World Petroleum Council
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Financing challenges for an energy industry in transition
WPC UK Committee Symposium
26 June 2018

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CENTER FOR ENERGY IMPACT

Energy Industry in Transition

The risks of greater uncertainty

Jamie Webster, Senior Director

@websterdrake

June 2018

Energy future uncertainty is rising

Uncertainty about future is not new- but the range and sources of uncertainty is

- Policy uncertainty- at multi-lateral, national and local levels
- Economic uncertainty- trade war concerns, interest rates, energy prices
- Technology uncertainty- more than just EVs and internet of things
- Demographic uncertainty- more urbanization, new generations

Uncertainty is driving new strategic efforts as companies seek to compete

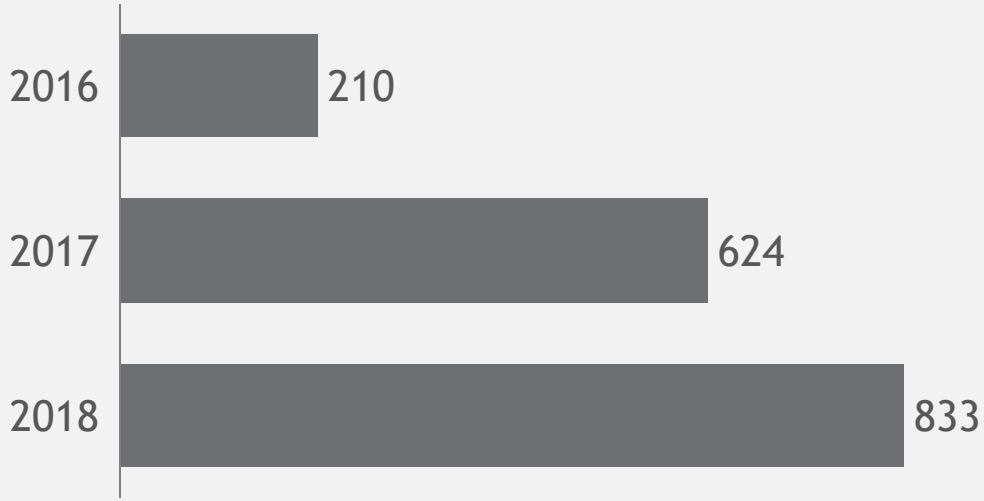
- Traditional oil and gas companies seek to avoid the fate of Kodak
- New entrants seek to avoid fate of Pets.com

Significant investments are required to drive the multiple energy transitions- but the path to profits is not always clear

Clear, frequently tested scenarios can help drive better decision making

Policy uncertainty- from power to autos

UK hours without coal-fired power



US coal exports

Source: MyGridGB, Energy Information Administration

Economic uncertainty

US interest rates

Faster-than-expected tightening will undermine growth globally.

Geopolitical tensions

Risks of confrontation in the Middle East and Korea are rising.

Global trade disputes

Trade disputes are rising protectionist sentiment is growing.

Very high oil prices

Sustained prices of $80+/b will accelerate inflation pressures.

These risks are already anticipated to be a drag on global economic growth from 2020.

Current IMF estimates suggest that risks are balanced over the next two years.

If they hit earlier, the impact will be to dampen global expansion more quickly.

These pressures could reduce growth to below 3.5% in 2018 and around 2.5% in 2019.

Source: IMF World Economic Outlook, April 2018

Technology uncertainty

Internet of things

Real time comms/ tracking

Big data

Virtual Reality

Enabler

Blockchain

Drones/UAVs

Sensors

Artificial intelligence

Agile

Autonomous Robots

3D printing

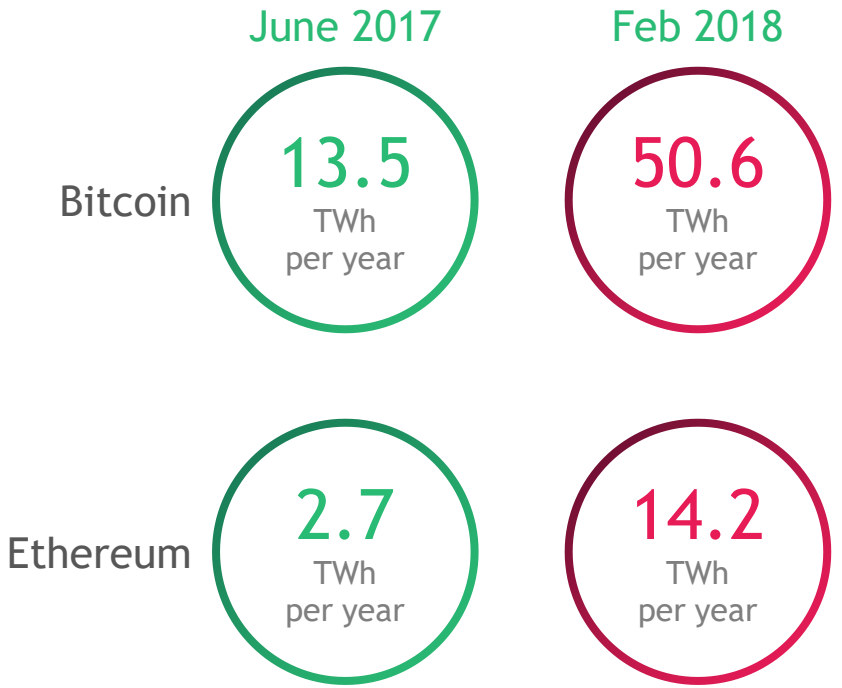
Machine learning

Cloud computing

Supporting technology

Cyber security

Digital growing pains: Cryptocurrency energy demand



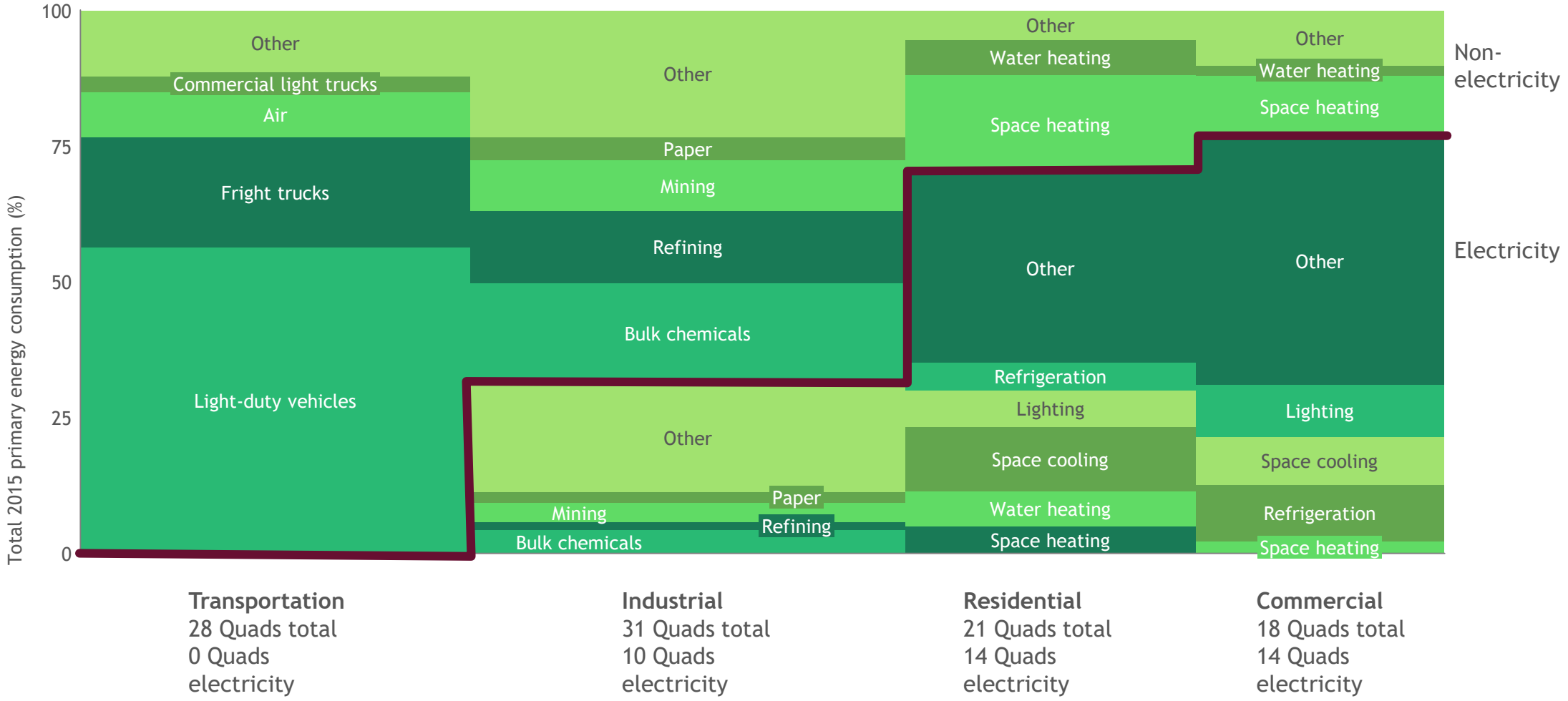
Crypto mining energy needs

- >Chile
- At current rate, >Brazil by end 2018

Efforts to reduce energy consumption

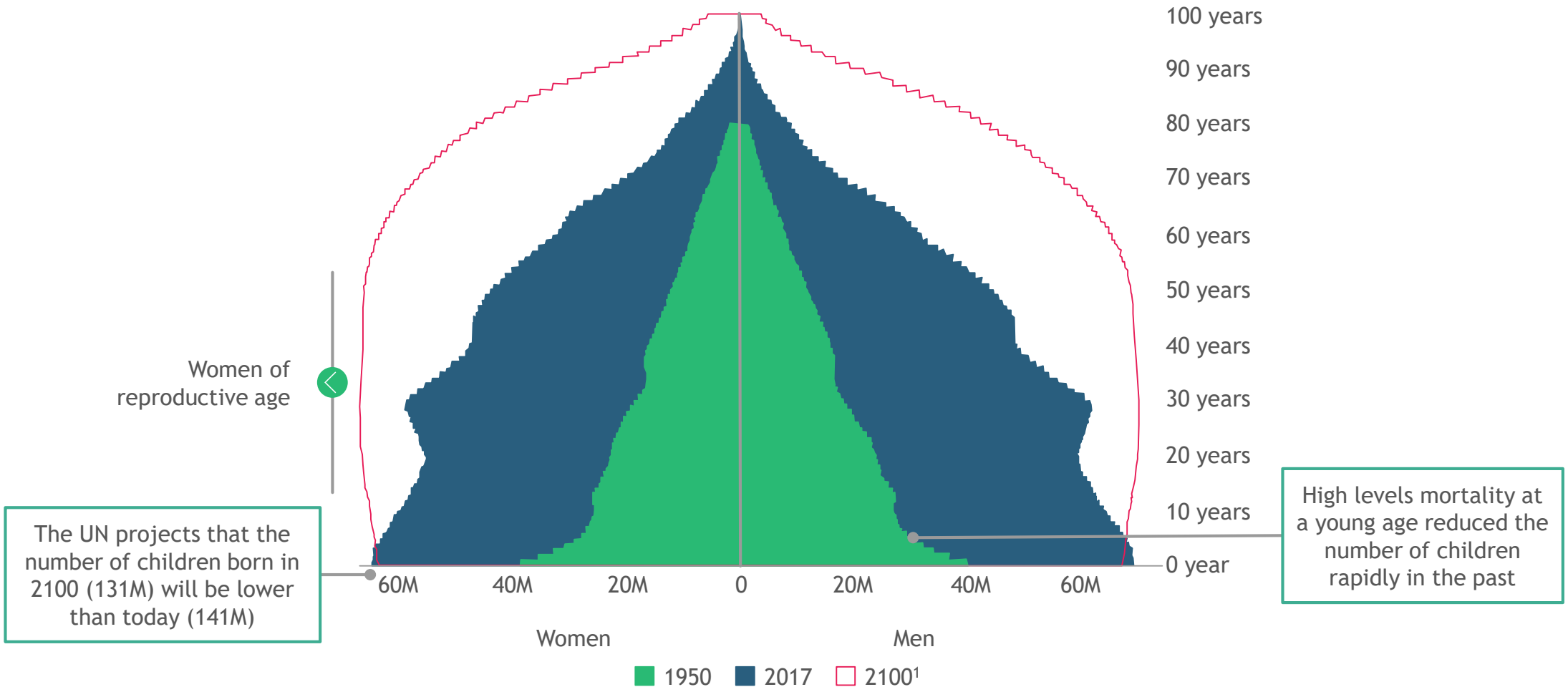
- Even “less energy intense” products still 50 Kwh per transaction

Digitalization will change demand as it increases process of electrification



Source: NREL Electrification study, 2017

Demographic uncertainty

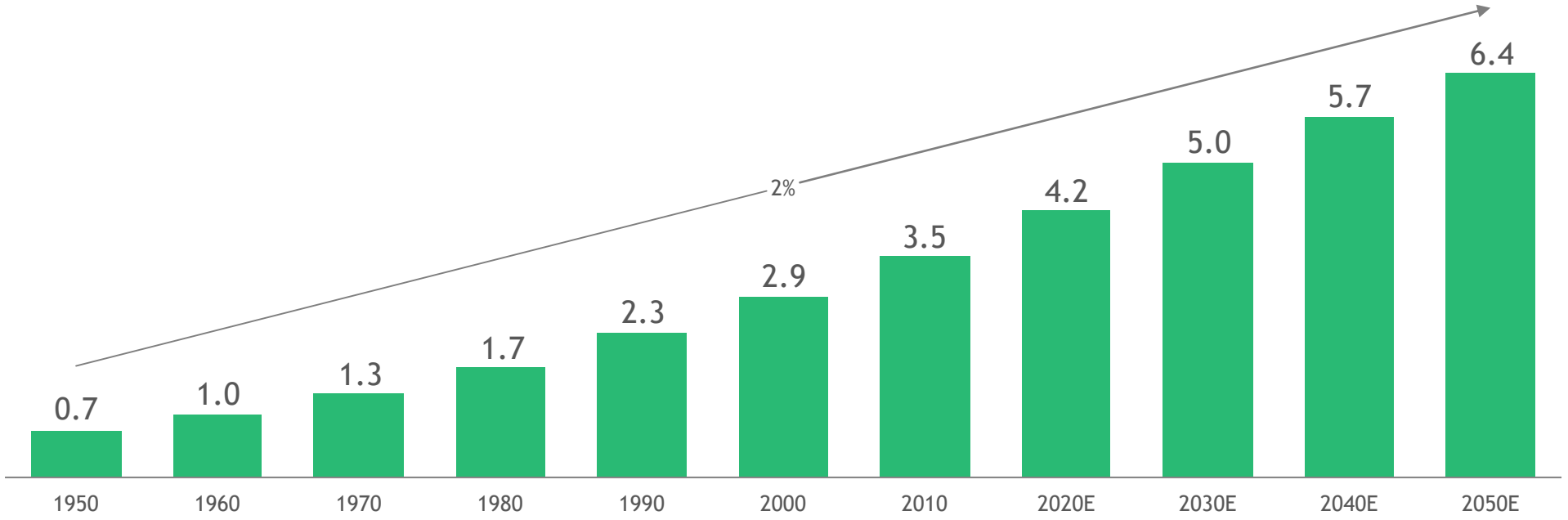


1. Projection by the UN

More city living = more energy intensity

Urban population to reach 70% in 2050

Estimated and projected global urban population (B)



Source: 1. and graph UN World Urbanization Prospects—2014 Revision; BCG analysis

To handle uncertainty, focus on 6 key areas

Steps to prepare for Energy Transition

Set the ambition: encompassing both carbon footprint and business building/replacing

Build the portfolio: targeting both elements above while acknowledging with the uncertainty

Establish governance: who should own the integrated view of the Energy Transition

Map signals: take a strong view on signals from the market that indicate scenario outcomes

Define active roles:
select opportunities where you can shape the market

Consider partnerships:
difficult to cover entire opportunity space in house

1. Carbon Capture and Storage

The future is already here — it's just not very evenly distributed

William Gibson

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CENTER FOR ENERGY IMPACT

Energy investment and the low carbon transition

Laszlo Varro

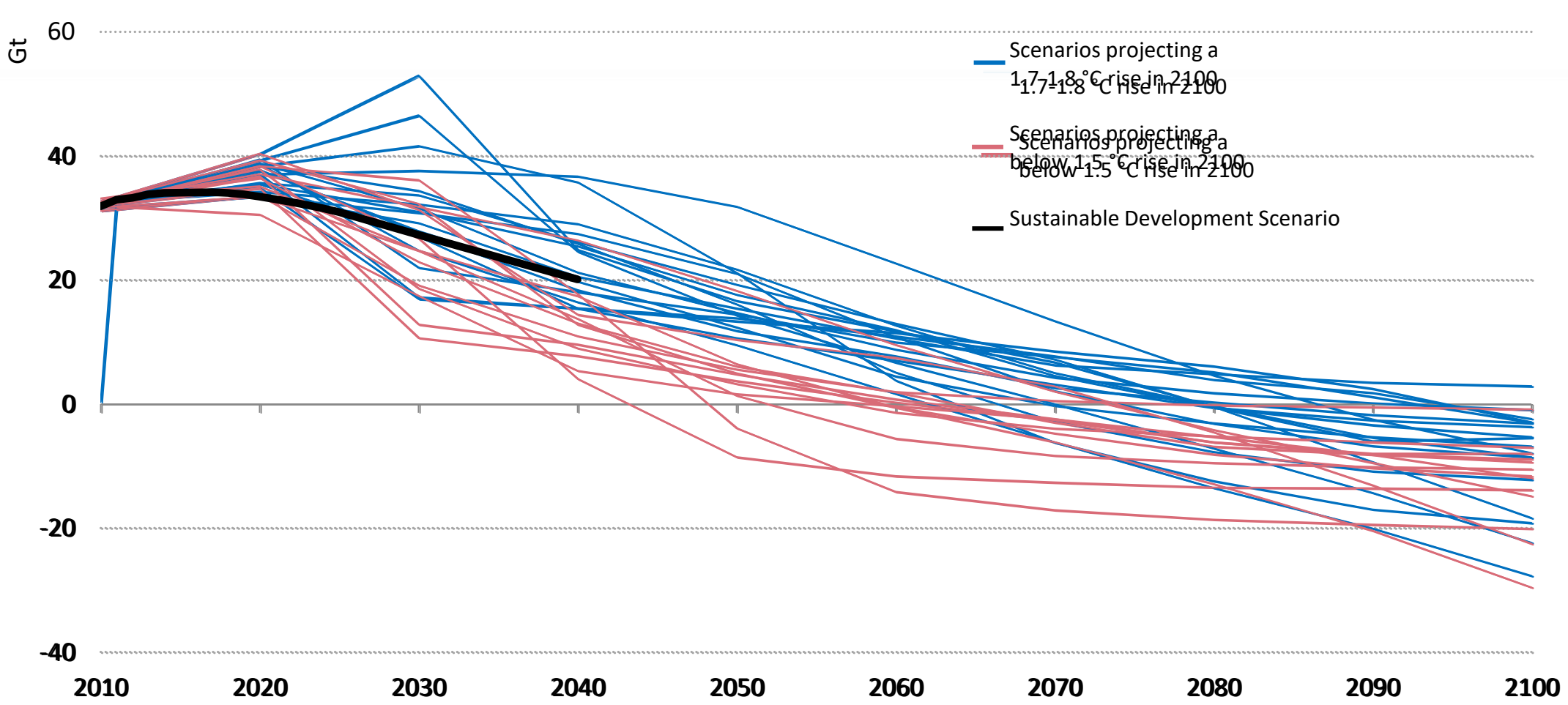
Chief Economist

IEA

On the journey towards a clean energy system

We made it to the base camp, with a tough climb ahead

Translating the Paris agreement to energy pathways



The emissions trajectory of the SDS is at the lower end of decarbonisation scenarios projecting a median temperature rise of around 1.7 °C to 1.8 °C in 2100

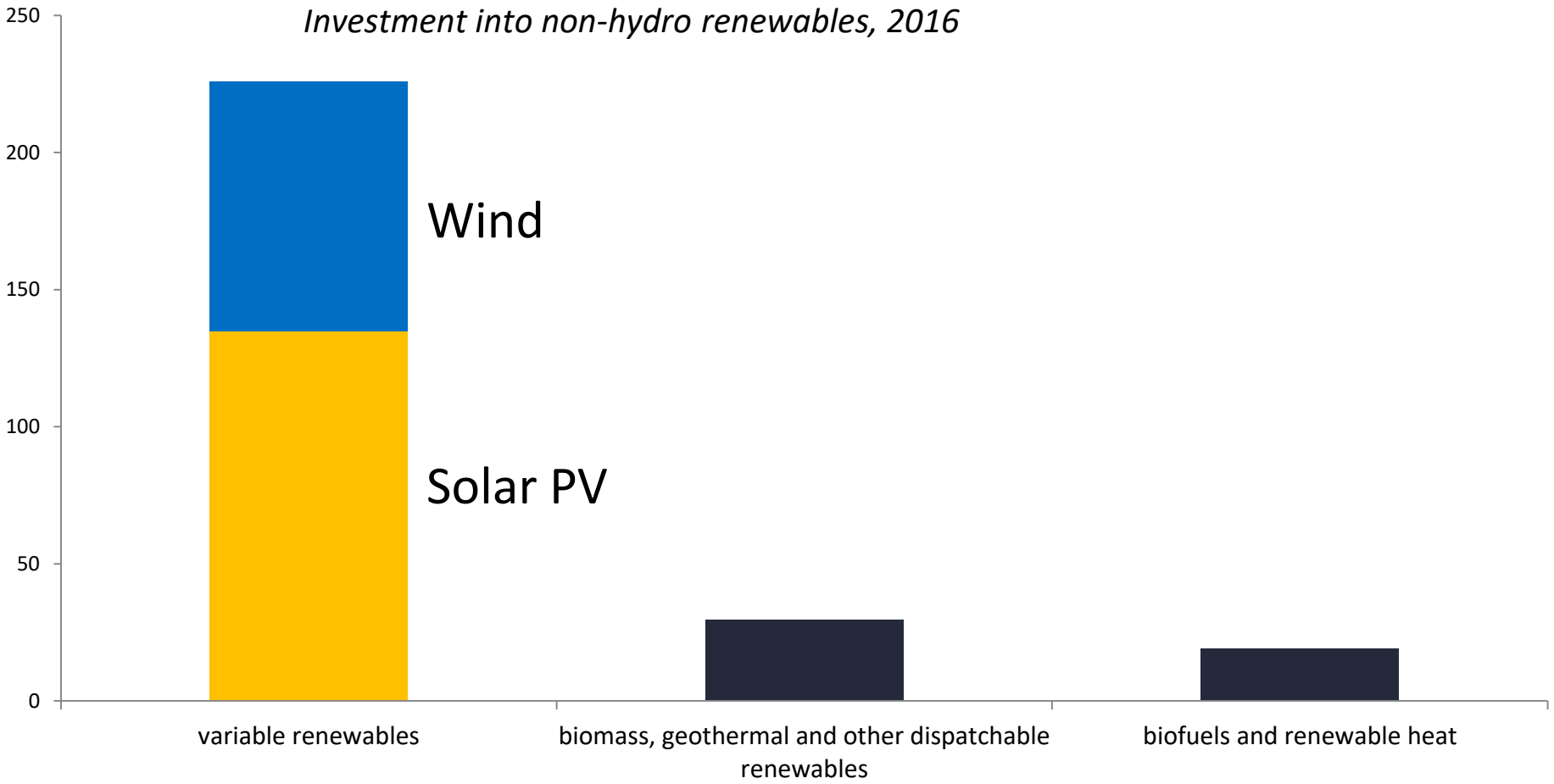
Imagine an alternative universe where

Large-scale deployment of baseload nuclear and geothermal replaces baseload coal

Rapid progress with advanced biofuels provides low-carbon fuel for internal combustion engines

In this case we would have a “copy paste” transition without needing to rethink energy systems.

