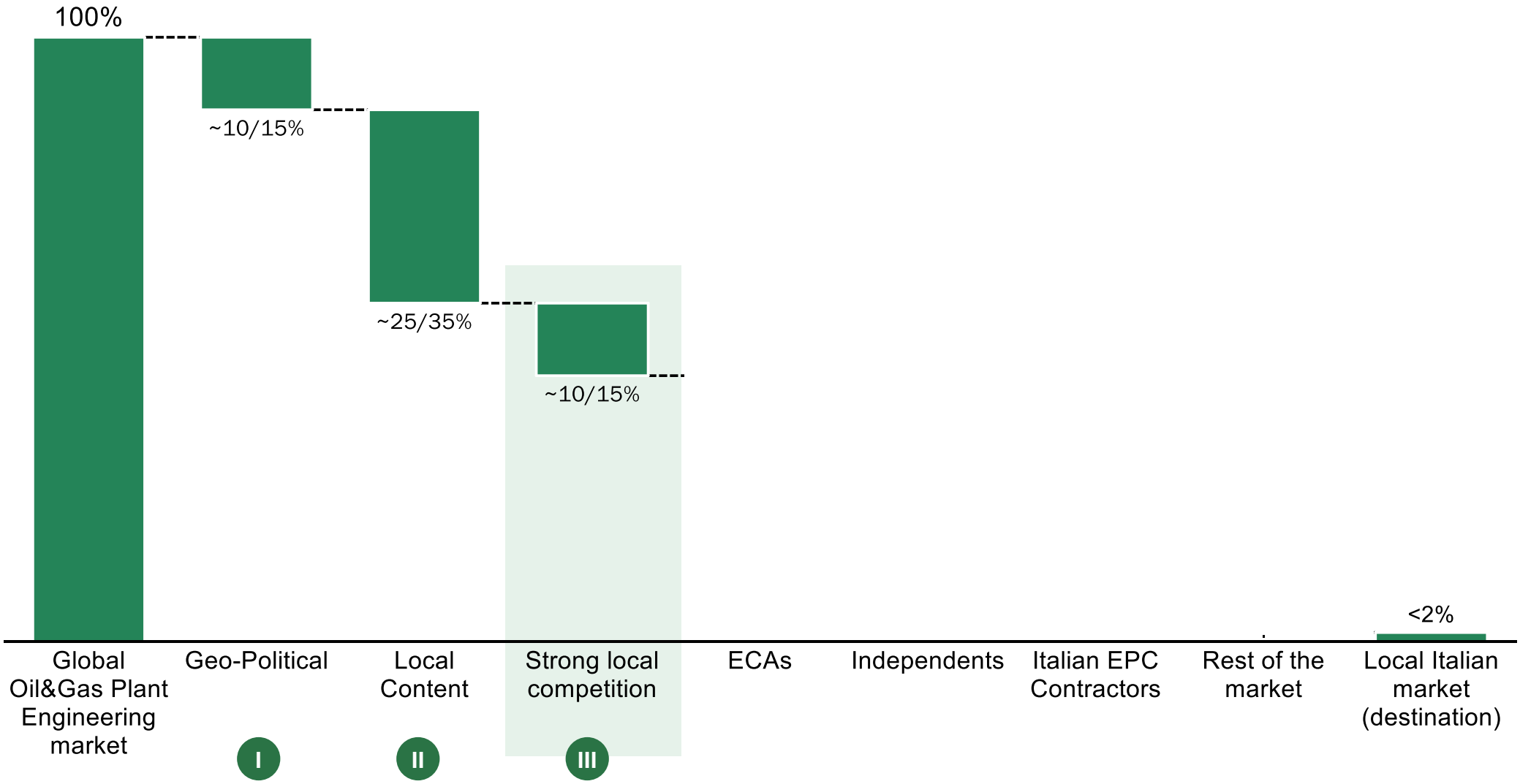
The changed policy of the US is **encouraging investment "in country"** to monetize the shale extractions: pipelines, fertilizers, methanol, petrochemicals, LNG, …

- Presence of structured LC programs
  - e.g. **Saudi Aramco** is seeking a **70% score by 2021** for each of its suppliers (30% is considered a strong score today)
- To be considered as a local players, one needs to have **local premises and local activities** (through direct investment ad / or local partnerships)
- **Complexity in finding the** right local partner, especially for SMEs
  - **Complementary players** may join efforts
  - Twist in competences: the "ability to deliver" needs to evolve into "**ability to let the local deliver"**