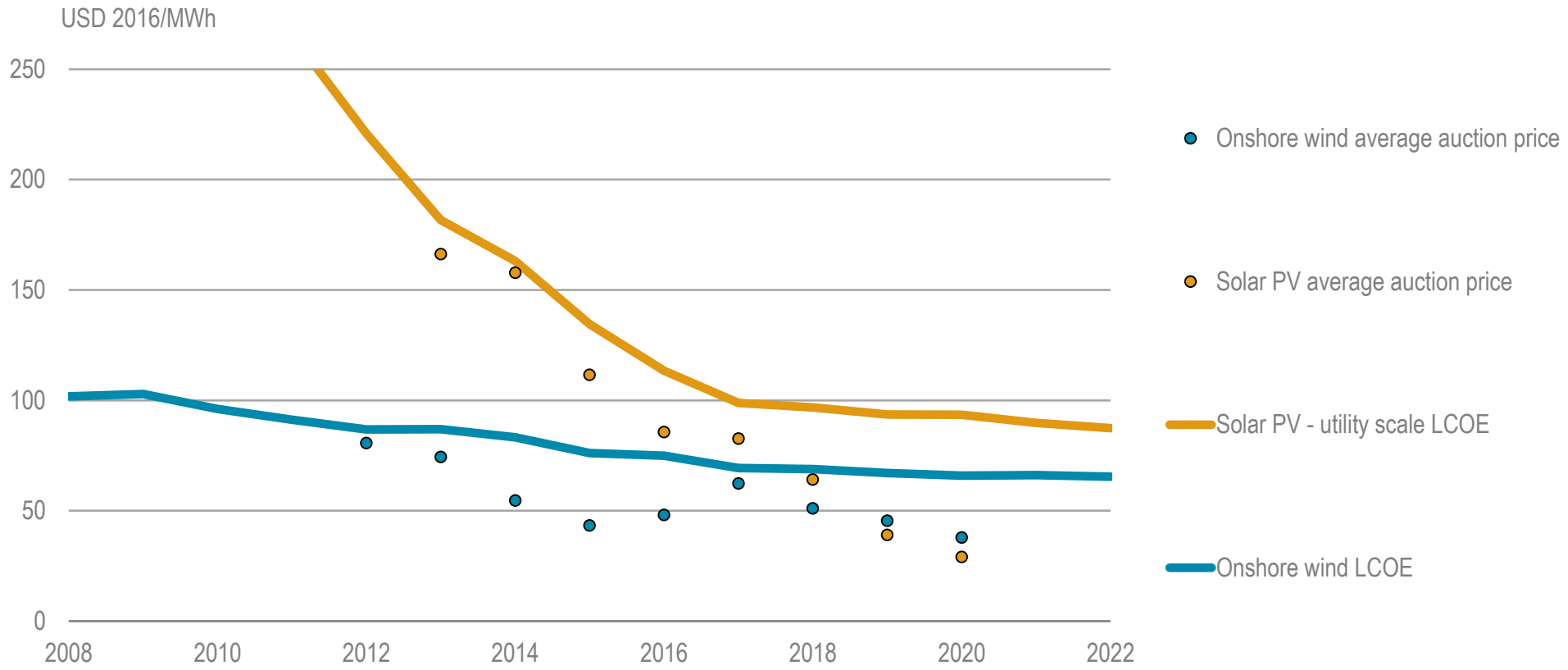
Instead, low-carbon investment is increasingly dominated by wind and solar PV



Asymmetrical technological progress with wind and PV are driving electrification and necessitates a system transformation.

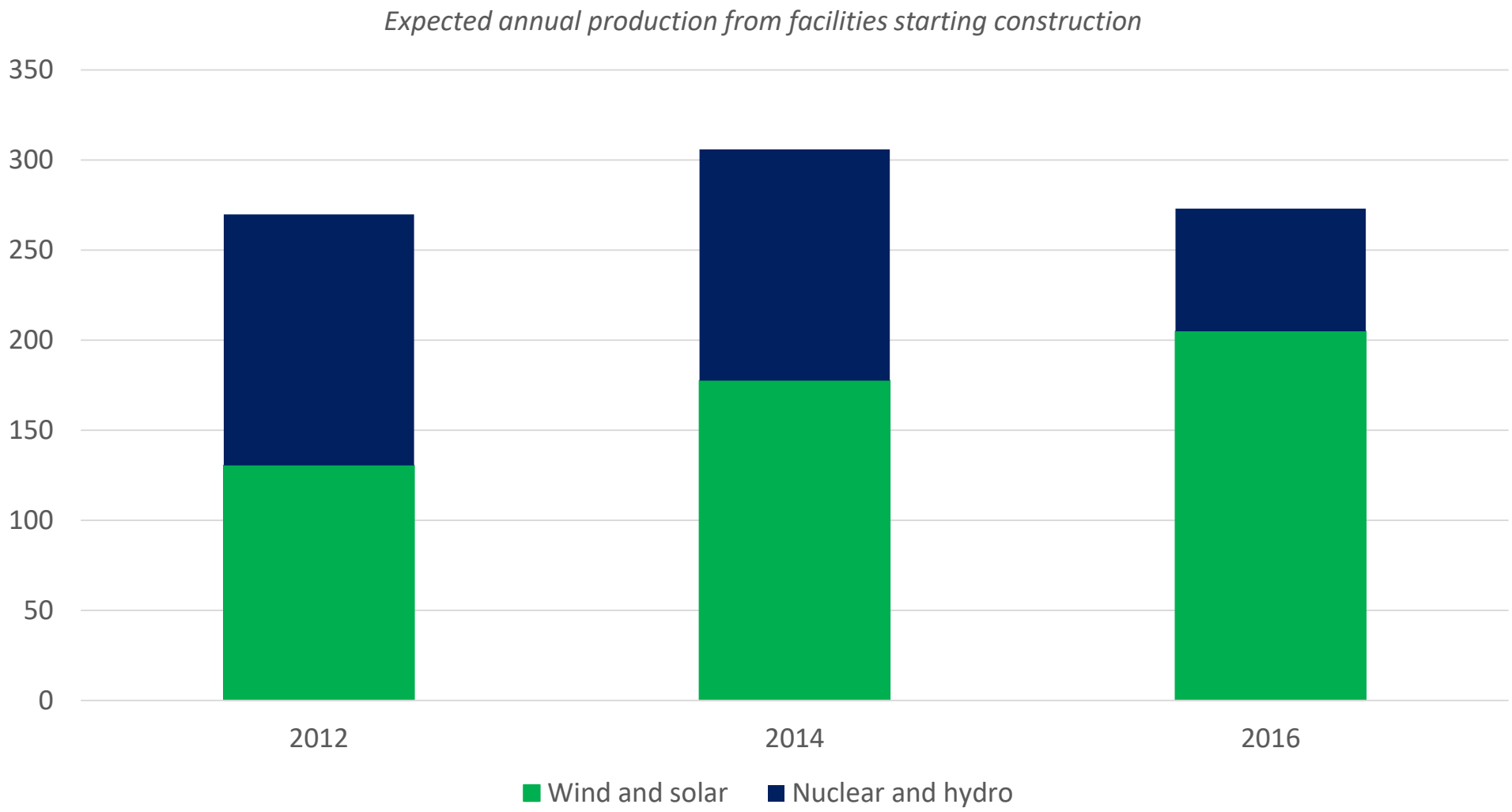
Wind and solar: technology, finance, policy design

Wind and solar PV average LCOEs and auction results by commissioning date



Competitive auctions combine technology incentives with ultra low cost of capital

The headwind of the hydro and nuclear slowdown



New low-carbon investment covers only around half of the global electricity demand increase.

The so called “decentralized” renewables

Investment into the electricity network is an essential component of the transition

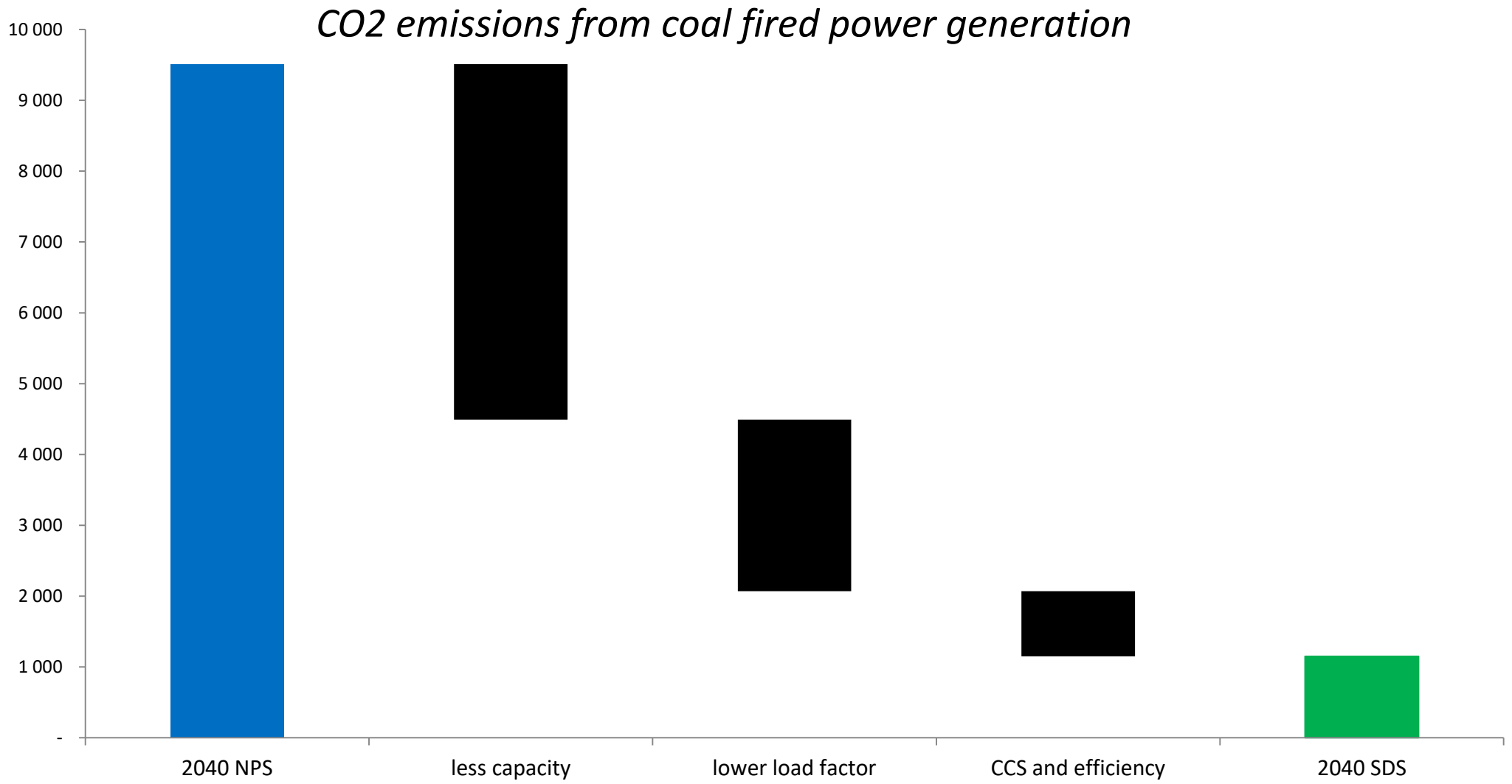
Innovation and new business models in electricity networks

Undersea DC interconnection with a merchant business model, North Sea

Distributed storage solutions substituting for transmission upgrades, New York

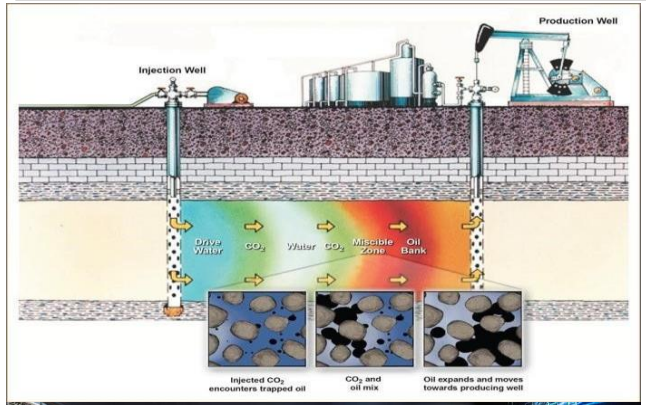
While the bulk of the interconnected system remains a regulated monopoly, competitive solutions emerge at the edges.

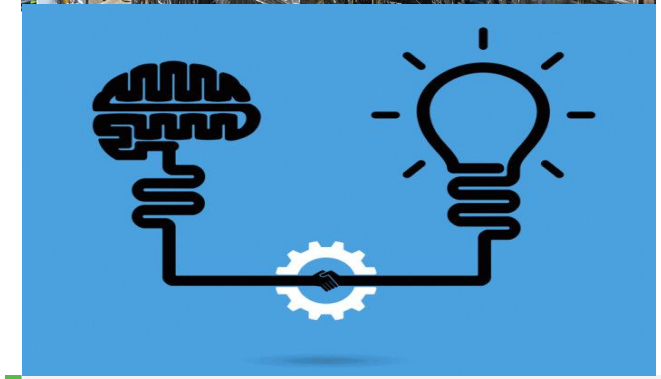
Hardly any room for coal plant emissions in the carbon budget



In SDS there is little new coal plant investment and most face CCS retrofit or early retirement

Carbon capture and storage: coming back to the game





USA: 45Q creates a new, viable business model for CCUS

China: the first CCS/coal conversion project started construction

EU/Japan: increasing interest and venture capital funding into innovative utilisation pathways through H2

CCUS investment is indispensable for a well below 2 degrees stabilization

A self driving electric future for transport, this time for real

LECTRICITY MAY BE THE DRIVER. One day your car may speed along an electric super-highway, its speed and steering automatically controlled by electronic devices embedded in the road. Highways will be made safe—by electricity! No traffic jams . . . no collisions . . . no driver fatigue.

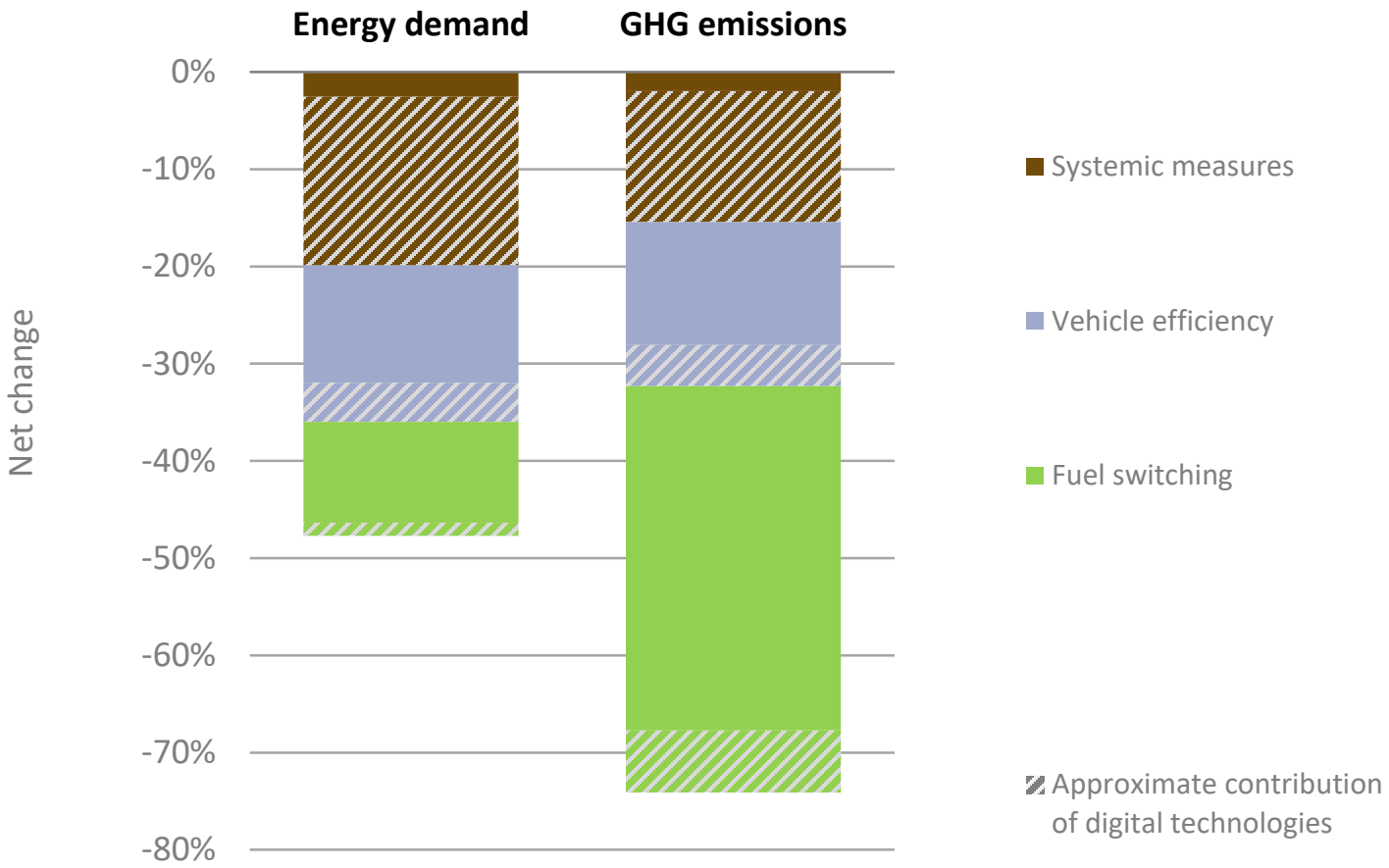
Power Companies Build for Your New Electric Living

Consumer preferences and oil demand

The three best selling vehicles in North America

In most major car markets the average size of new cars is increasing.

Trucks: electrification and digitalisation

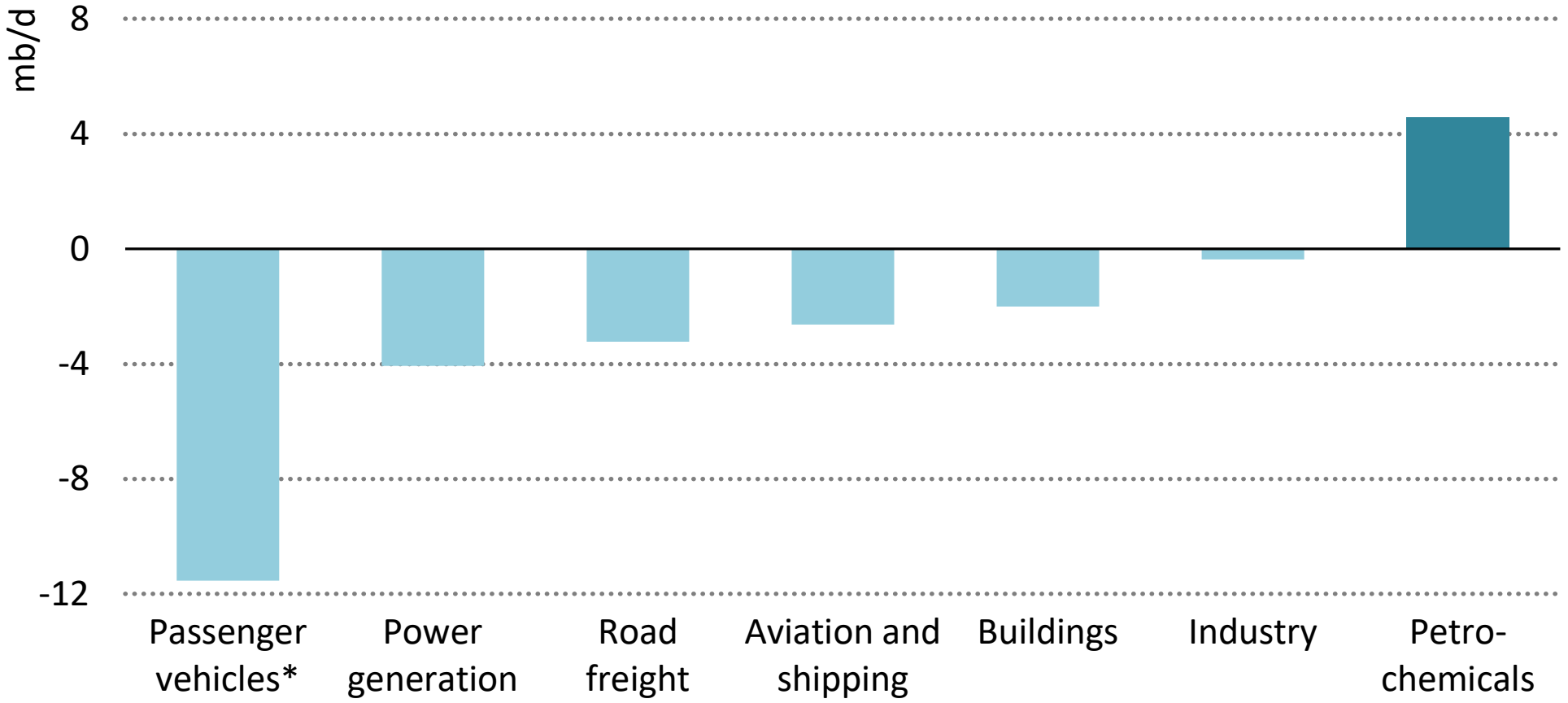


Source: IEA (2017). The Future of Trucks: Implications for energy and the environment.

Digital solutions for trucks and logistics could reduce energy use for road freight by 20-25%.

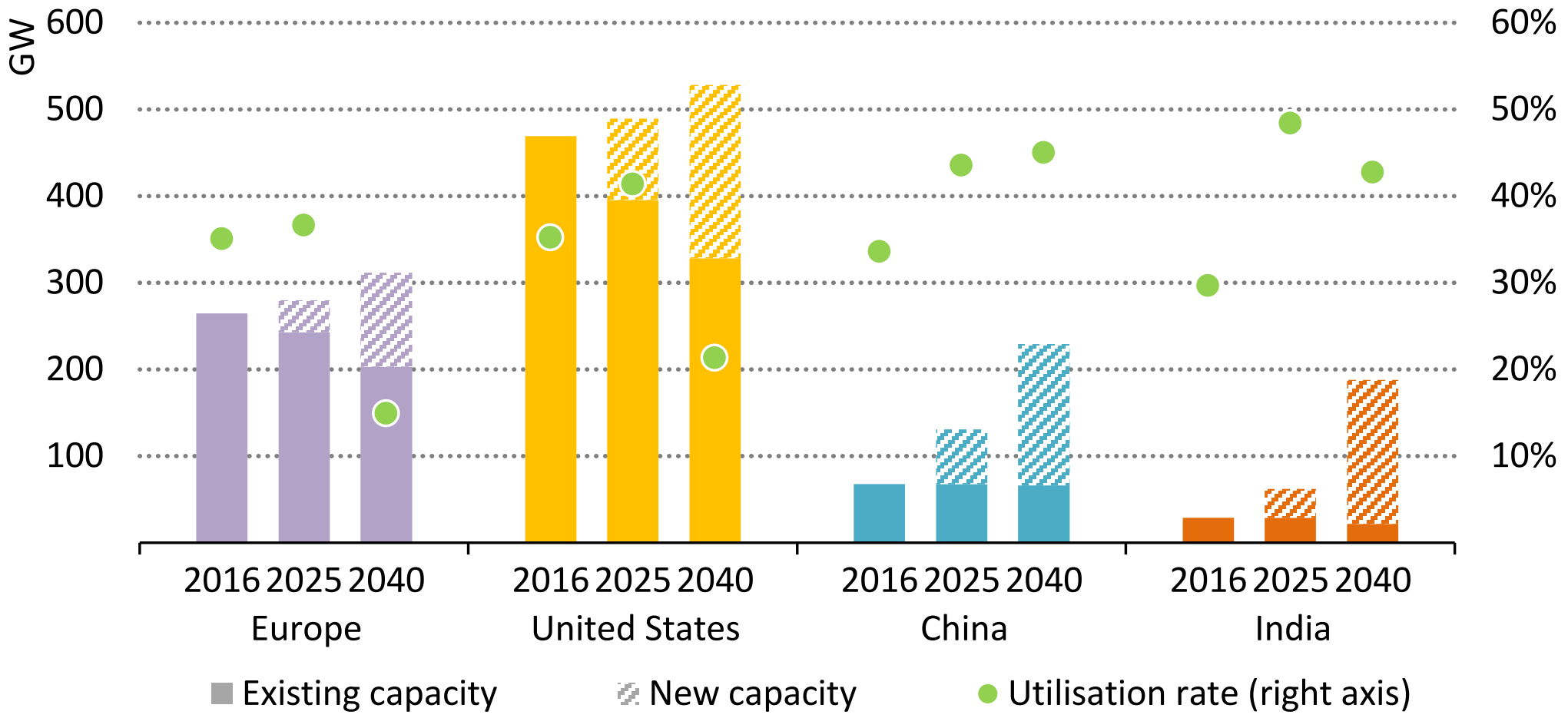
In SDS by 2030s global oil demand decline exceeds 1 million B/day annually

Change in global oil demand in the Sustainable Development Scenario



But even in SDS, oil serves the majority of transport energy needs till 2040.

Gas capacity remains essential for electricity security



Renewables constrain the load factor of gas, making it essential to have a market design that provides a sustainable business model.

The role of gas: recent investor perception

GE to Cut 12,000 Jobs in Its Power Business

By **Rick Clough**
07 December 2017 12:09 *Updated on* 07 December 2017 16:50

January 26, 2018 6:05 am JST

Renewable energy rise forces layoffs at Mitsubishi Hitachi Power

Rival manufacturers of fossil-fuel power stations also cutting jobs

BUSINESS NEWS NOVEMBER 16, 2017 / 4:05 PM / 3 MONTHS AGO

Siemens to cut 6,900 jobs to tackle flailing turbines business

G.E. Cuts Jobs as It Navigates a Shifting Energy Market

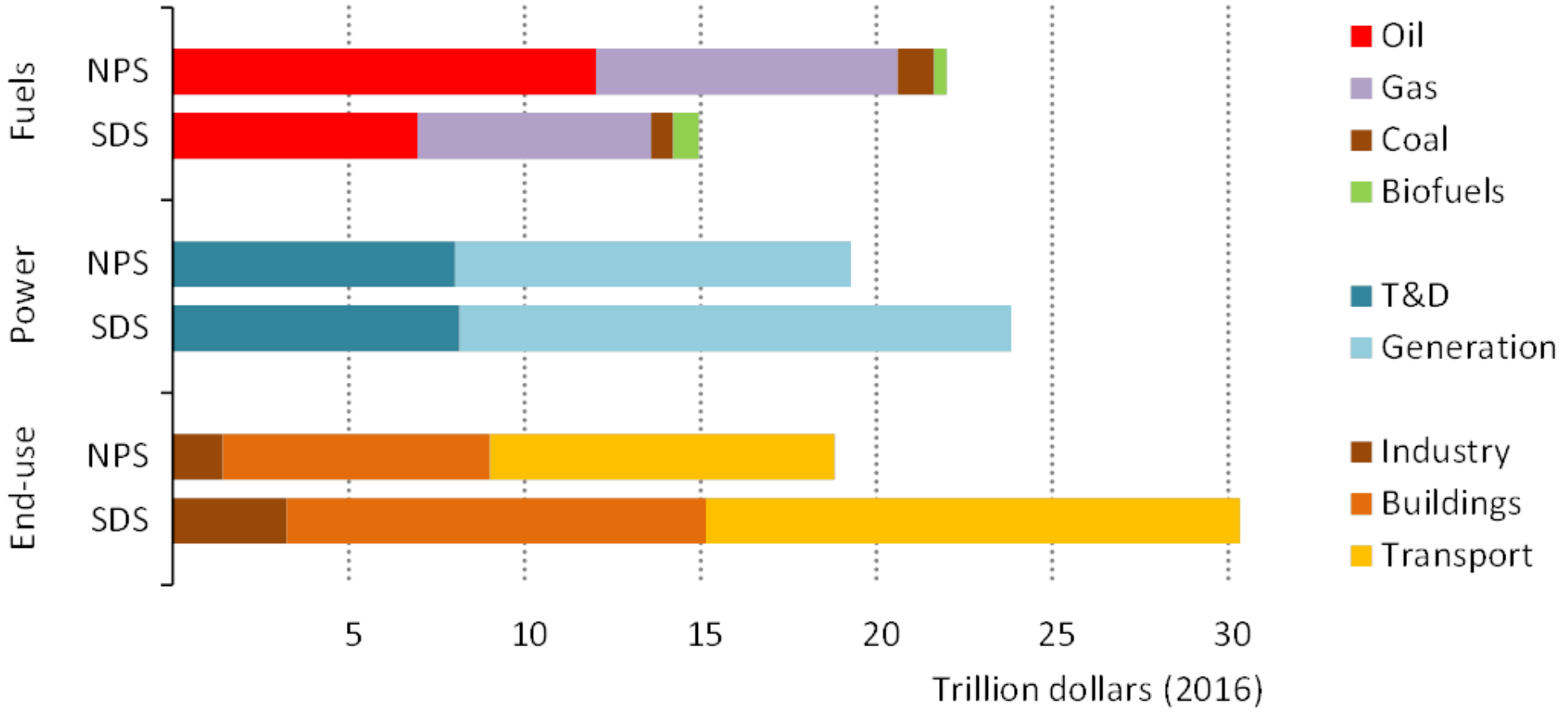
By **TIFFANY HSU** and **CLIFFORD KRAUSS** DEC. 7, 2017

GE and Siemens: power pioneers flying too far from the sun

The two industrial titans are struggling to cope with the disruption to their business models from wind and solar

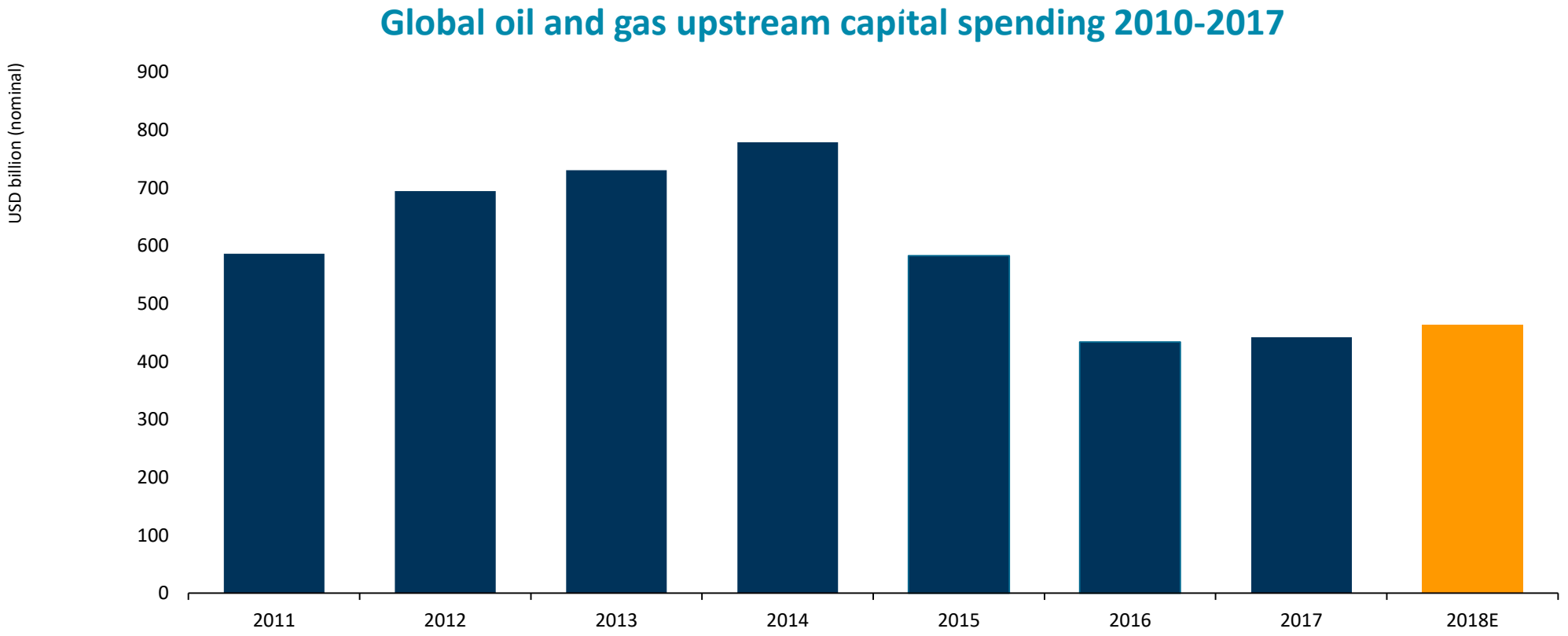
d Crooks in New York and **Patrick McGee** in Frankfurt NOVEMBER 12, 2017 55

Oil and gas investment remains substantial in SDS



Even the robust policy assumptions of SDS lead to a lower demand decline than the natural depletion of production.

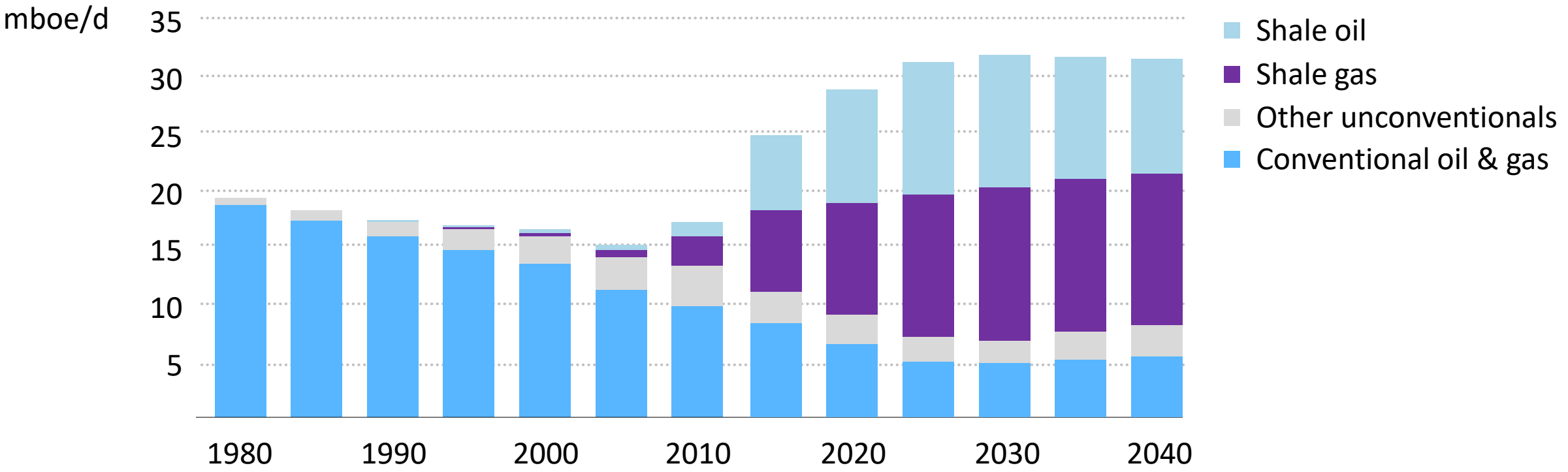
Upstream overinvestment concerns: Generals preparing for the previous war?



The cyclical downturn from 2015 generated a proportionally bigger investment decline in two years than the NPS to SDS transition.

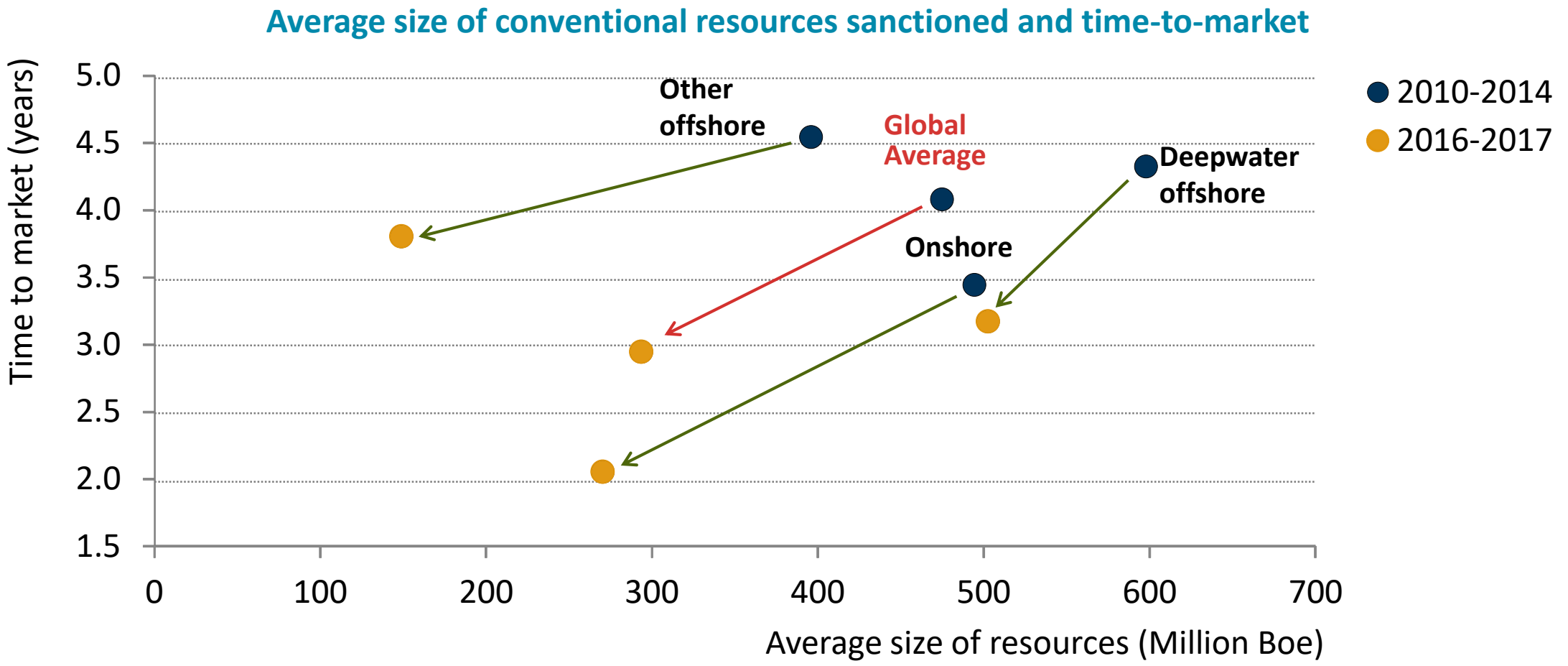
US shale: the largest single component of supply growth

Oil and gas production in the United States



With a short investment cycle and widespread hedging climate related stranded asset risk is practically zero with US shale.

Conventional oil and gas projects becoming faster and smaller



A shift in company strategies and technology developments leads to shorter project cycles across all the oil and gas industry.


iea

Financing Challenges for an Energy Industry in Transition

WPC symposium

Angus McCrone

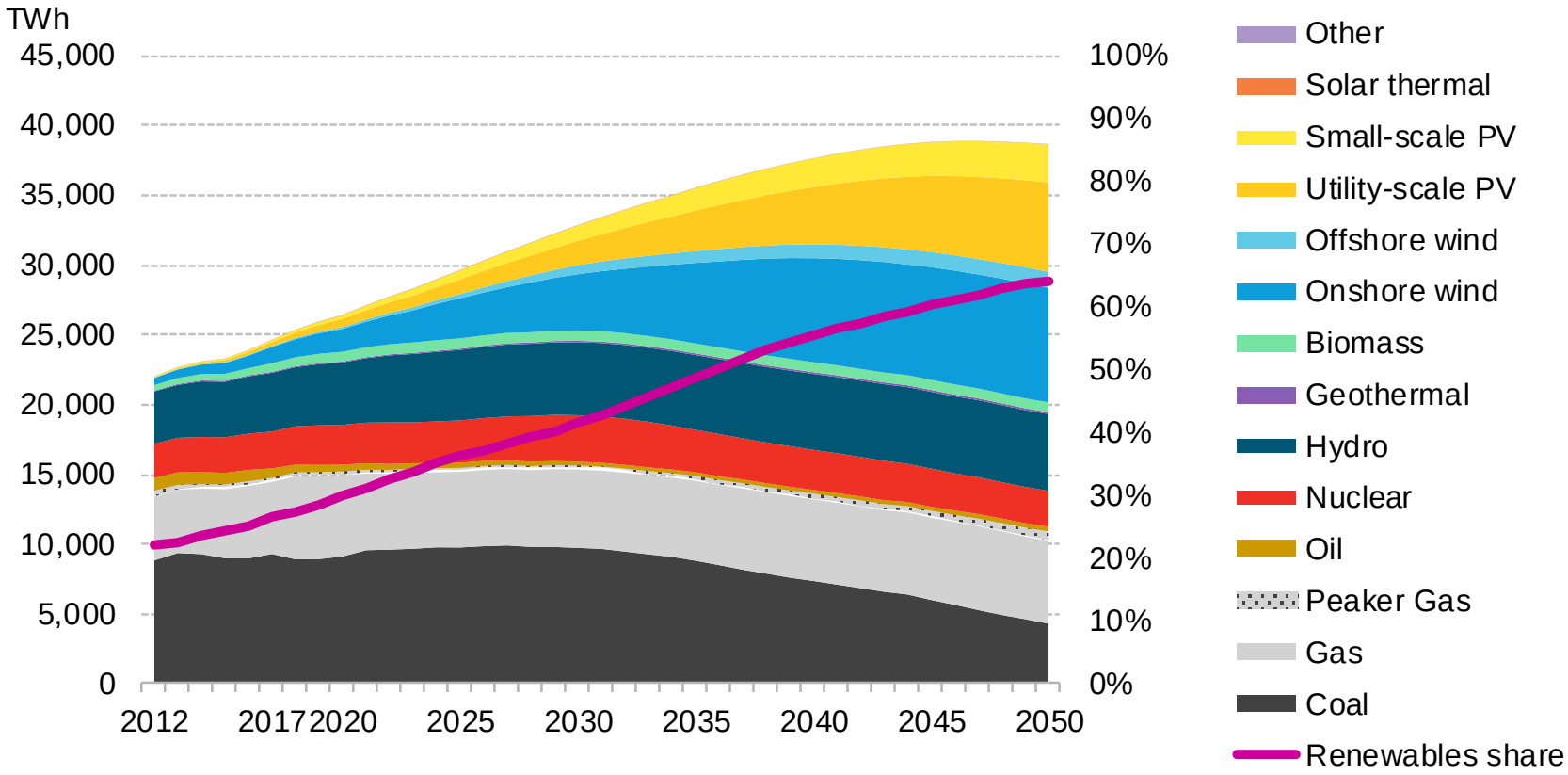
June 26, 2018

Bloomberg New Energy Finance

2018 BNEF focus areas

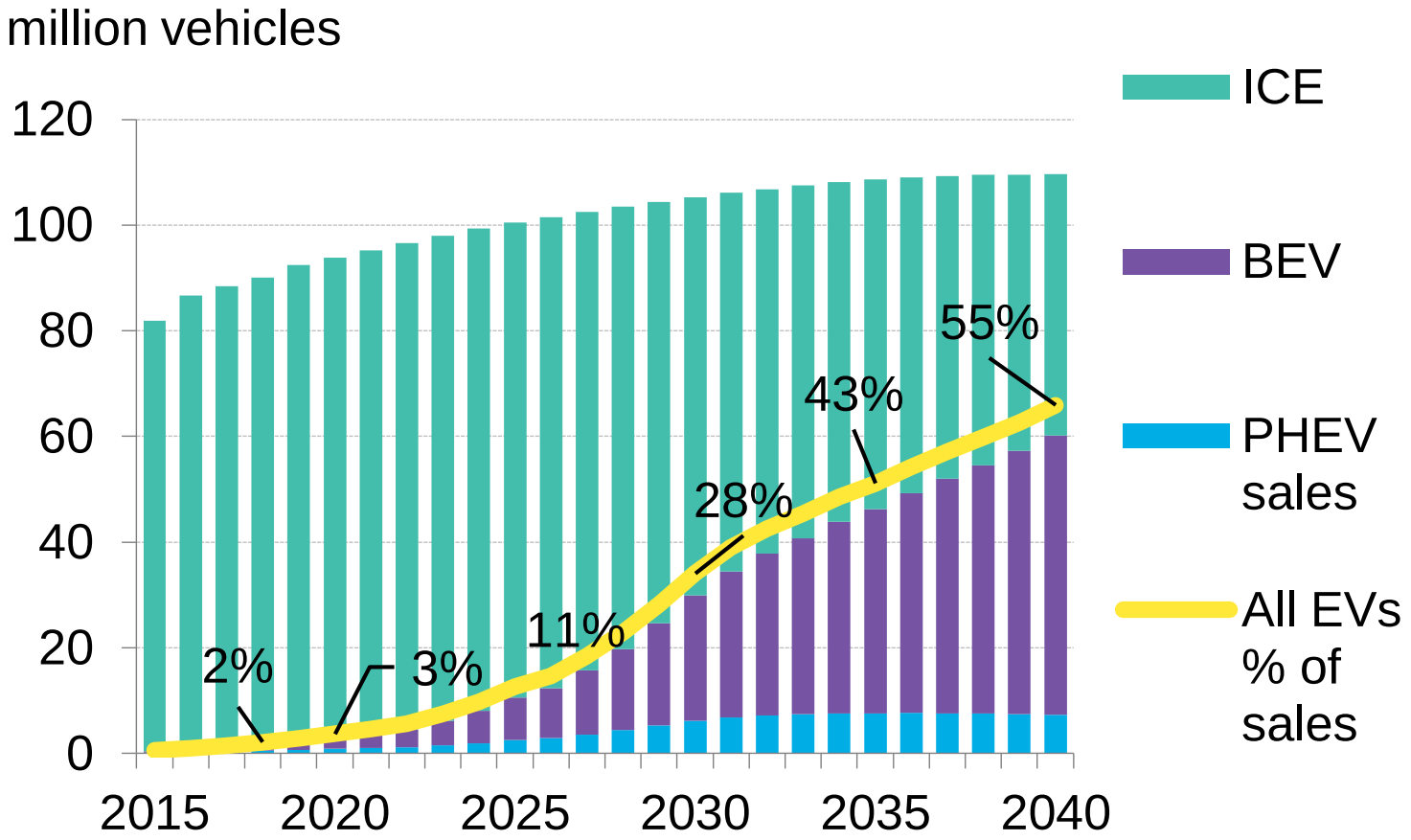
Investment	Markets	Customers	Technology	Strategy
Energy investment policy Renewable energy auctions and evolving support mechanisms, trade wars and pacts, levelized costs of electricity generation, merchant risk	**Power market design and price formation** Capacity / reliability mechanisms, market integration, integration of distributed resources, retail tariffs, power market forecasts, merit order shifts, realized power prices, impacts of renewable energy	**Decentralized energy** Consumer PV and storage, EV charging, dynamic demand, community solar, peer-to-peer trading, virtual power plants, behind-the-meter business models, valuing distributed resources, regulatory reform for distributed energy	**Transformative technologies** Industrial IoT, solar/ wind technology breakthroughs, software and hardware for distributed assets, blockchain, machine learning, advanced materials and metals, hydrogen for flexibility, carbon capture & storage	**Evolving utility and oil & gas strategies** Investments and M&A, international expansion, innovation, centralized vs distributed approaches, new retail opportunities, competition, business models, and impact of regulatory reform
Emerging market opportunities Increasing power demand, grid infrastructure needs, one belt one road, solar-diesel hybrids, micro-grids and energy autonomy, energy access to the 1 billion, LNG imports, public-private financing	**Grid flexibility and resilience** Changing load profiles, balancing across different time horizons, network constraints, flexible resources including batteries, demand response, electric vehicles and natural gas, climate implications	**Corporate energy and sustainability** Corporate energy procurement (C&I), ESG, green finance, green bonds, green investors, demand from corporate buyers, corporate energy security and resilience	**Electrified and autonomous mobility** Electric vehicles, policy support, charging infrastructure and grid integration, commercial fleet electrification, access over ownership, business models, autonomous systems	**Questioning demand orthodoxies** Changing power demand, oil and gas demand displacement from EVs, rising lithium demand from batteries, LNG competitive economics, shipping fuel substitution