III Strong local competition

Breakdown of the Global Oil&Gas Plant Engineering market, 2016-2019

ILLUSTRATIVE



Source: SupplHi analysis on the SupplHi Projects Database

III Strong local competition (e.g. China), with global ambitions

- **Strong presidium of the local market** (particularly relevant for Downstream and Fertilizers)
- **Reduction in local Chinese** spend has restricted growth options in the home market
- In order to compensate for this shrinkage and following the **nation's One-Belt-One-Road strategy**, many Oil&Gas players have turned to international markets
  - Growing role of Chinese players in the **Middle East** and **CIS**, other than **Africa**
  - They also **bring funding**

Source: Bloomberg

IV ECAs

Breakdown of the Global Oil&Gas Plant Engineering market, 2016-2019

ILLUSTRATIVE

Source: SupplHi analysis on the SupplHi Projects Database

IV Increasing role of the **funding** through Export Credit Agencies (ECAs)

- **Funding is key**, with increasing role of ECAs' guarantees to sustain the export, impacting the **Procurement Strategy**
- Nevertheless, **presence in the local Vendor List is required**
- Barriers to entry not only reduce the market size but also create a **stronger competition with proven track record for the future**
- *"Chinese money, Chinese decisions"*

Source: DNB

V Independents

Breakdown of the Global Oil&Gas Plant Engineering market, 2016-2019

ILLUSTRATIVE

Source: SupplHi analysis on the SupplHi Projects Database

V Serving **independents** may exalt the Italian capabilities