NEO 2018: Global electricity generation by technology



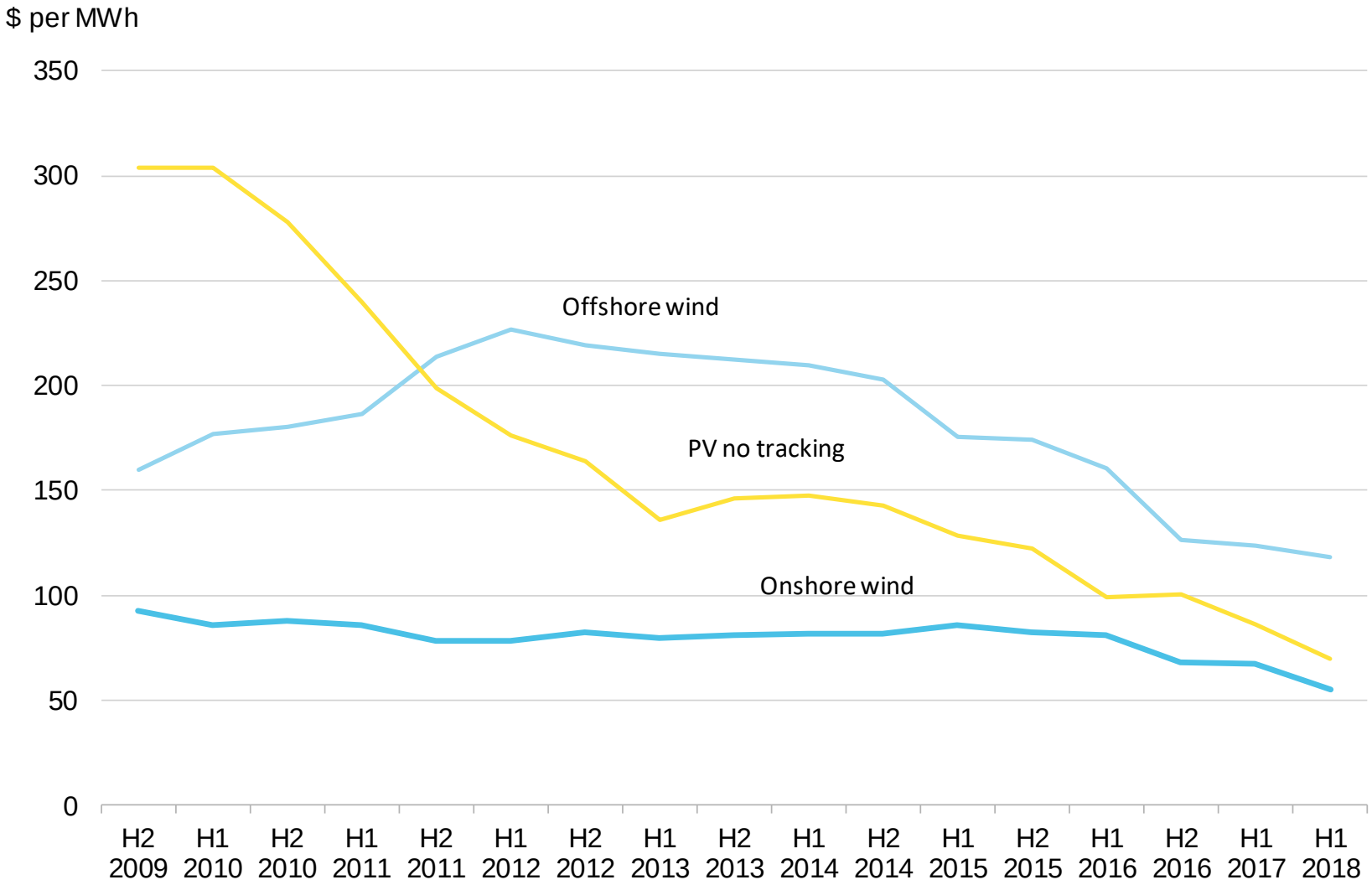
Source: Bloomberg New Energy Finance

EVO 2018: Annual global light-duty vehicle sales



Source: Bloomberg New Energy Finance

Global benchmark solar and wind LCOE



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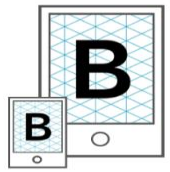

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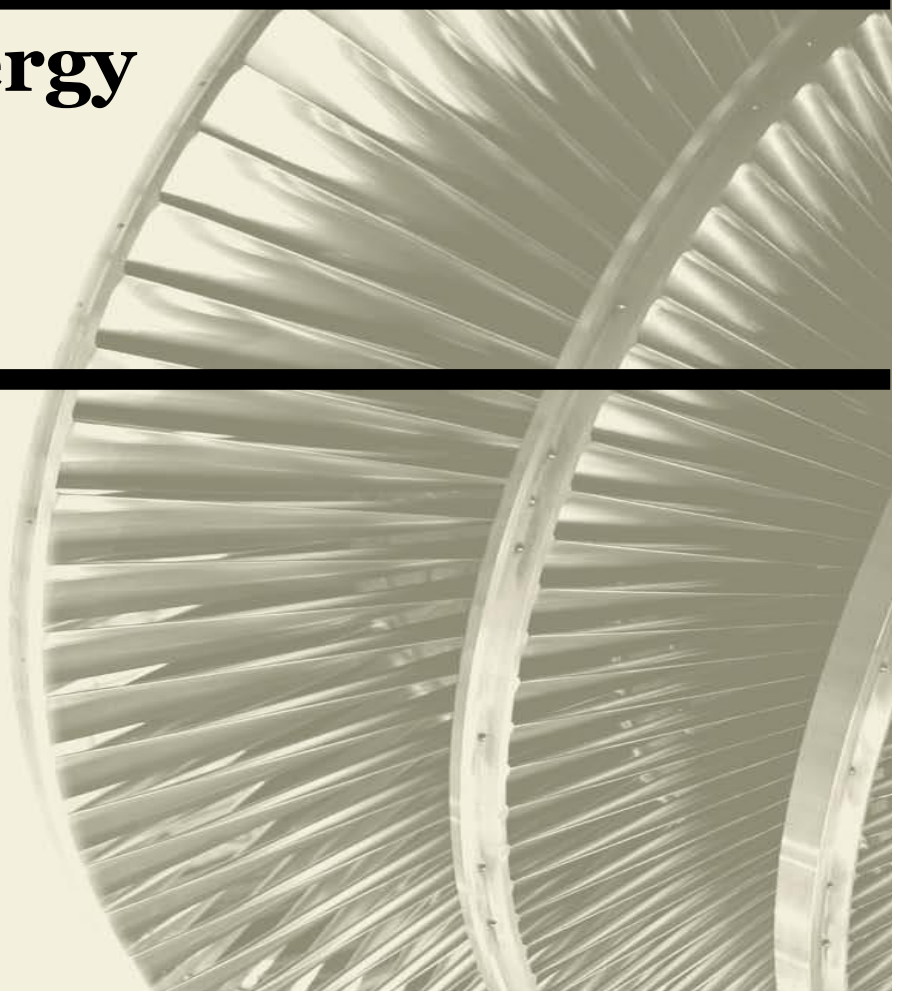
Renewable Energy Infrastructure



Presentation to

Financing challenges for an energy industry in transition
Tuesday 26 June 2018, Deloitte, London

Private and Confidential

Glennmont Partners

Delivering sustainable returns from energy investment

€1.2bn+ under management

Infrastructure in Clean Energy

- Electricity power stations – not technologies
- Predictable long term cash flows
- Inflation linked revenue streams

Proven technologies in Europe

- Onshore wind, offshore wind, solar and bioenergy
- Strong growth through 2020 backed by targeted climate change legislation
- Euro focus: stable markets with transparent regulation

Predictable financial return

- Absolute return
- Early dividends

Fund I

- Closed at €437m
- Fully invested in 14 investments in 5 geographies across 3 technologies

Fund II

- Closed at €500m
- Follows a similar strategy to Fund I
- 11 investments made

Fund III

- First close at €198m. Second close at €248m.
- Follows a similar strategy to Fund I and Fund II

Team

- Combined financial and technical experience spread across the team
- Experience throughout the investment process cycle

Supported by Blue Chip Investors

Glennmont investors include:

- BNP Paribas
- Dutch corporate pension fund
- Dutch sector pension fund
- Belgian insurer
- Japanese pension fund
- UK local authority
- A German Pensionskasse
- A German insurer
- A Swedish insurer
- An Korean insurer
- US Fund of Funds

PGGM

DSM BRIGHT SCIENCE. BRIGHTER LIVING.

UBS Global Asset Management

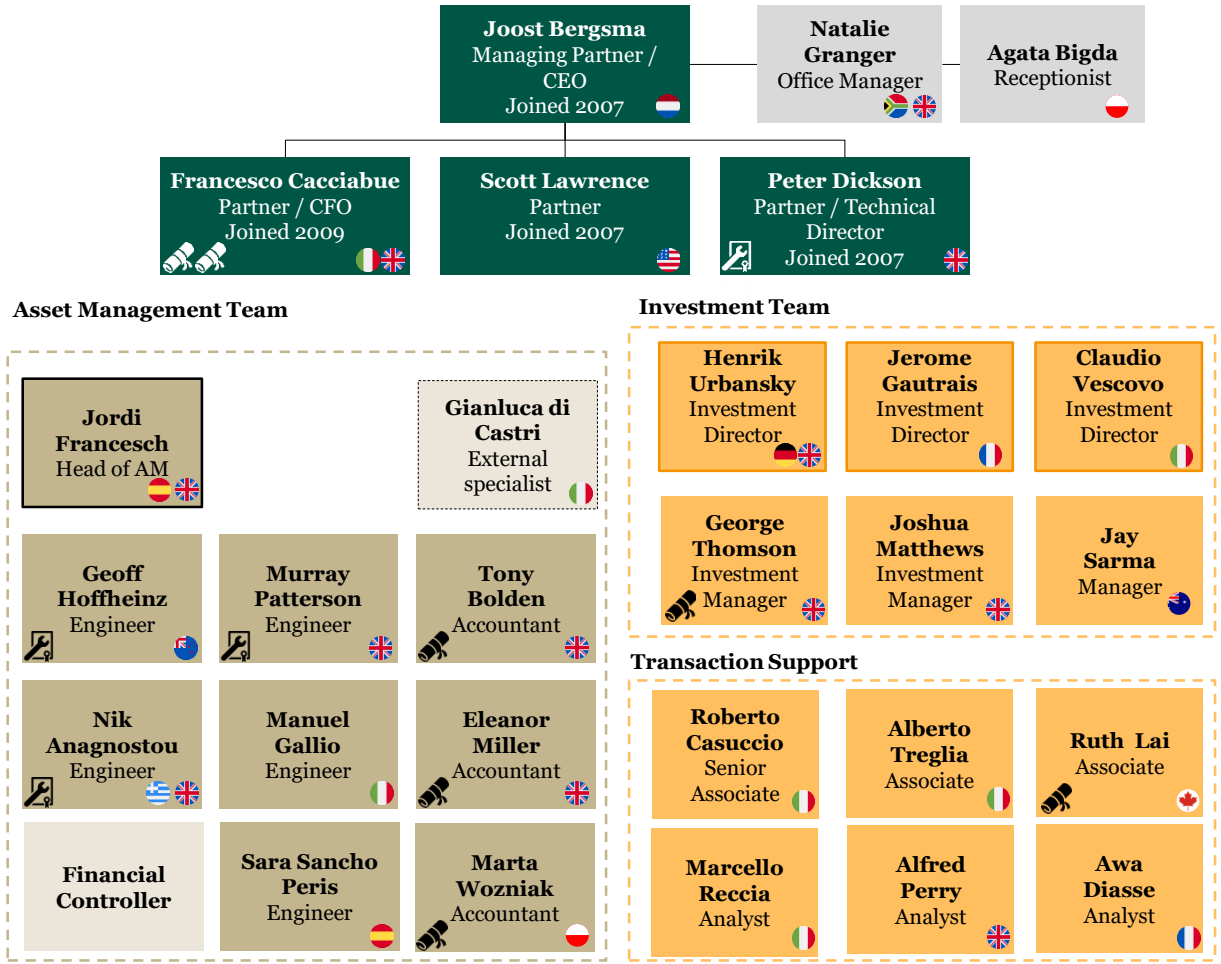
MERCER

PGB pensioendiensten

European Investment Bank

Well-established team

Multi-disciplined teams across all investment stages



Team qualifications

Experienced team:

- 100+ years of combined experience in renewables and energy sectors
- Fully-dedicated Technical Director
- Entrepreneurial and legislative experience in clean energy
- Deal structuring experience (project finance and private equity)
- Access to local markets (>10 nationalities & languages spoken)

In-the-field qualifications:

- Significant networking within key clean energy markets and countries
- Speak same languages as sellers
- Agility to sort and execute opportunities

Nationality CFA / Chartered Accountant Chartered Engineer

Young cash yielding portfolio in four clusters

Fund I

UK & Ireland

1	12.5 MW wind farm (2014)
2	25.0 MW wind farm (2010)
3	20.0 MW wind farm (2010)
4	38.5 MW straw-fired biomass plant (2011)

France

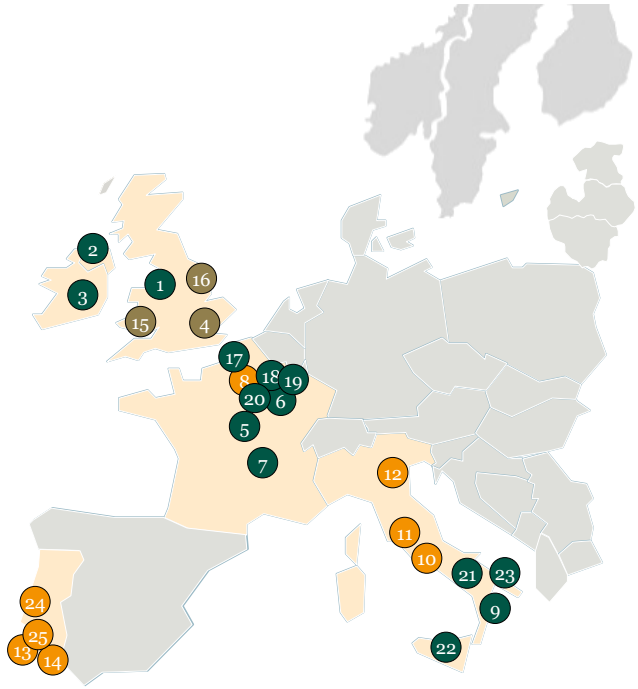
5	12.0 MW wind park (Dec 2006)
6	12.5 MW wind farm (2009)
7	35.0 MW wind park (2012)
8	55.0 MWp solar portfolio (2012)

Italy

9	30 MWp wind farm (2012)
10	13.2 MWp solar park (2010)
11	24.2 MWp solar park (2010)
12	48.0 MWp solar park (2012)

Portugal

13	6.7 MWp solar park (2013)
14	22.7 MWp solar park (2012)



Wind markets / Wind Asset

Solar PV markets / Solar Assets

Bioenergy markets / Bioenergy Assets

Fund II

UK

15	40 MW biomass plant in Wales (2015)
16	40 MW biomass plant in England (2015)

France

17	20.4 MW wind portfolio (2014)
18	25.0 MW wind portfolio (2014)
19	18.4 MW wind farm (2015)
20	20.0 MW wind farm (2015)

Italy

21	60.0 MW wind portfolio (2015)
22	245 MW wind farm portfolio (2016)
23	10 MW wind farm (2017)

Portugal

24	4.4 MWp solar park (2013)
25	18 MWp solar park (2014)

On Shore Wind Energy - continues to grow rapidly

Overview

Smart Turbines

Taller / cheaper

Repowering

Biomass - Base Load Power Generation

Overview

24hrs /7 days week

Circular economy

Feedstock

Solar Power - Fastest Growing Segment

Easy to Integrate

Q & A

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CEO / Managing Partner
Glennmont Partners

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Distributed Energy

the key element disrupting the utility business model

Wim Heuninck
Sr. Advisor to the Board

Energy Transition

DECARBONISATION

DIGITALISATION

DECENTRALISATION

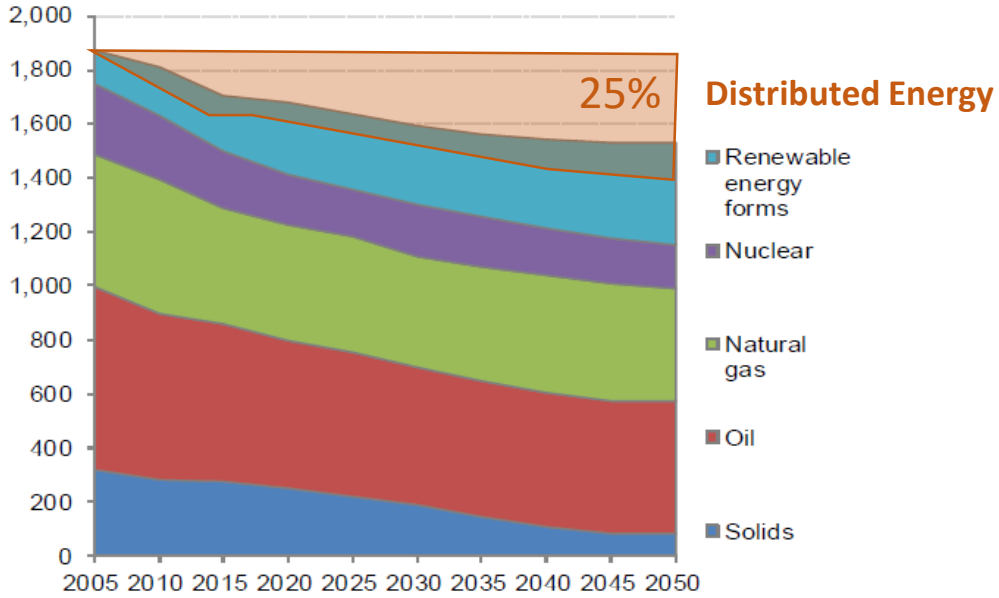
Three major **trends** are shaping the energy revolution

New Energy Ecosystem based:

- **Service**
- **Economies of scale on the demand side**
- **Open & Flexible**
- **Prosumers** (Producers & Consumers at same time)

Distributed Energy

Flexible and Efficient Power for the Future Energy Mix



EU28: Gross Inland Demand [1]

Worldwide DE market = **$130 Billion** in 2015 [3]

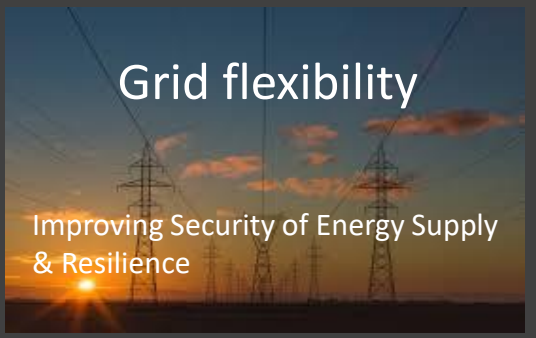
- EU DE Market: $32 Billion

Decline in demand thanks to **Energy Efficiency** improvements [2]

- By 18.4% (relative to 2007 baseline) in 2020.
- By **23.9%** in 2030

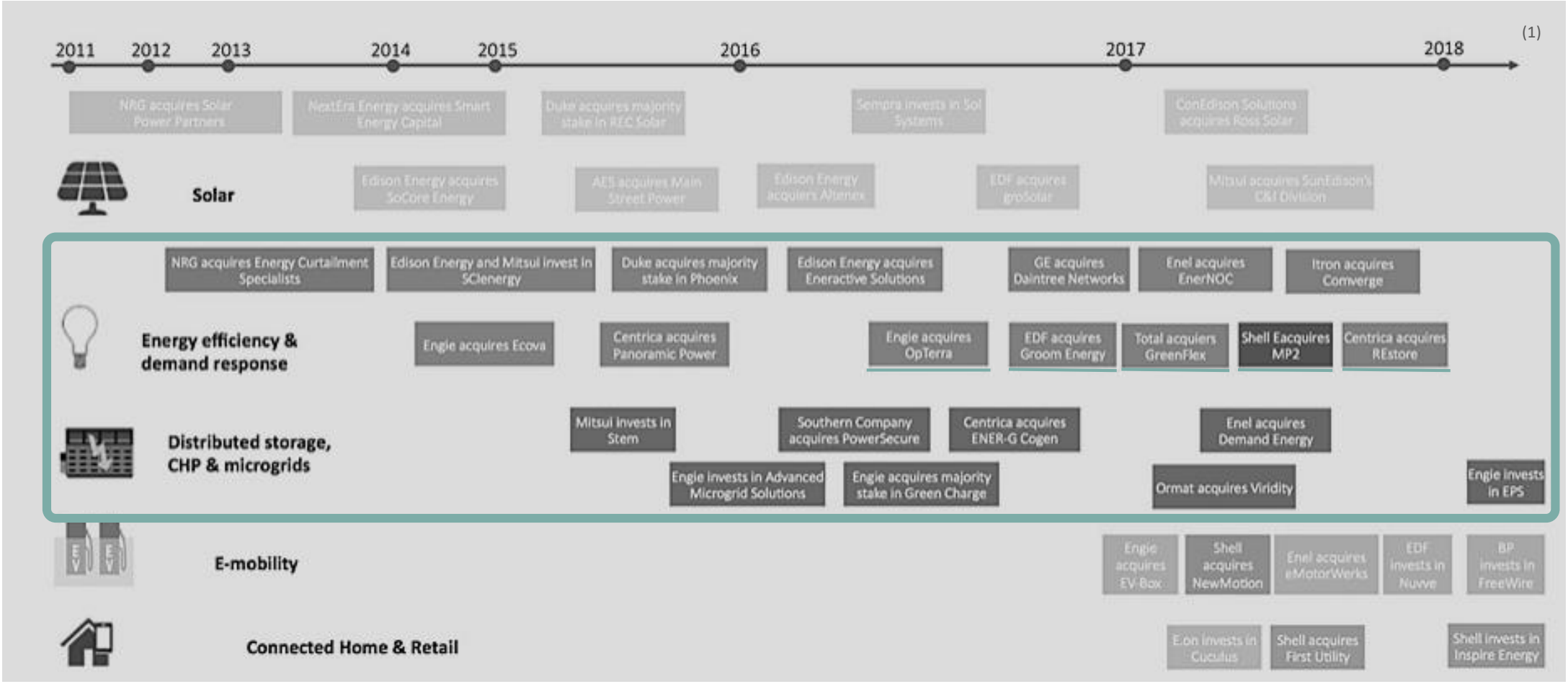
DE is a concept which include a diverse kind of generation, energy efficiency, heating and cooling, storage and energy monitoring and control solutions.