- Growing presence of small independent players in Oil&Gas (mainly Midstream and Upstream – frequently backed by financial investors), looking for providers able to:
  - Offer **system integration** and **reduce interfaces**
  - Deliver according to time, quality and budget based on a **proven track record**
  - **bring the best manufacturer standard** and reduce "gold-plating" specs
- ***"More Service, Less Product"***
  - This approach requires joint efforts by complementary players

Examples of Independent Oil&Gas Co.

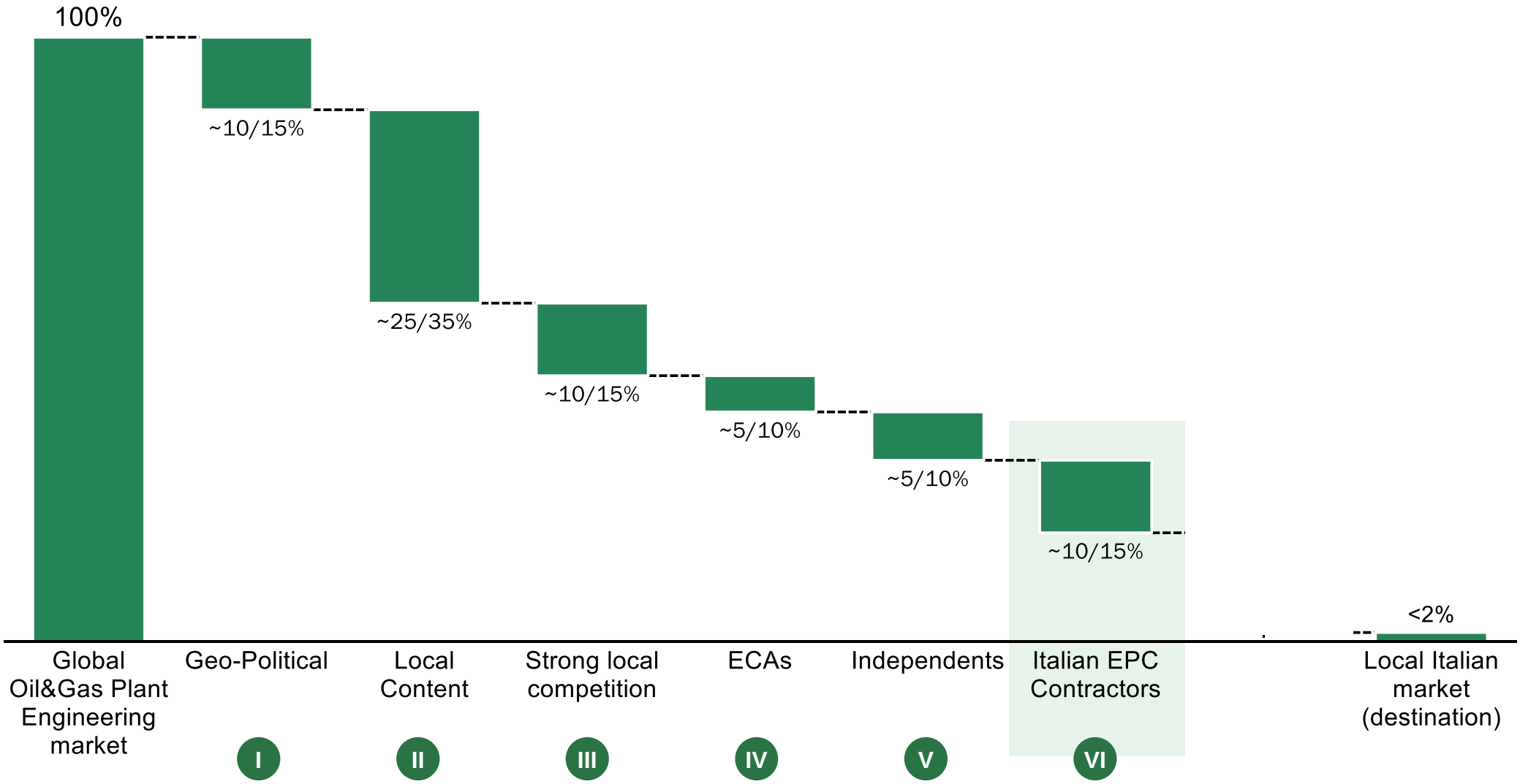
Segment	Country	Operator
Storage and Terminals	United States	Howard Energy
FSRU	Bangladesh	Petrobangla
Subsea Field Development	United Kingdom	Alpha Petroleum
Storage and Terminals	United States	Artemis Liquids
Upstream Onshore Conventional	United States	EnLink Midstream
Upstream Onshore Conventional	United States	Targa Resources
Upstream Onshore Conventional	Australia	APA Group
Onshore Pipeline	Canada	Eagle Spirit Energy Holdings
LNG Onshore Liquefaction Plant	Canada	Pieridae Energy
LNG Onshore Liquefaction Plant	Canada	Pacific Oil and Gas
Floating LNG (FLNG)	Republic of Congo	New Age
LNG Onshore Liquefaction Plant	United States	Universal LNG
Refining	Uganda	Yaatra Ventures
Floating LNG (FLNG)	Canada	Steelhead LNG
Onshore Pipeline	United States	Boardwalk Pipeline Partners
Upstream Onshore Conventional	Canada	Keyera
FSRU	India	H-Energy
LNG Onshore Liquefaction Plant	United States	Parallax Energy
Upstream Onshore Conventional	Australia	AWE
Upstream Onshore Conventional	Philippines	Gas2Grid
…	…	…

Source: SupplHi Projects Database

VI Italian EPC Contractors

Breakdown of the Global Oil&Gas Plant Engineering market, 2016-2019

ILLUSTRATIVE

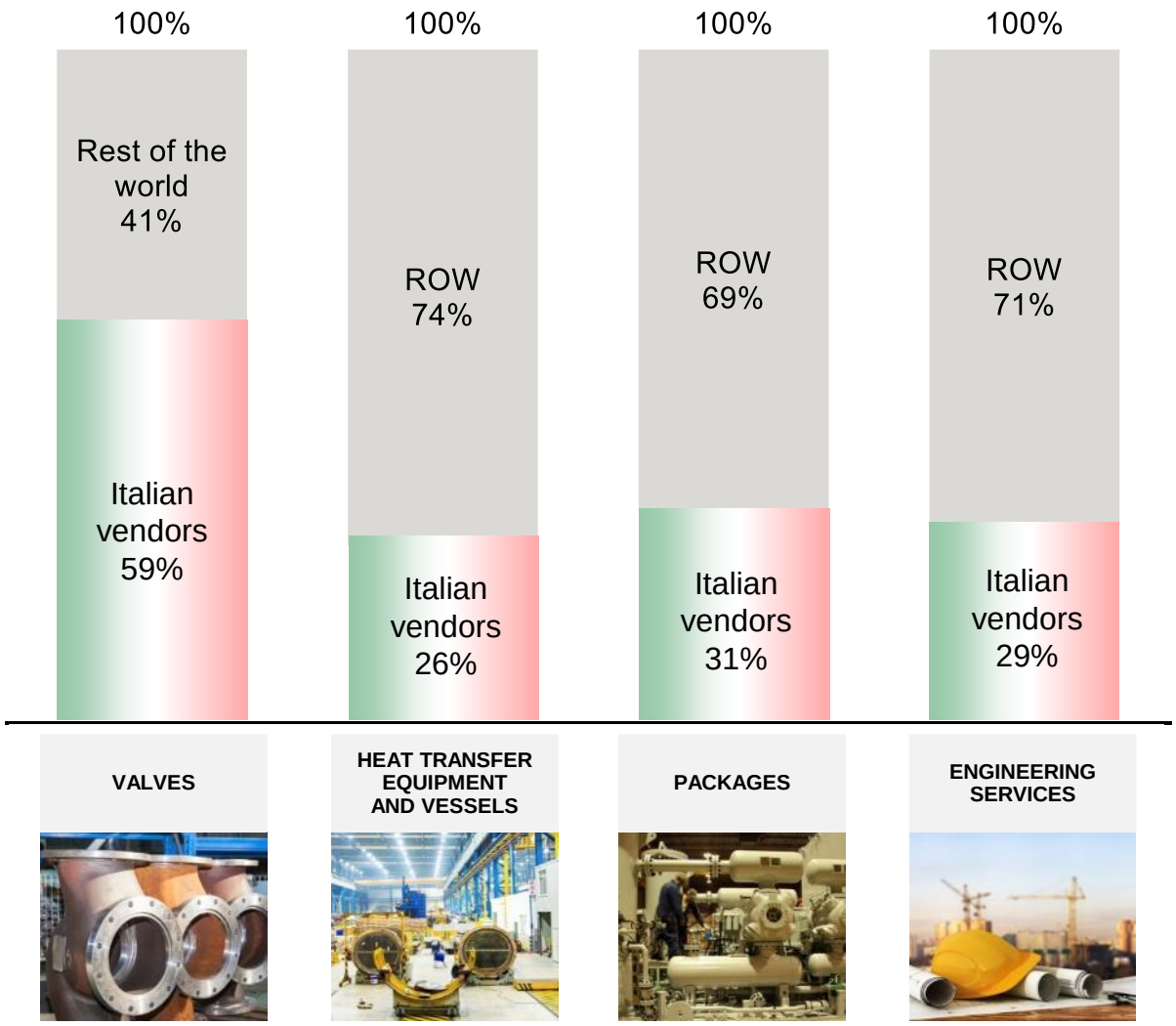


Source: SupplHi analysis on the SupplHi Projects Database

VI Sales through **Italian EPC Contractors** may not be enough / further increased

- EPC Contractors are increasingly subject to **Local Content**
- Some categories of supply already have a **traditionally high relevance of Italian players**
- **Lack of presence in the local Vendor Lists and of an After Sales support** make their involvement since the bidding phase complex
- **Funding by ECAs** is very relevant and influences the **Procurement Strategy**

Incidence of purchases of selected Italian EPC Contractors from Italian vendors in the last 5 years