DE can be tailored to very specific requirements and users' applications including cost reductions, resilience and CO_2 reduction.



Source:
(1) IEA – World Energy Outlook 2017
(2) European Commission - EU Reference scenario 2016 – Energy, transport and GHG emissions – Trends to 2050.
(3) BCG Finding the Sweet Spot in Distributed Energy - https://www.bcg.com/publications/2017/green-energy-environment-power-utilities-finding-the-sweet-spot-in-distributed-energy.aspx

Energy Giants are investing in Distributed Energy

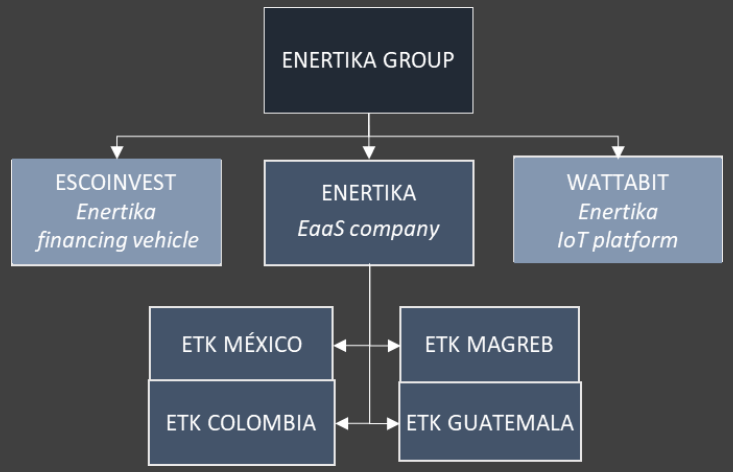


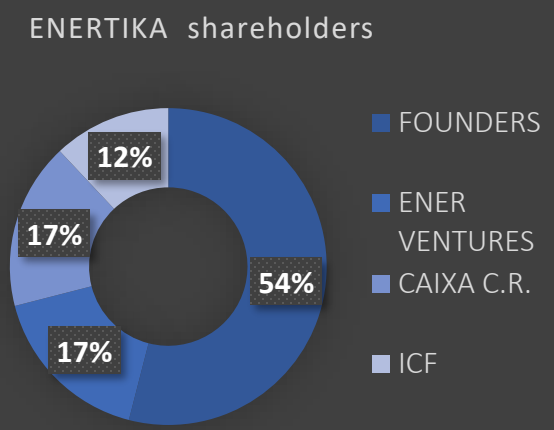
Source:
(1) Gtm reserch, February 2018

a first - mover providing integrated **EaaS** solutions for Cities & Industries

Since 2008 **Enertika** is an independent energy services company, leader in Spain, LatAm and Maghreb, delivering differentiated solutions in Energy Efficiency, Distributed Energy Generation, and Smart Energy Management.

Over the last few years, the company has been evolving into a **Distributed Energy Operator** with the **Energy-as-a-Service** (**EaaS**) business model.





DIGITIZATION

enertika

- Heating
- Cooling
- Power
- Lighting
- Compressed Air
- Demand Response

Services

Only pay for the service, ENERTIKA takes care of the rest

END-TO-END EaaS SOLUTIONS + ZERO INITIAL INVESTMENT + GUARANTEED SAVINGS + GUARANTEED PERFORMANCE & UPTIME + 100% REMOTE CONTROLLED + LONG-TERM FIXED* PRICE = **Zero-Risk** project for the client

Public Lighting as a Service
MARRAKECH (Morocco)

- 60,019 light points replaced
- Smart management service O&M
- Smart City pilot project included
- Investment € 22M
- Contract volume € 64M
- Contract duration 10 years
- **Savings 60.03% €1M/year**

Heating as a Service
University (Madrid, Spain)

- 21 Managed buildings
- 31 Renewed boiler room
- Retrofit 66 High efficiency condensing boilers, 5 solar ACS installations, smart management service, O&M
- Investment € 2.5M
- Contract volume € 7,5M
- Contract duration 9 years
- **Savings 24% € 360k/year**

Heating & Lighting as a Service
Nursing homes (Spain)

- 47 Managed buildings
- 13 Renewed boiler room
- Retrofit 11 low temperature + 2 biomass boilers, installation 11,064 LED, Smart management system, O&Mand
- Investment € 1.5M
- Contract volume € 4,5M
- Contract duration 6 years
- **Savings 29% € 322k/year**

Cooling as a Service
Base Stations (Mexico)

- 1,655 Managed sites
- 13 Renewed boiler room
- installation 1,655 FREE COOLING's smart management system, O&M
- Investment € 3.2M
- Contract volume € 8,5M
- Contract duration 6 years
- **Savings 25%**

Enertika has selected, analyzed, promoted, implemented and managed over 100 projects in different sectors such as telecommunications, automotive, logistics, food processing, retail, hospitality, buildings and public institutions.

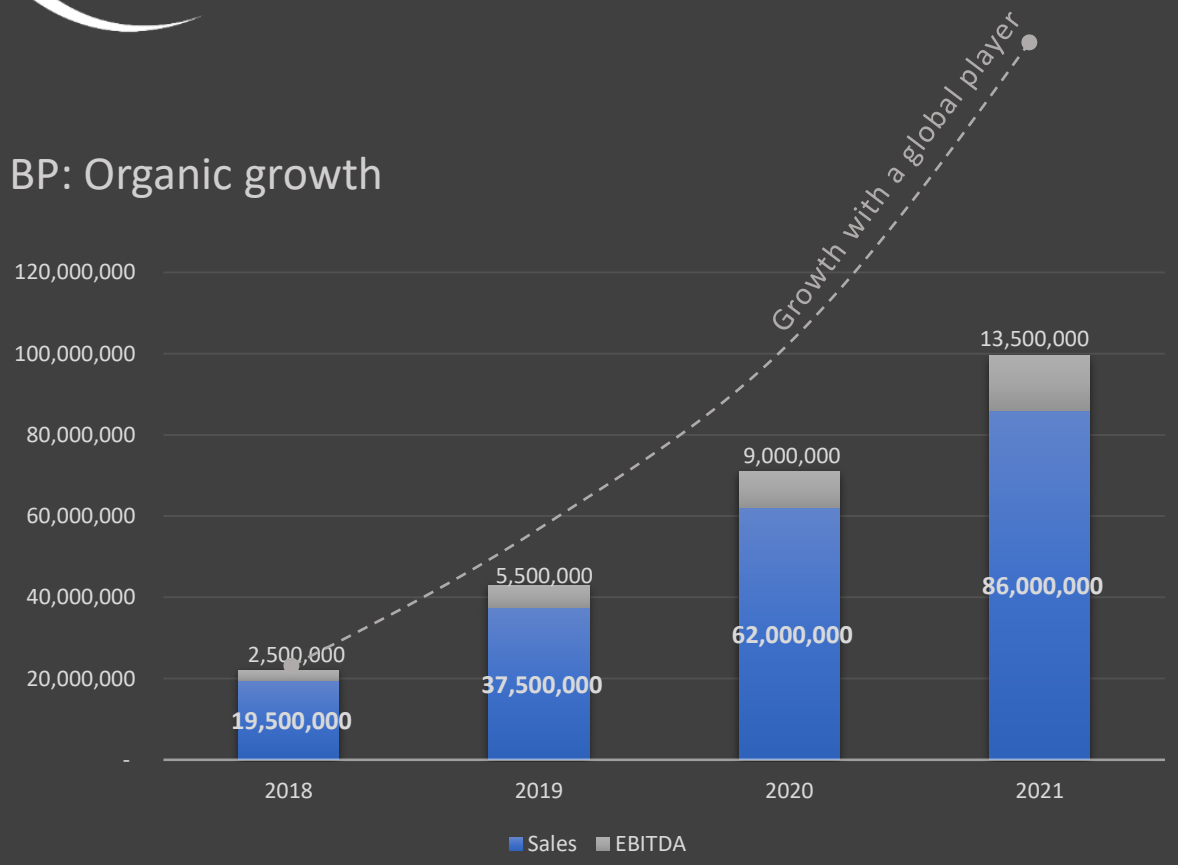
Enertika has a demonstrable track record in EaaS services for lighting, climate control, industrial processes and distributed power generation, aimed at reducing energy expenses and the associated direct & indirect costs.

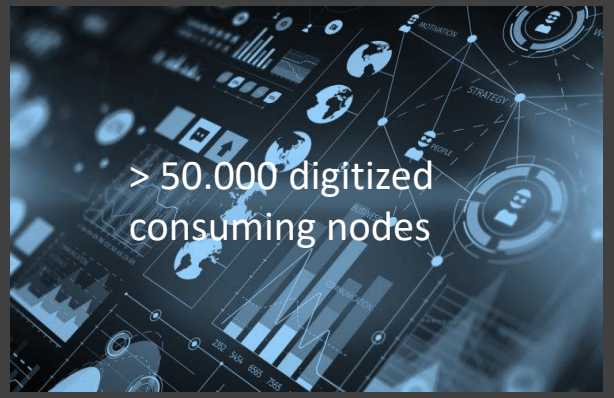
Some of the satisfied clients include:

cellnex, Telefonica, tigo, TORRECOM, orange, POLITÉCNICA, Ajuntament de Barcelona, madrid, MARRAKECH, saba, Domus, SEAT, GM, SOLB STEEL, URSA, MAPSA

enertika

BP: Organic growth





ENERTIKA a trusted partner to access the future Distributed Energy business

- Innovative End-to-End Model
- Track record
- Digitalization technology
- Brand acknowledgment
- Pipeline, Recurrence
- Demand aggregation
- DPG aggregation
- Internationalization

Repsol strategy

- Clarification and concretion
- Deployment speed
- Minimizing risk
- Opportunity Cost Optimization

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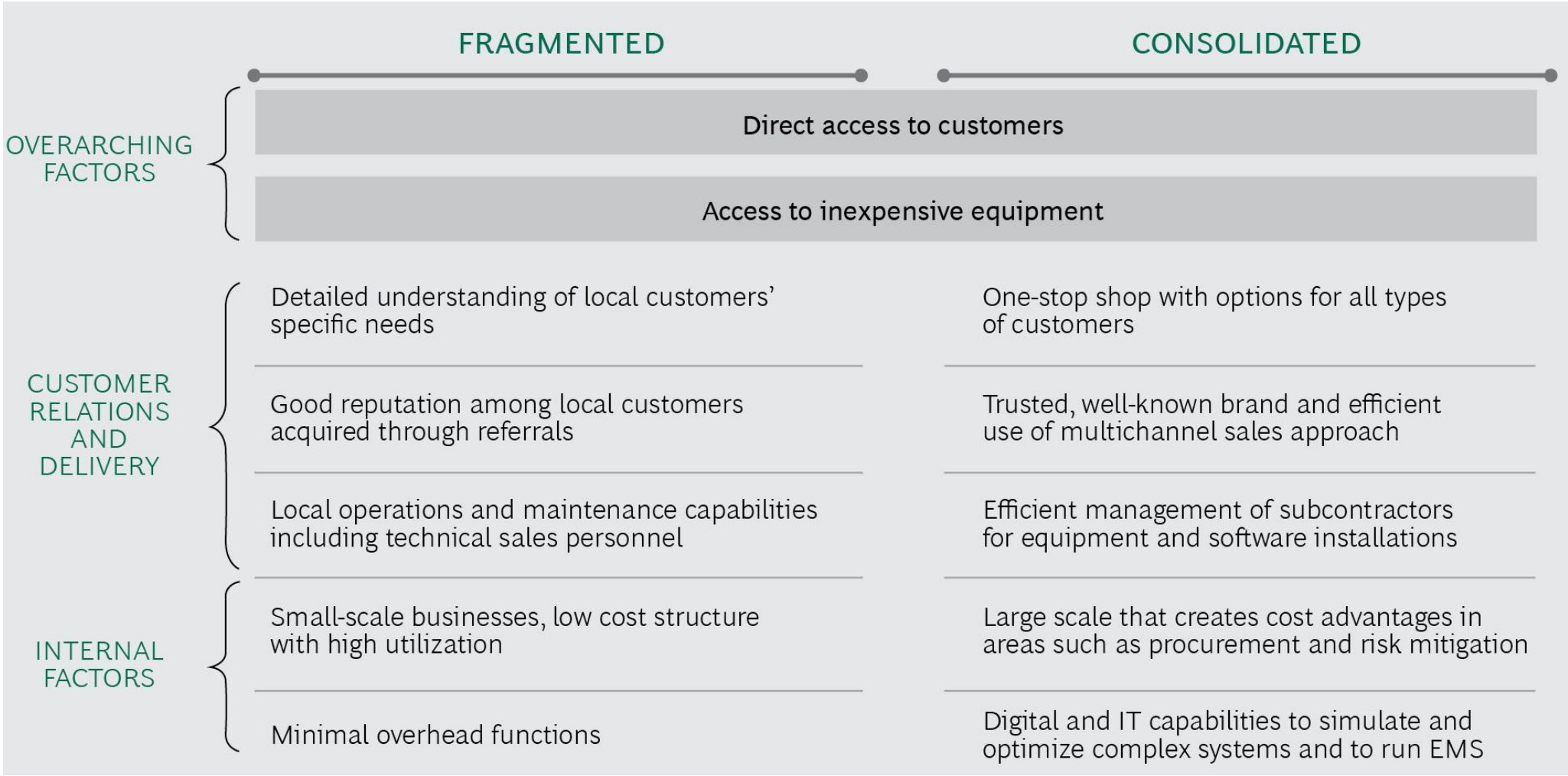
Maghreb Offices
Rabat
Marrakech

enertika

Searching for a partner to scale up becoming leader in a concentrated market

DE industry outlook

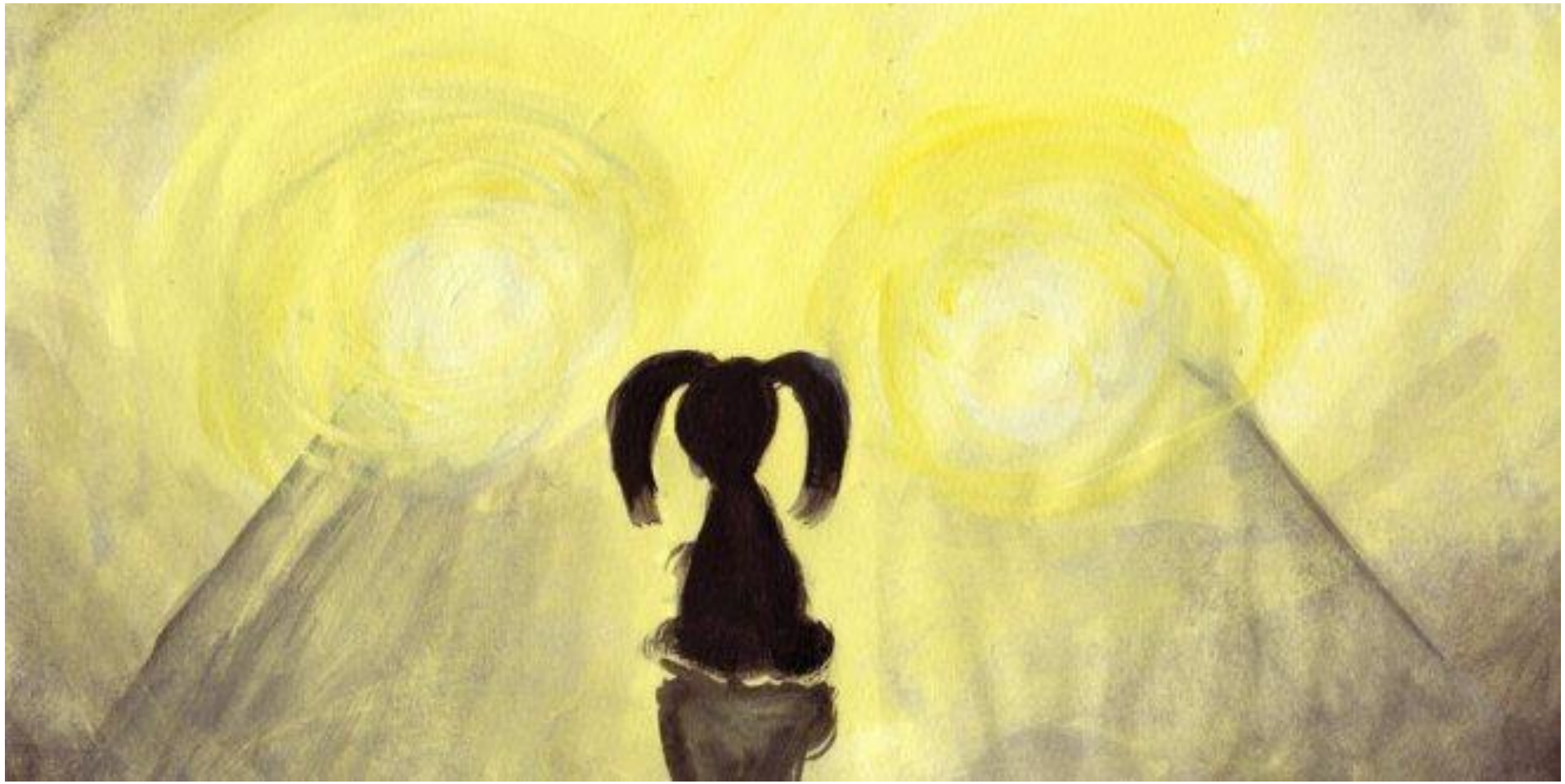


Source:
(1) BCG Analysis 2018

Surviving and Thriving in the Energy Transition
June 2018

Paul Appleby– Group Strategic Planning

Caught in the headlights?



Too big to change?

How to handle the energy transition?

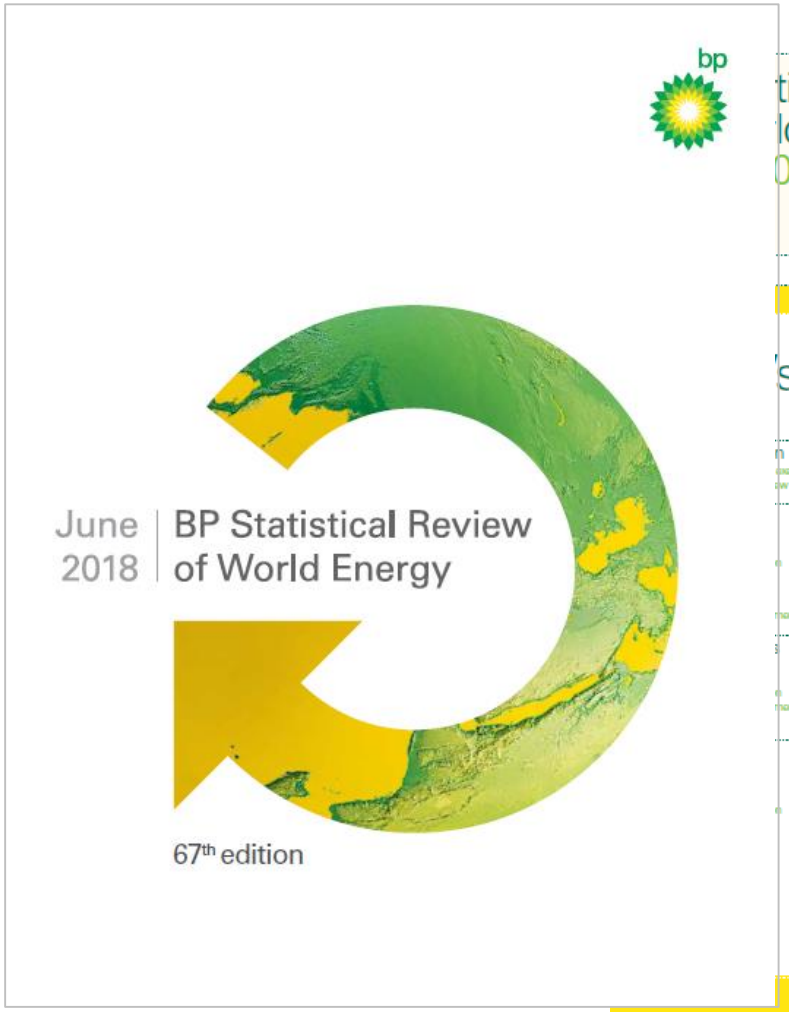
- Track the transition
- Explore the uncertainty
- Get on board: “Advancing the energy transition”
- Get into action – do, learn, do

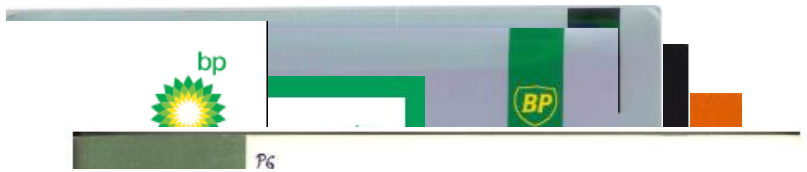
How to handle the energy transition?

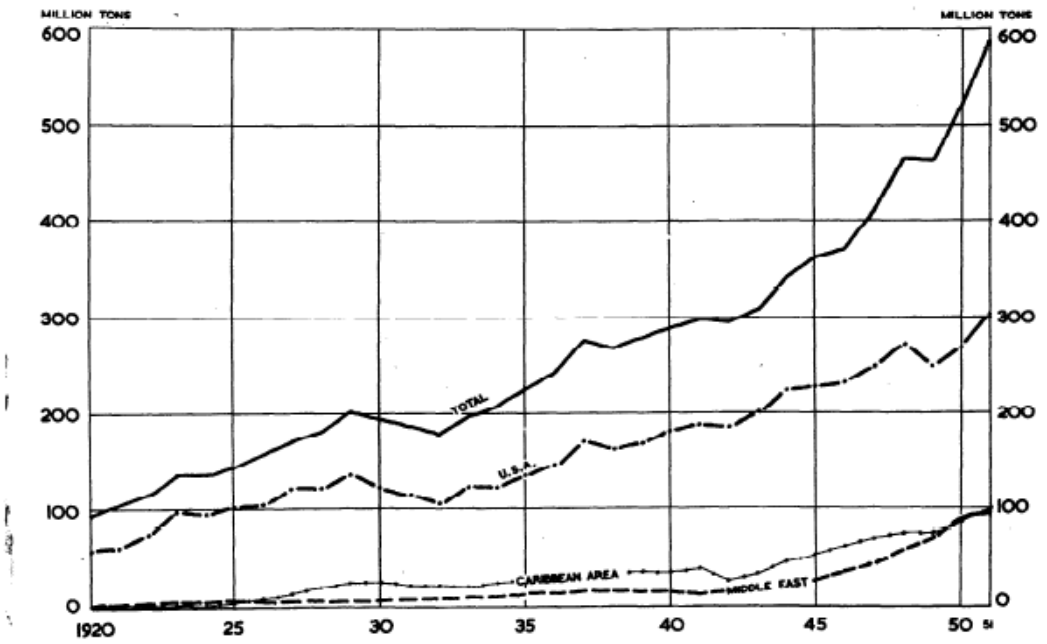
Communicate

Collaborate

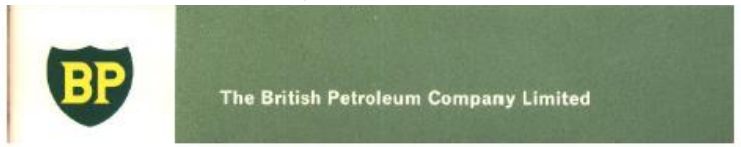
Tracking the transition



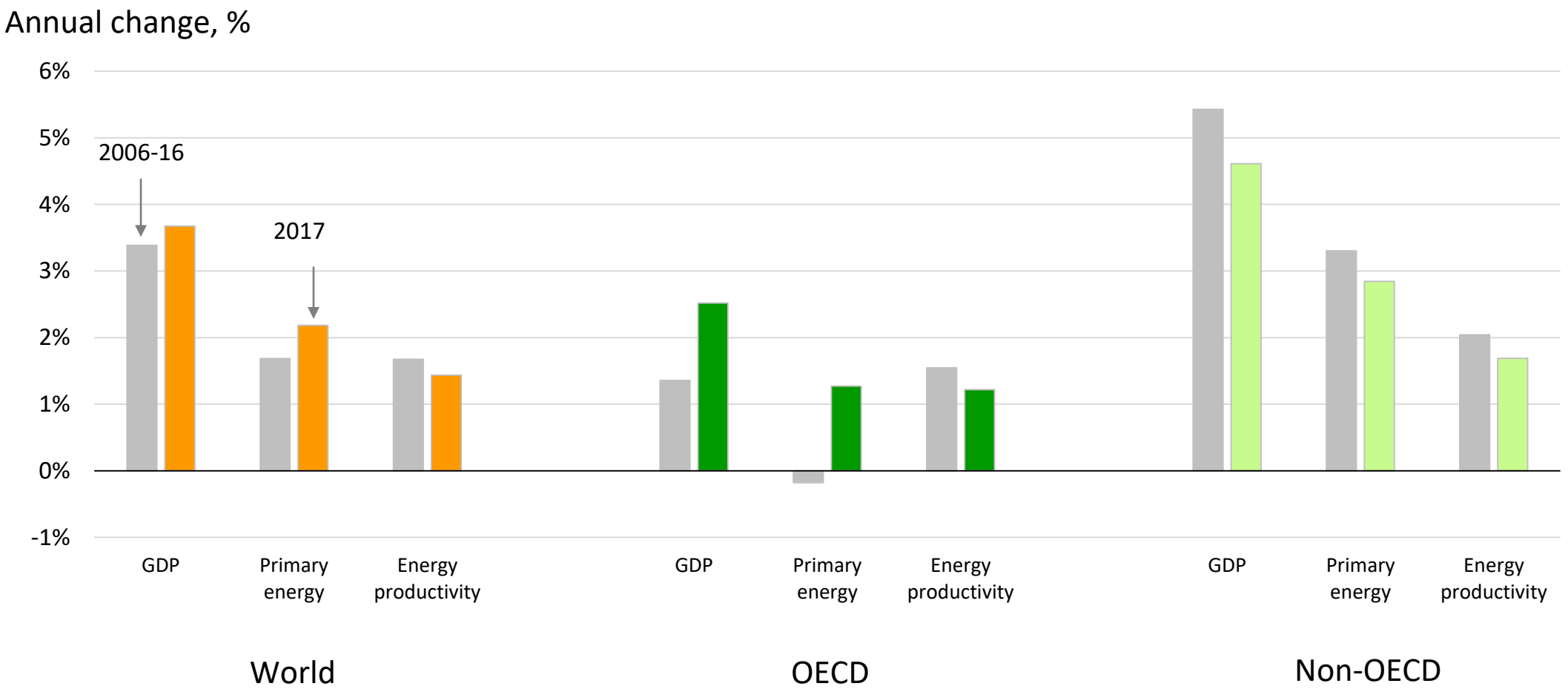




WORLD CRUDE OIL PRODUCTION 1920 — 1951



Growth in GDP and energy

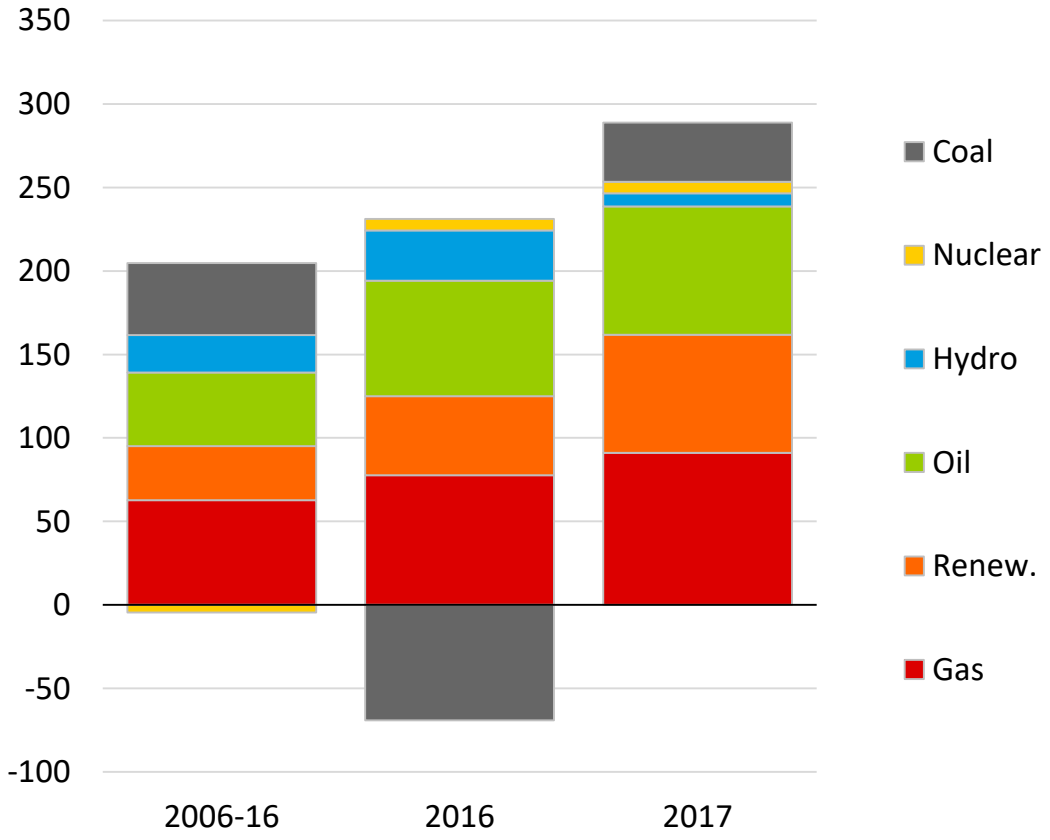


BP Statistical Review of World Energy

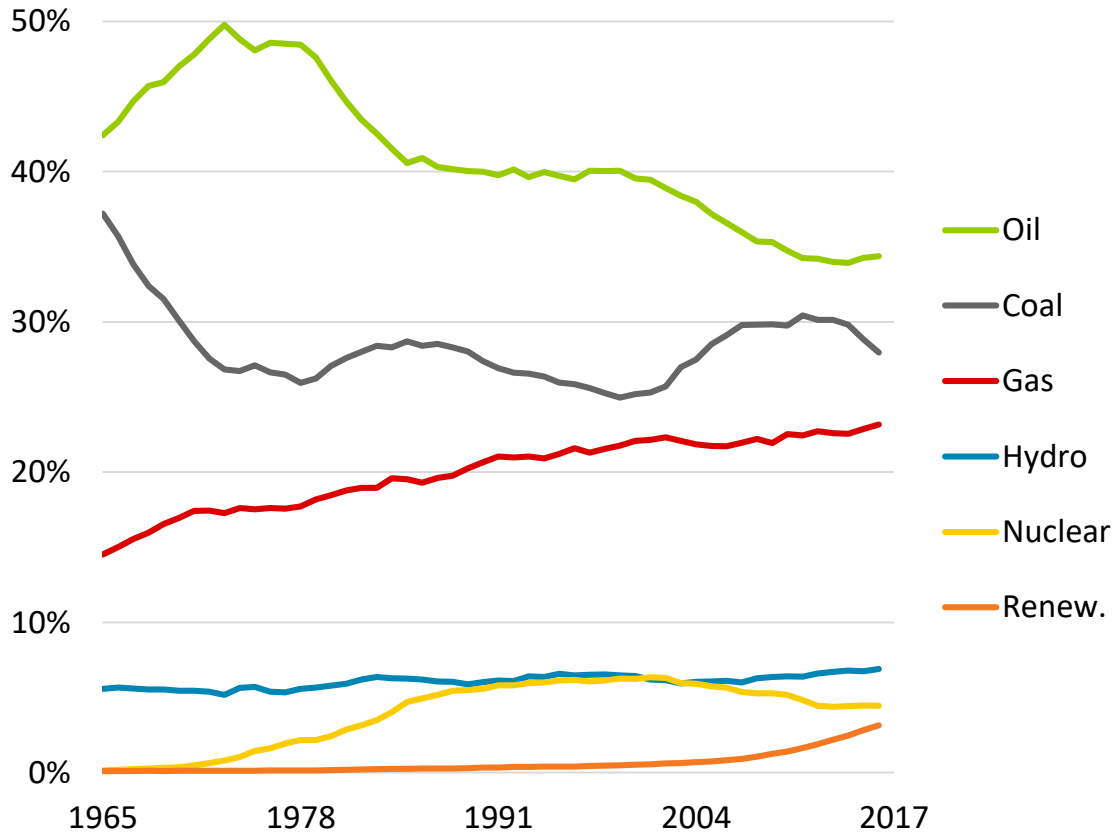
Primary energy fuel mix

Consumption growth by fuel

Annual change, Mtoe



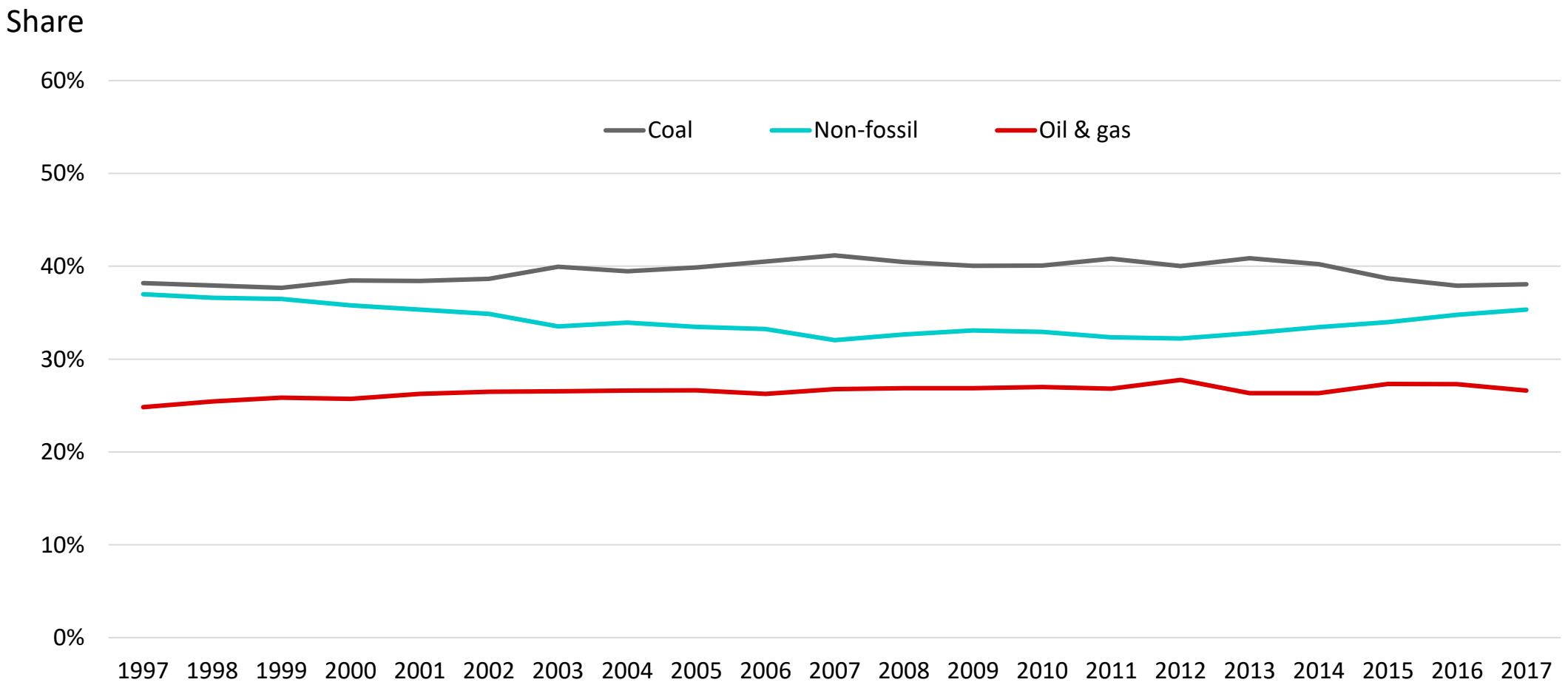
Shares of primary energy consumption



Note: Oil includes biofuels

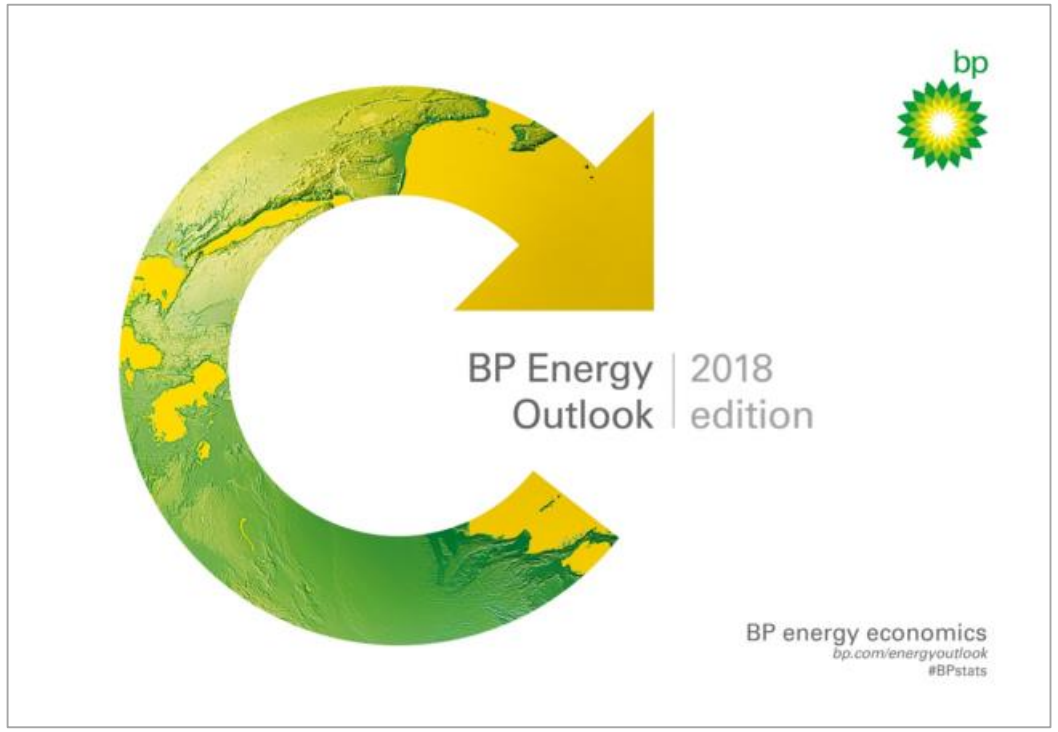
BP Statistical Review of World Energy

Fuel shares in power generation



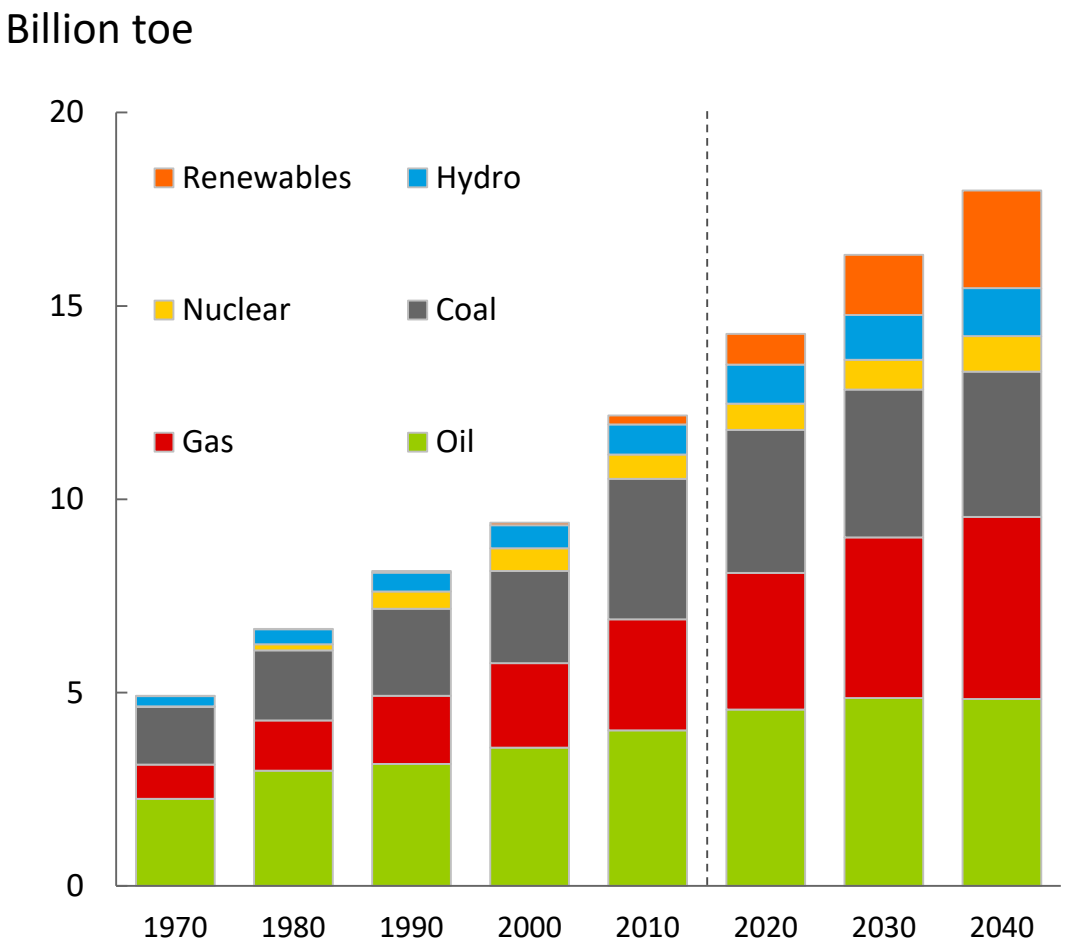
BP Statistical Review of World Energy

Exploring the uncertainty

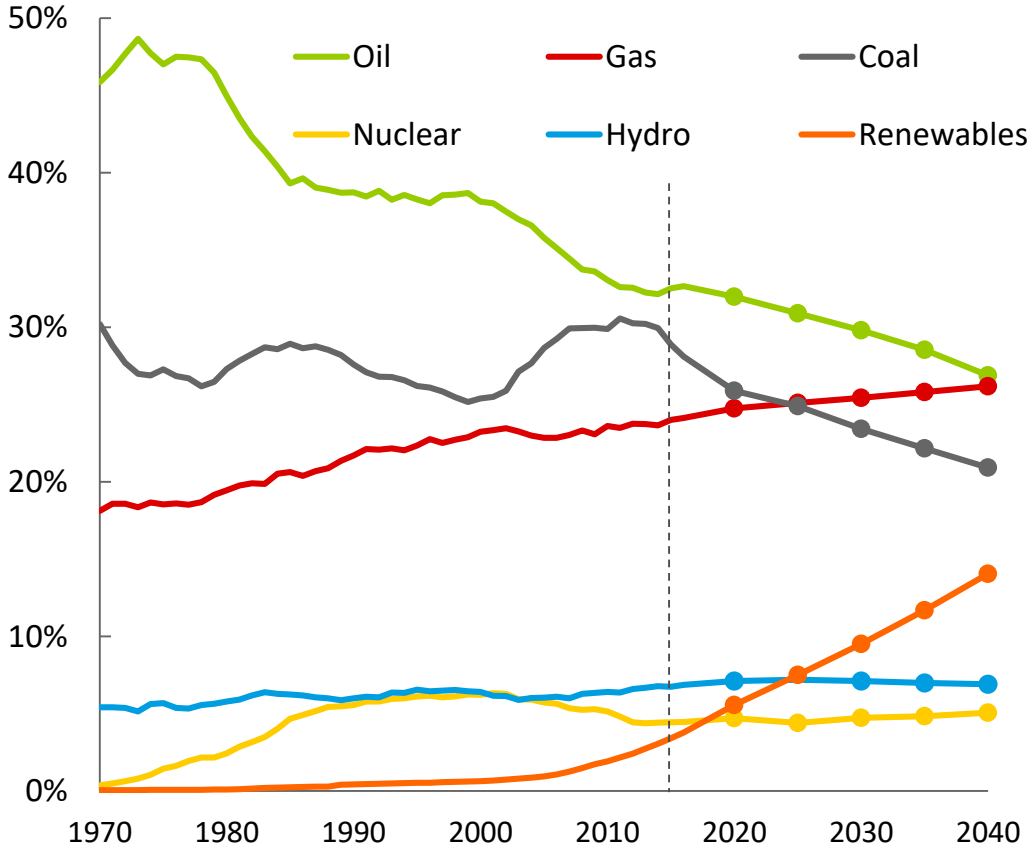


Global energy by fuel

Primary energy consumption by fuel

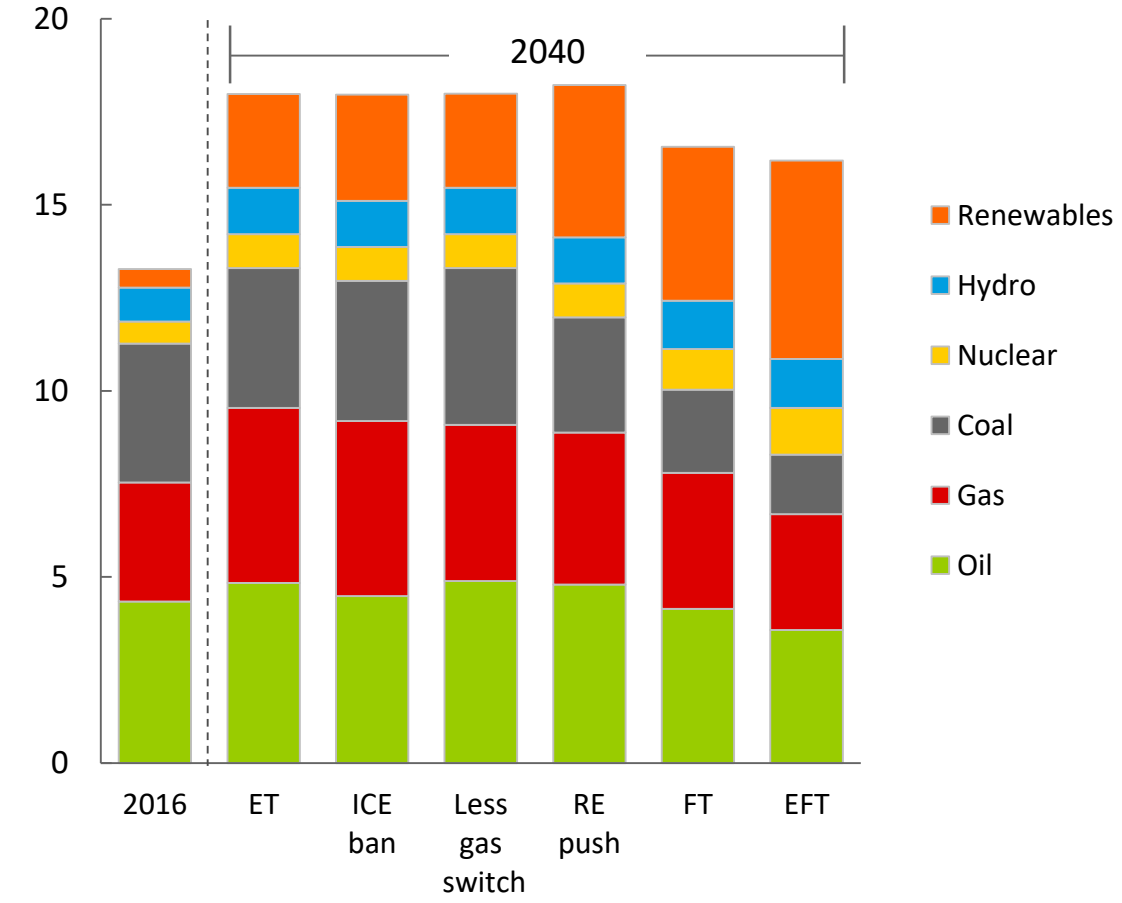


Shares of primary energy

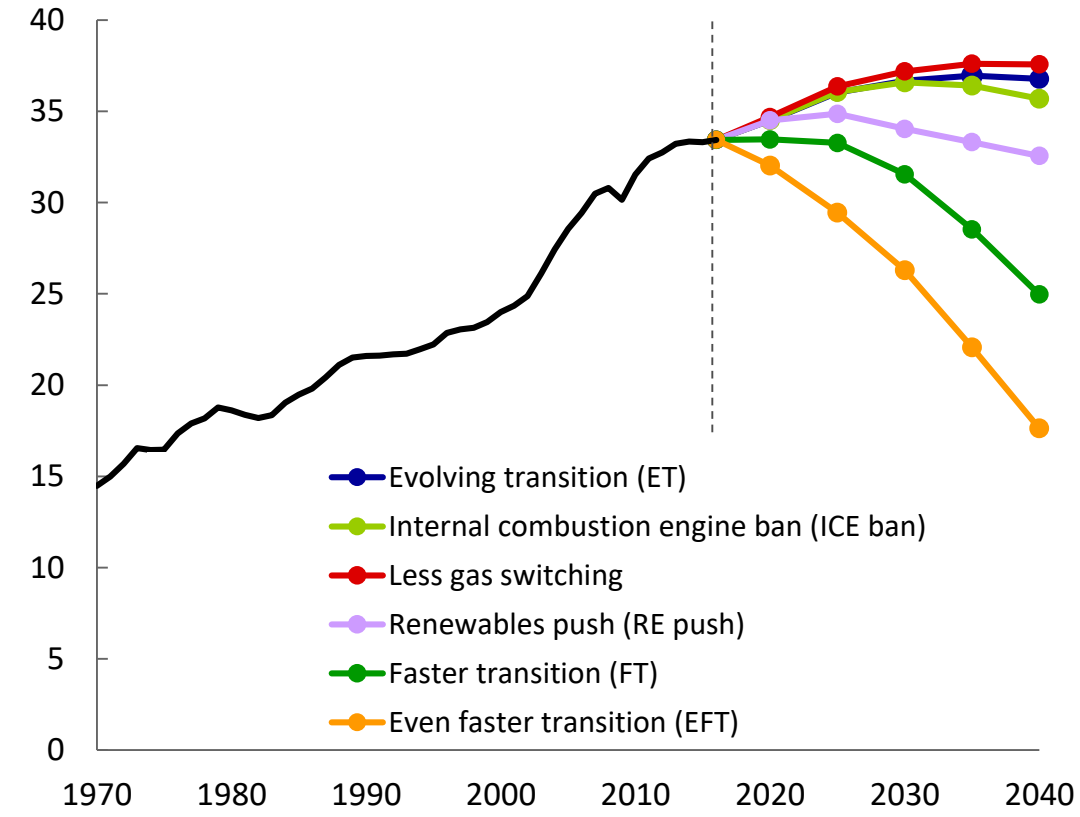


Alternative scenarios

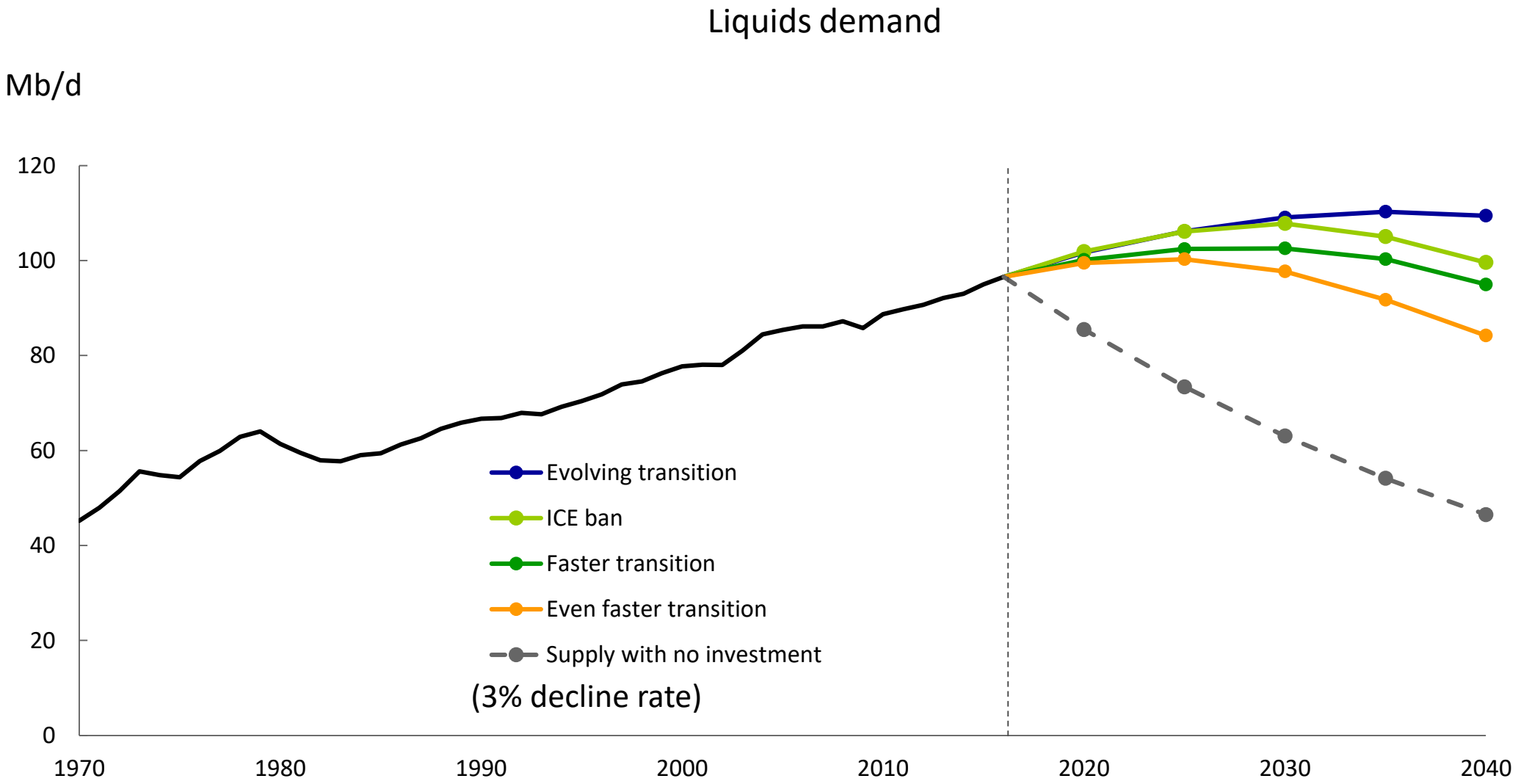
Primary energy consumption by fuel



Carbon emissions



Demand for oil and other liquid fuels



BP Technology Outlook – what's changed

What's **changed**?

- Energy storage – lower battery costs
- Renewables – lower solar and wind costs
- Higher performance of unconventional reservoirs

What's **not** changed?

- Abundance of energy resources
- Comparative ease of Power sector decarbonisation
- Rapid evolution of digital technology

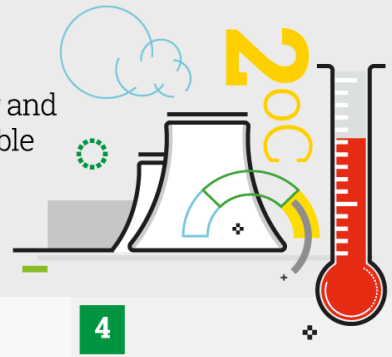
What's **new**?

- Deep dive on intermittency
- Study of power storage options
- Analysis of the heat sector
- Focus on air quality
- Energy efficiency
- Modelling of low-carbon future and alternatives
- A focus on the energy systems of China, Europe, North America

What are the key points that emerge from the BP Technology Outlook?

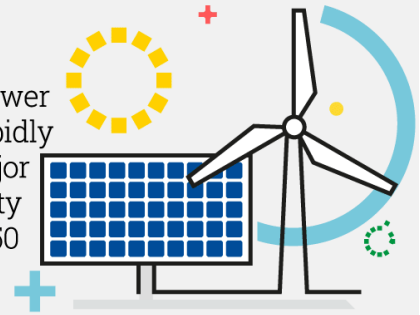
1

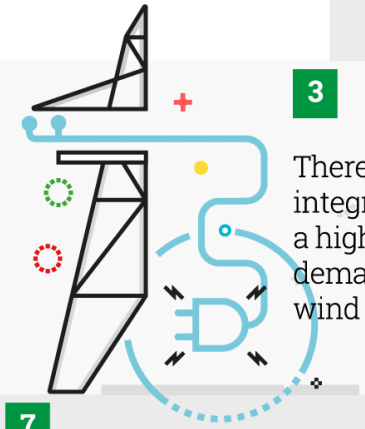
Meeting the Paris goals is technically and economically feasible but would require profound change



2

Wind and solar power are set to grow rapidly and become a major source of electricity world-wide by 2050





3

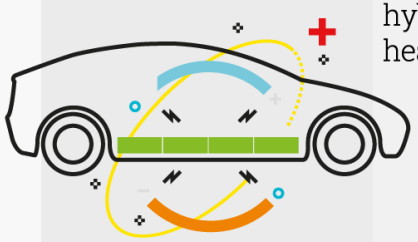
There are significant integration costs when a high proportion of grid demand is provided by wind and solar power

4

Energy storage options are developing rapidly

5

Transport is set to see transformative change, led by electric vehicles

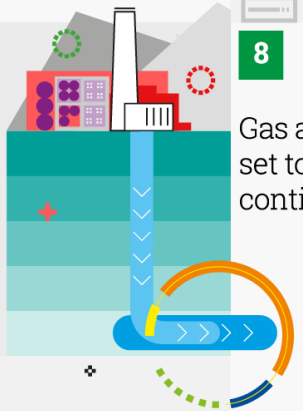


6

Much of the world's heating is projected to continue to be provided by gas-fired appliances although action to reduce carbon emissions could favour electric systems and hybrid appliances using heat pumps with gas

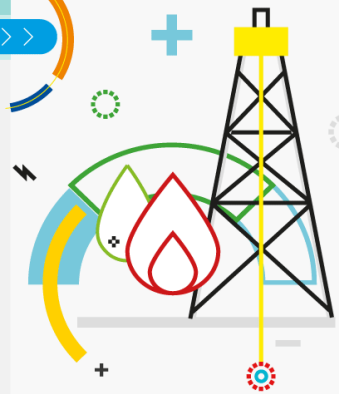