Source: SupplHi analysis, interviews with selected EPC Contractors

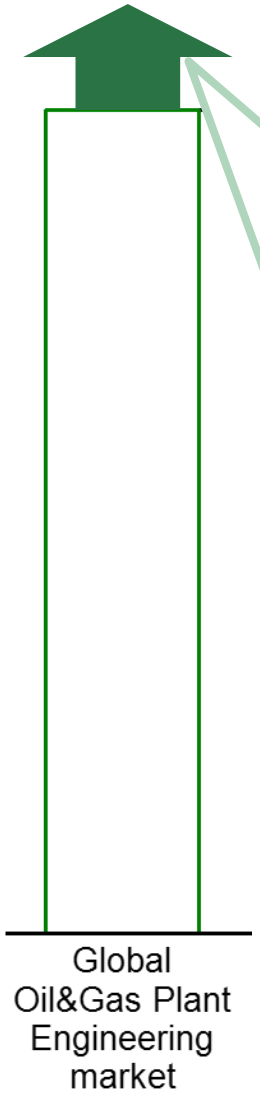
VII Rest of the Market

Breakdown of the Global Oil&Gas Plant Engineering market, 2016-2019

ILLUSTRATIVE

Source: SupplHi analysis on the SupplHi Projects Database

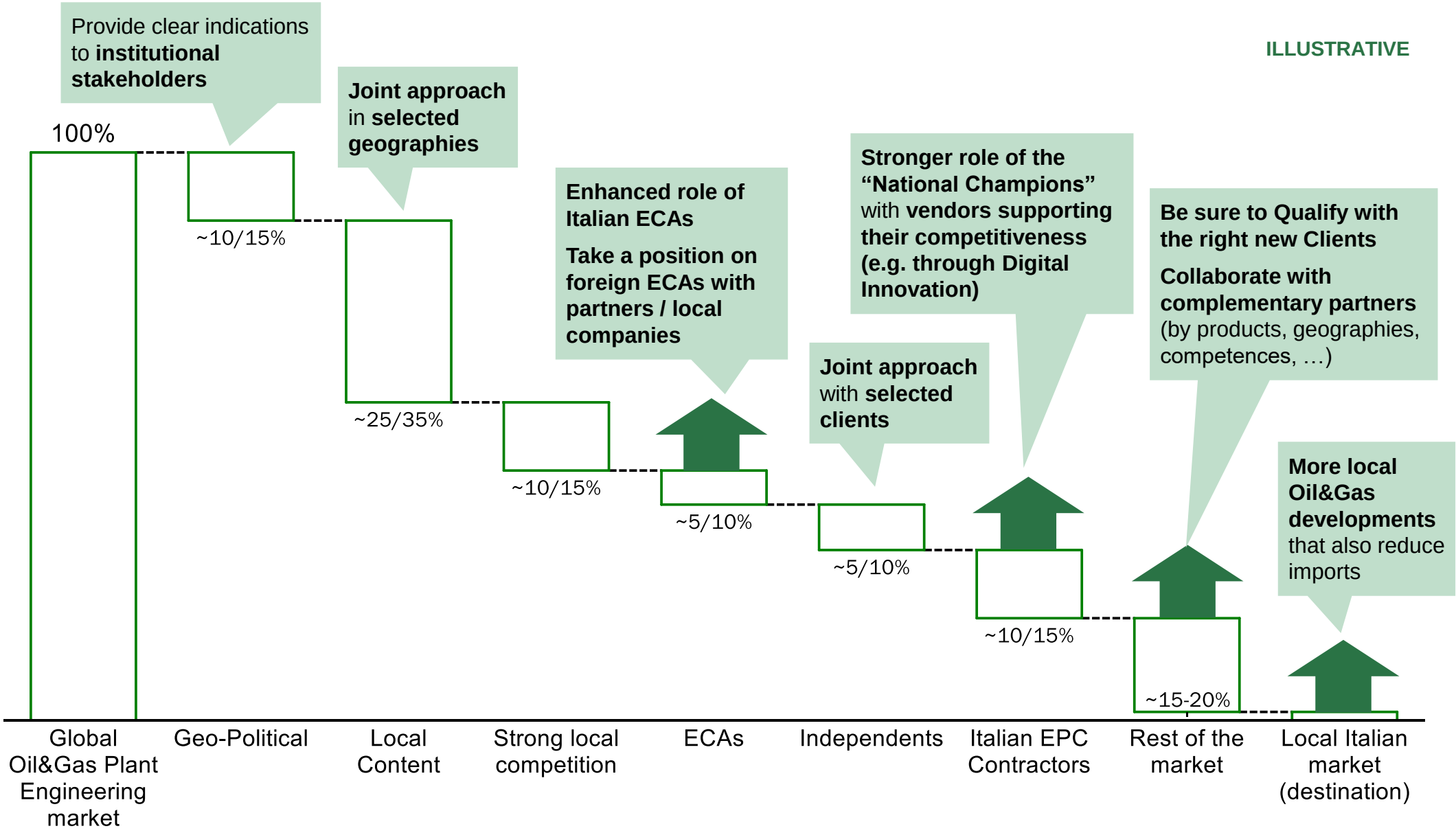
How to increase the overall market?
Beyond traditional Oil&Gas



- Across the Alps: **Nuclear revamping program in France**
  - EDF is allocating €55 billion to prolong the life of its nuclear power stations from an average of 40 years to a minimum of 50 years
- **Decommissioning**, also converting existing assets / vessels
- **A world powered by renewables is not around the corner, this will be a long-term transition - a matter of decades, not years**
  - **Offshore Wind Farms** (7:1 ratio with traditional Oil&Gas offshore platforms)
  - Never forget that **China, United States, Japan and India** are the world's biggest investors in renewables
  - Follow **Oil Cos that are diversifying their needs**, e.g. Statoil and Aramco plan for Renewables (Wind, Solar, …)

Electric Substation for Offshore Wind Farms

How to collectively **increase our addressable market**?



Breakdown of the Global Oil&Gas Plant Engineering market, 2016-2019
Source: SupplHi analysis on the SupplHi Projects Database

What are your next **competitive advantages**?

Grow your accessible market
(vs the traditional "grow with the market")

Play with complementary partners

Get qualified visibility with the right Clients

(Digital) Innovation to solve client's issues

Thank you for your attention

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