7

Decarbonized gas technologies are important to resolving the dual challenge of reducing greenhouse gas emissions while meeting growing demand for energy



8

Gas and oil are set to play a continuing role



9

Digital technology is the most significant source of sytem-wide efficiency improvement, although its full power is unknowable

10

Energy efficiency offers massive potential to reduce emissions and save energy

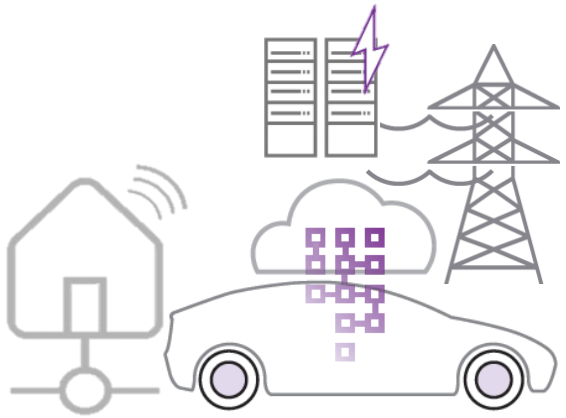
Source: BP Technology Outlook

BP Technology Outlook – insights

Technology can play a vital role…

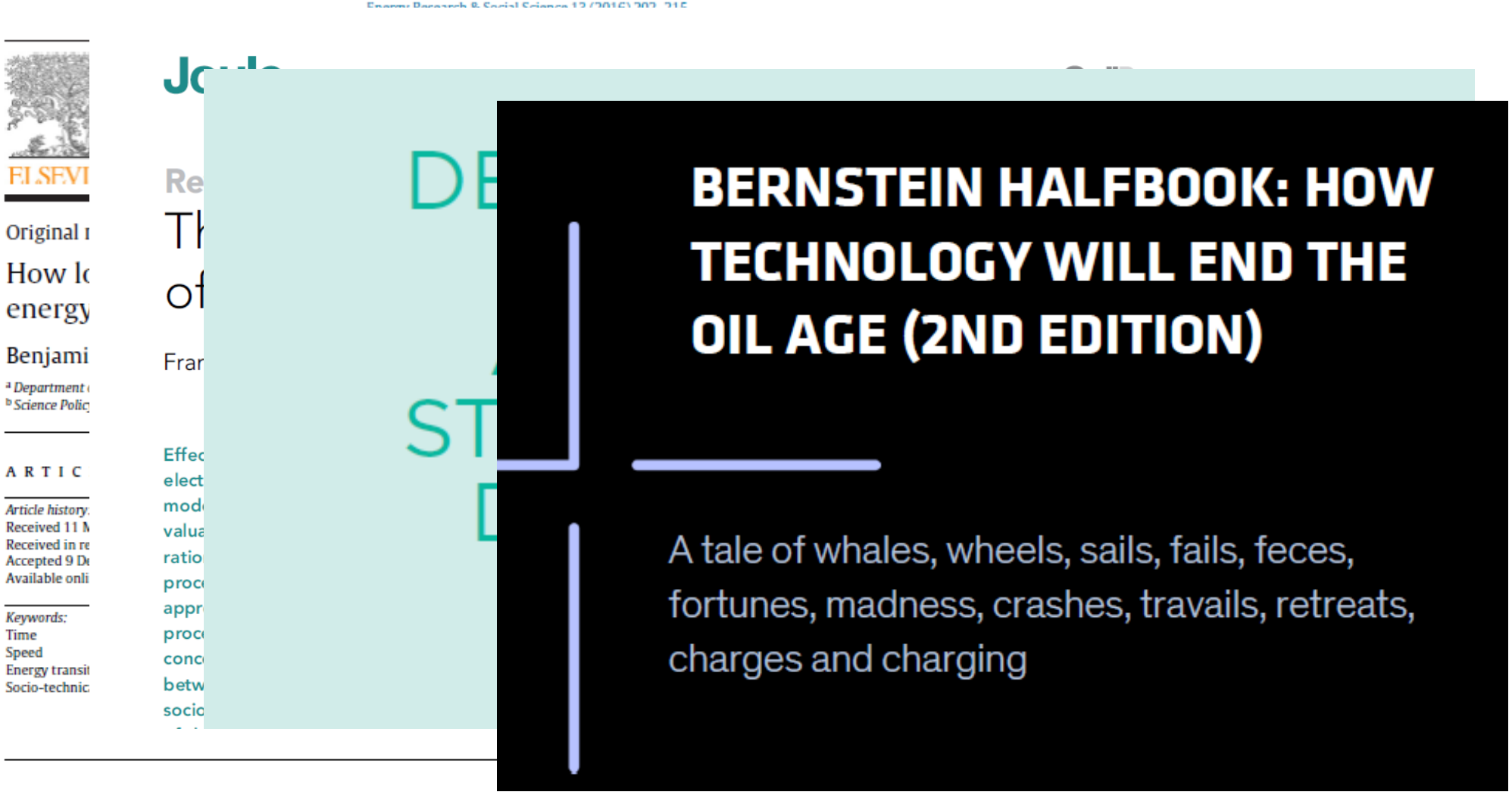
Game-changing technologies

1. Digital innovation
2. Energy efficiency
3. Renewable power
4. Energy storage
5. De-carbonised gas



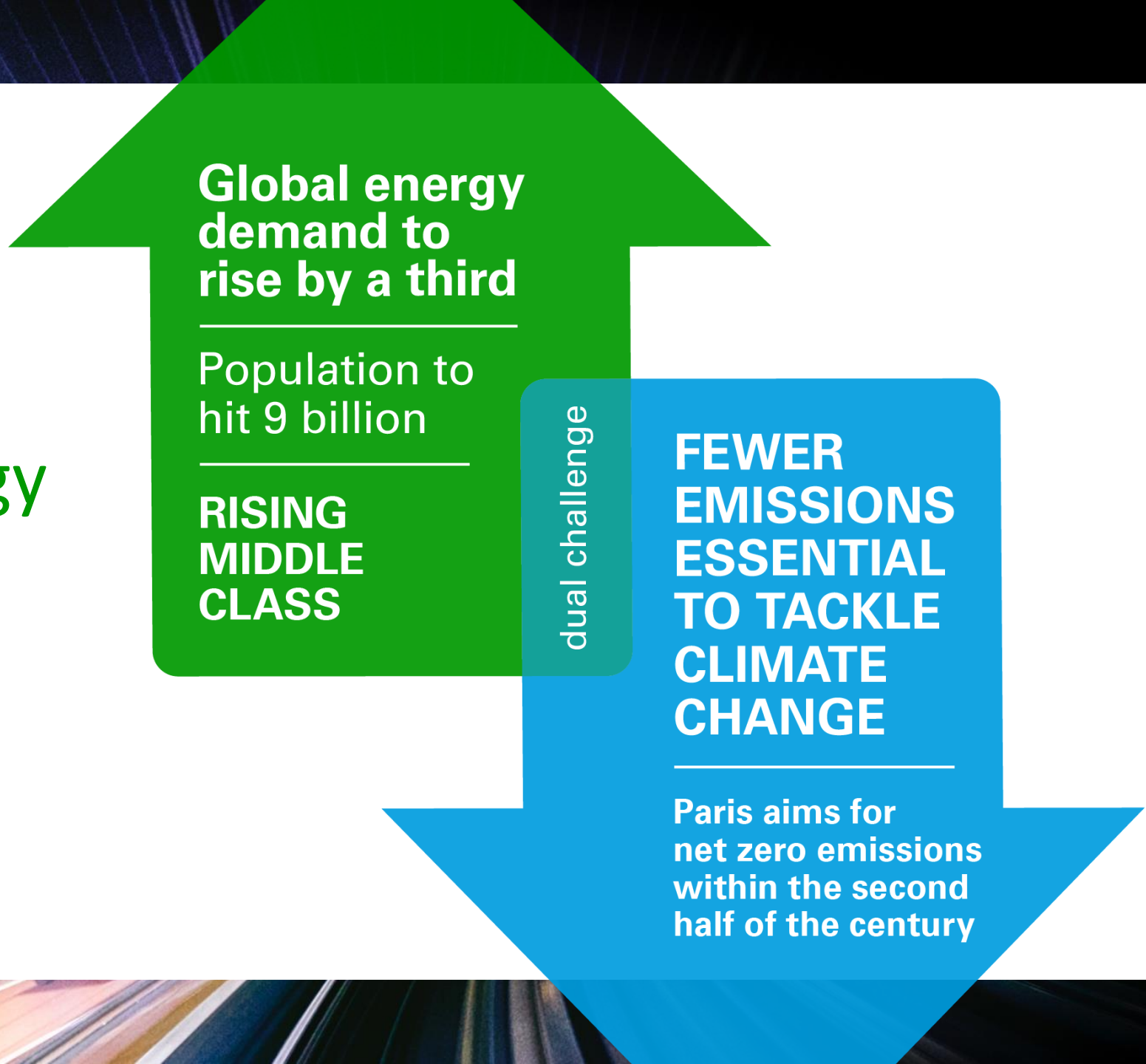
…but policy and consumer choices are key

Understanding transition dynamics

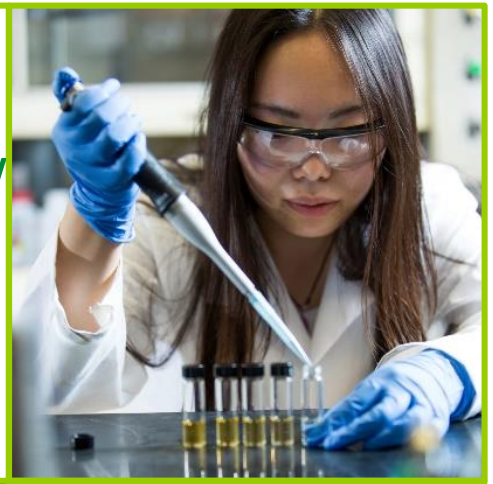



bp
Advancing the
energy transition
www.bp.com/energytransition

The dual energy challenge



Our strategy for the energy transition

Growing gas and advantaged oil in the Upstream		Venturing and low carbon across multiple fronts	
	Market led growth in the Downstream		Modernising the whole Group

Our commitment to advance a low carbon future

Reducing
emissions in our operations

Zero
net growth in operational emissions out to 2025

3.5 Mte
of sustainable GHG emissions reductions by 2025

Targeting methane intensity of
0.2%
and holding it below 0.3%

Improving
our products

Provide lower emissions gas

Develop more efficient and lower carbon fuels, lubricants and petrochemicals

Grow lower carbon offers for customers

Creating
low carbon businesses

Expand low carbon and renewable businesses

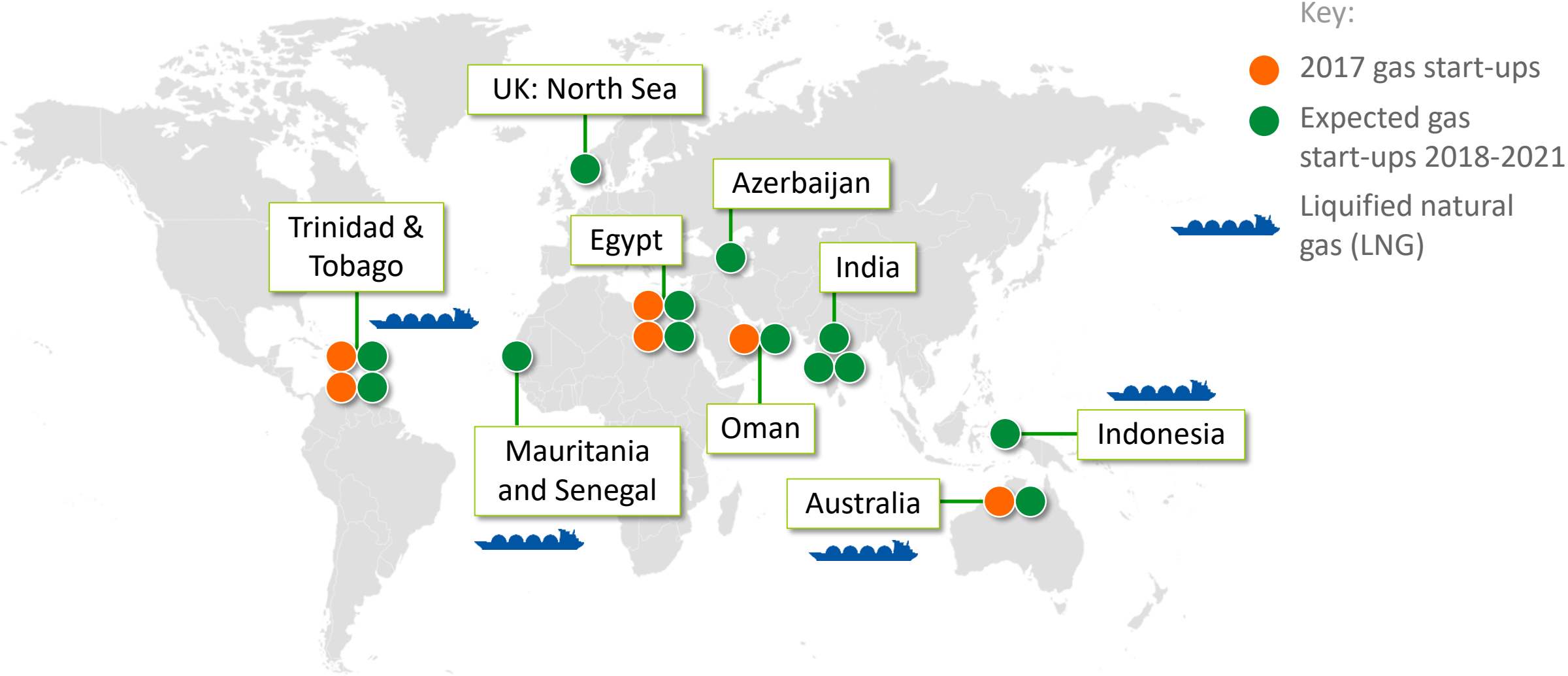
$500 million invested in low carbon activities each year

Collaborate and invest in the Oil and Gas Climate Initiative's **$1 billion** fund for research and technology

Advancing low carbon
Our accreditation programme for low carbon activities

Producing more natural gas

BP's growing natural gas portfolio



Creating and building low carbon businesses

Advanced mobility

Electric, connected and autonomous vehicles

Bio and low carbon

New fuels, gas, lubricants and plastics

Carbon management

Lowering carbon footprint for customers and BP

Power and storage

Low carbon power, storage and trading

Digital

Transforming productivity and customer experience

Getting into action – recent examples

BP invests in ultra-fast charging battery company StoreDot

Getting into action – recent examples

Biojet set to take off as construction begins on waste-to-fuel plant

Getting into action – recent examples

Joint venture to fund green infrastructure in India

Run, rabbit, run!

IHS Markit™

WPC Symposium

Financing challenges for an energy industry in transition

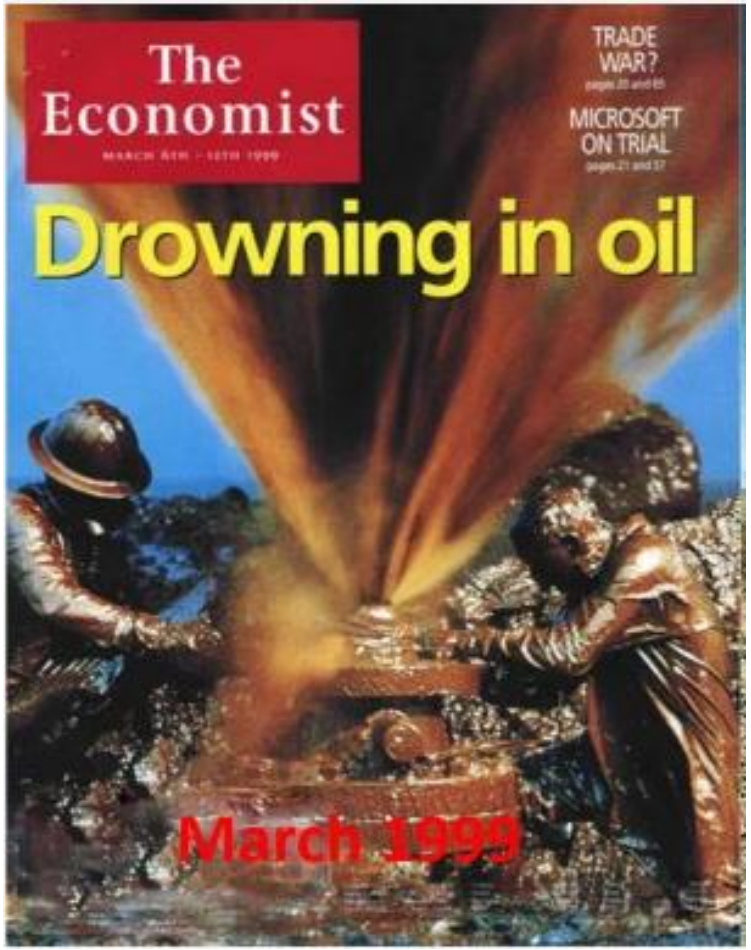
26 June, 2018

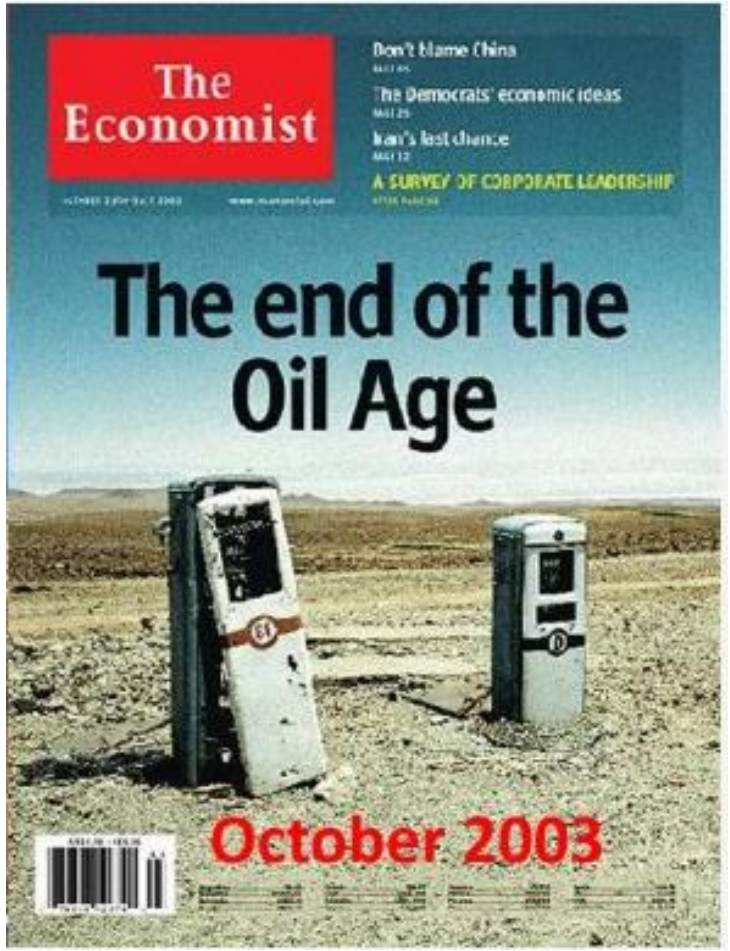
Jon.story@ihsmarkit.com

Agenda

- **A Capricious Industry**
- Capital and Operational Efficiency: a step change
- Portfolio selection
- New participants / new expectations
- Innovative solutions to close deals

Market sentiment is fickle…





…and sentiment swings back and forth

Deep sigh of relief

The shale gas and oil bonanza is transforming America's energy outlook and boosting its economy

March 2013

Shale oil and gas

Fractured finances

The Economist

America's shale-energy industry has a future. Many shale firms do not

July 2015

America's shale firms don't give a frack about financial returns

Exploration and production companies are poised to go on another investment spree

The Economist

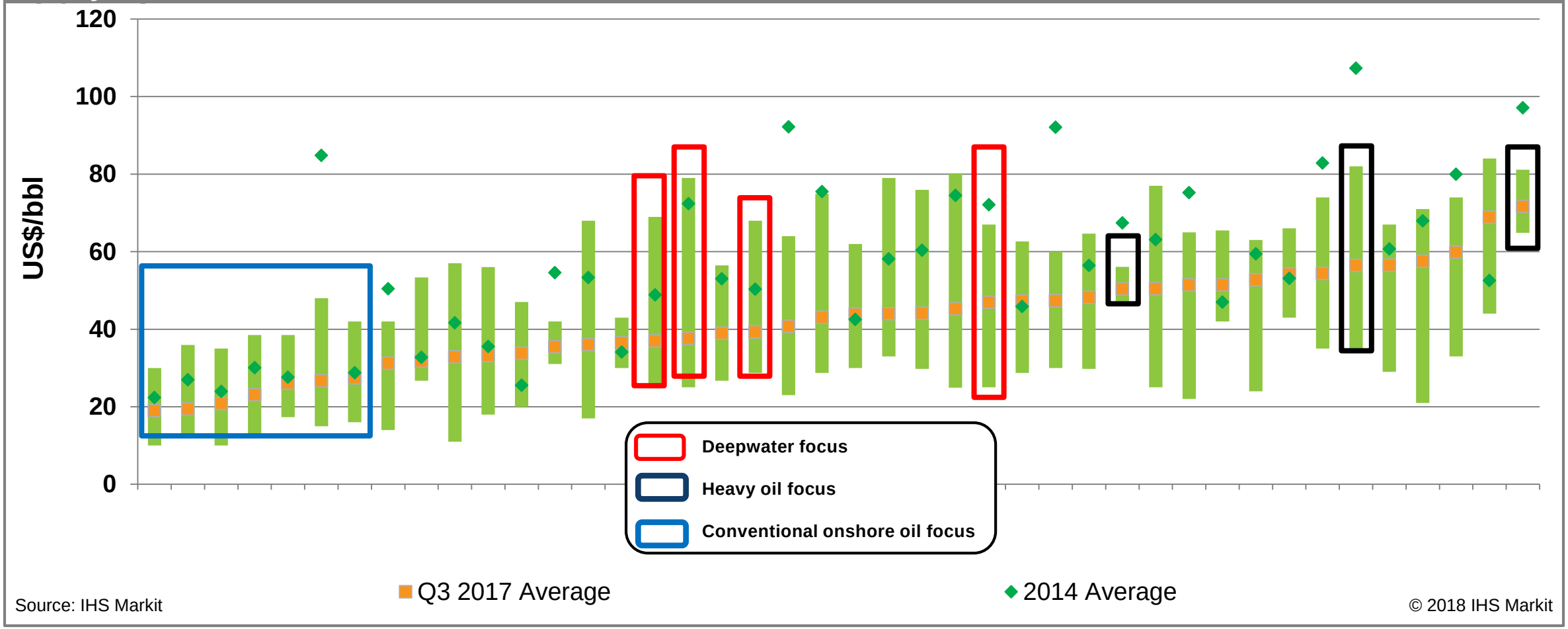
March 2017

Agenda

- A Capricious Industry
- **Capital and Operational Efficiency: a step change**
- Portfolio selection
- New participants / new expectations
- Innovative solutions to close deals

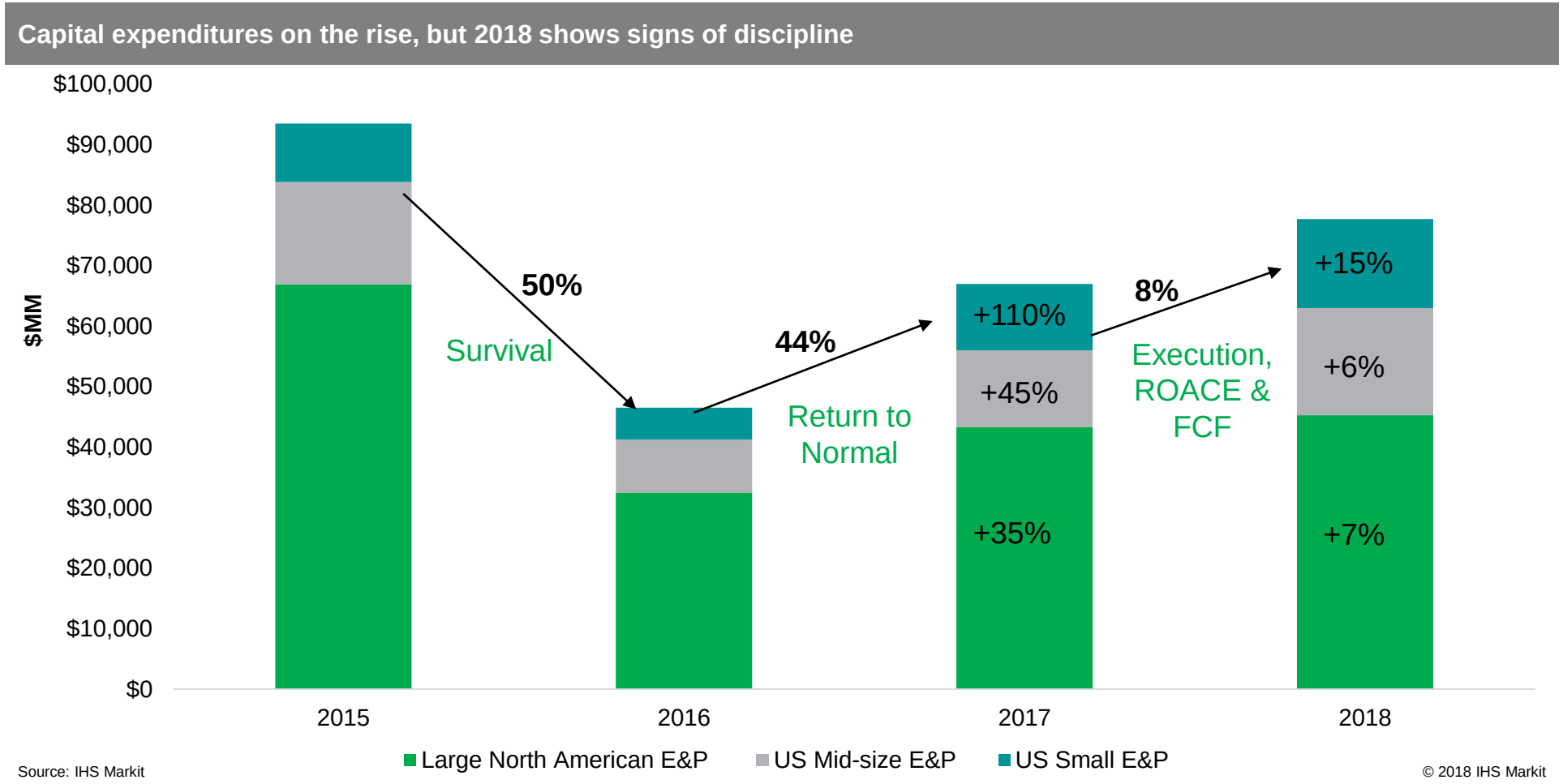
A key mindset for E&P Players: competing on the cost of supply

Full-cycle costs in terms of Dated Brent at 10% rate of return



Source: IHS Markit

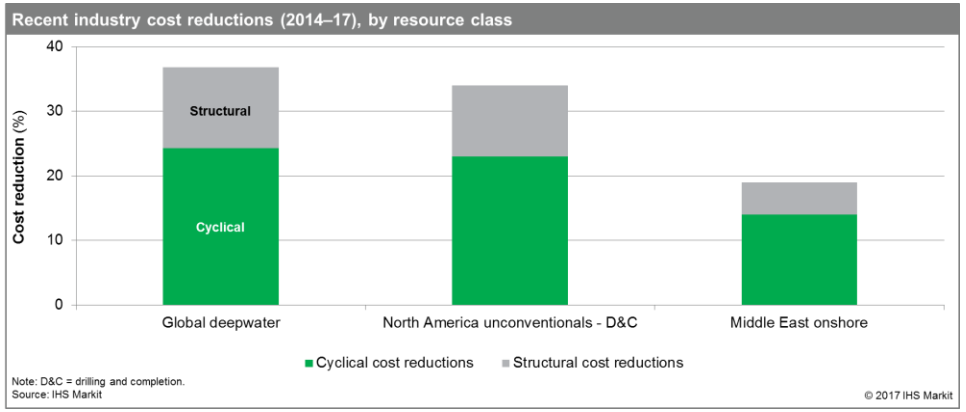
Discipline? Capex & growth back on the rise

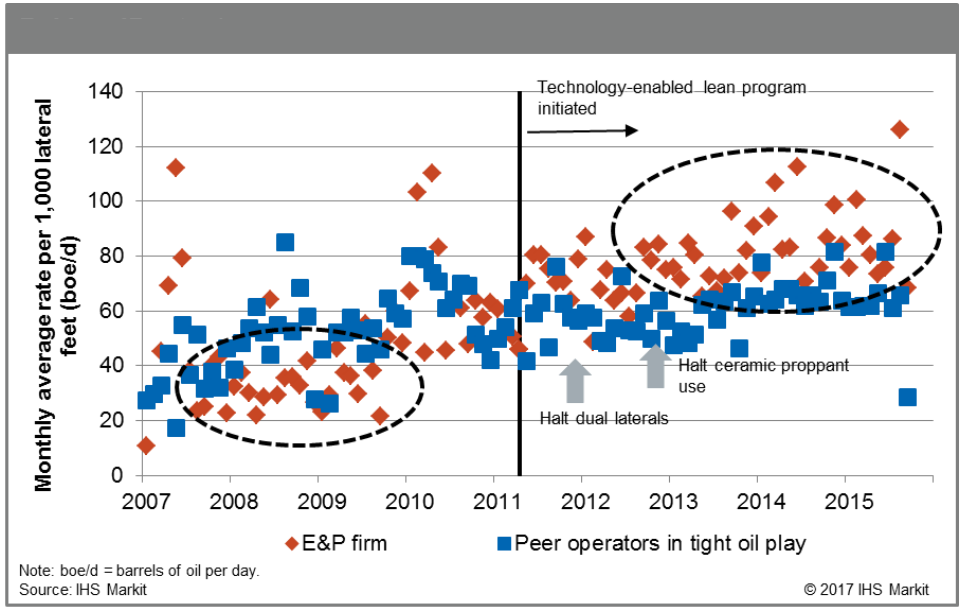


Source: IHS Markit

Technology and Innovation: Ensuring the sustainability of the upstream "cost re-set" demands more innovative approaches to resource management

- **Continued advances in new technology development and its effective application** are needed to drive higher upstream efficiencies, and thus temper the impact of rising service sector prices in 2018 and beyond
- The **upstream sector has achieved 35 to 40 percent cost reductions** in key resource classes (deepwater, unconventional) over the past few years
- Further IHS Markit analysis, however, reveals that **a full two-thirds of these cost reductions are cyclical in nature**, and thus likely to rebound as activity recovers
- To ensure that the industry "cost re-set" sticks, E&P players are seeking to:
  - **Broadly adopt technology-enabled project design concepts** that are proven to raise capital efficiency by 8 to 15 percent: longer subsea tie-backs, modular designs, extreme minimum-manning facilities, …
  - **Automate and remotely perform key upstream activities** to reduce costs 15 to 25 percent: well construction, surveillance & inspection, asset optimization
  - **Extend Advanced Analytics/AI/Big Data tools** that have proven so effective in raising unconventional productivities and lowering their costs, into more conventional resources





New flatter and leaner organizational models will focus on key capabilities, agility, and lower cost

The organizational ability to conduct work efficiently

Organizational Model Elements

- Organizational capabilities are the lifeblood of an enterprise
  - In the E&P sector this includes positional assets, such as acreage
  - Also include intangible assets, such as expertise (e.g., Mitchell Energy)
- Organizational model shapes and directs these capabilities – including human expertise, technological capacity, and financial resources – to execute core functions
  - Precise list of most critical capabilities, and relative importance, determined by the positional assets and strategy
- Oil & gas industry has undergone dramatic evolution and disruptive change
  - Many aspects of resources, technology, society, etc. are changing
- Circumstances call for lower-cost models
  - Fewer layers, more agility and local control/adaptation by asset teams; more collaboration with vendors, partners
  - Aramco IPO being used as a *catalyst* for organizational and cultural change

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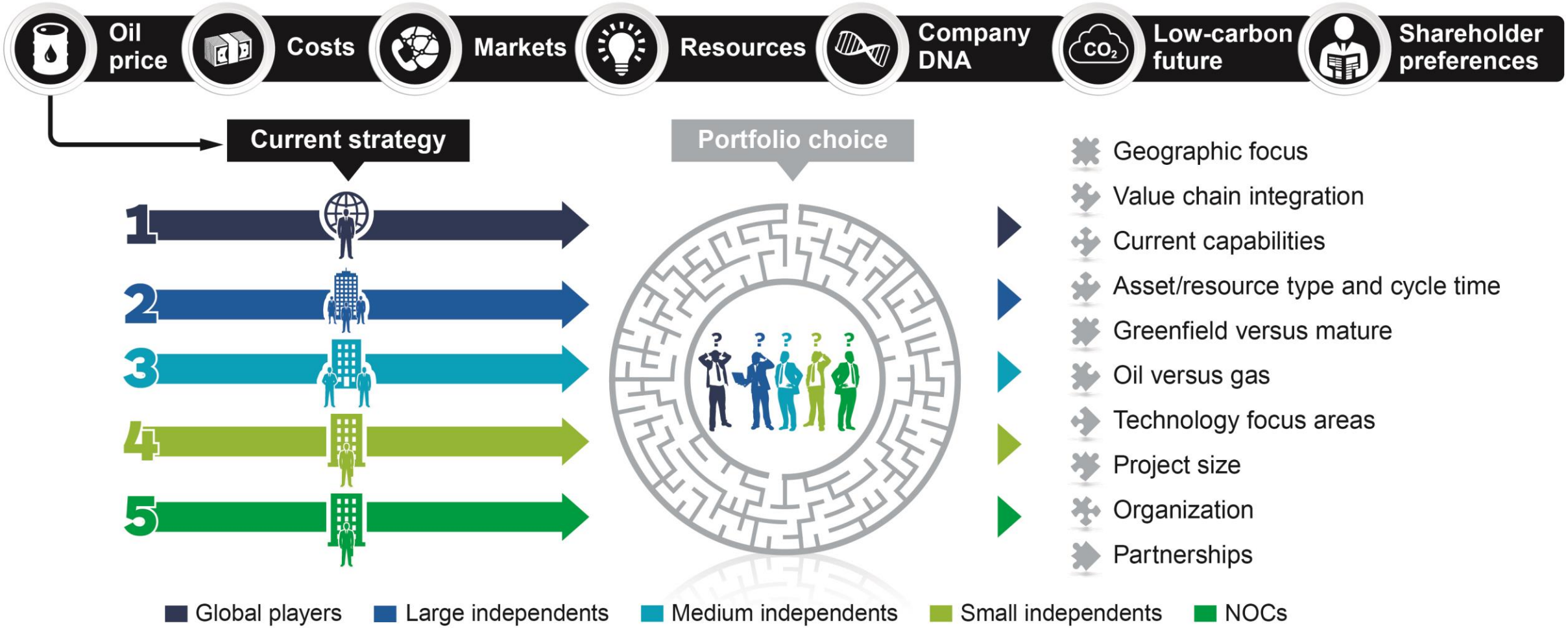
All Change ! Current drivers of portfolio choice



Source: IHS Markit

Short cycle barrels have fundamentally changed the structure of oil markets and the nature of upstream investment

Capital flexibility rewarded in financial markets – matches up with quarterly expectations. Will operators need to justify to the financial community why long-cycle investments are necessary?

Immediate (<6 mo)

- Spare Production Capacity
- Global Crude Inventories

Short-Cycle (6-12 mo)

- US Tight Oil

Medium-Cycle (1-3 yrs)

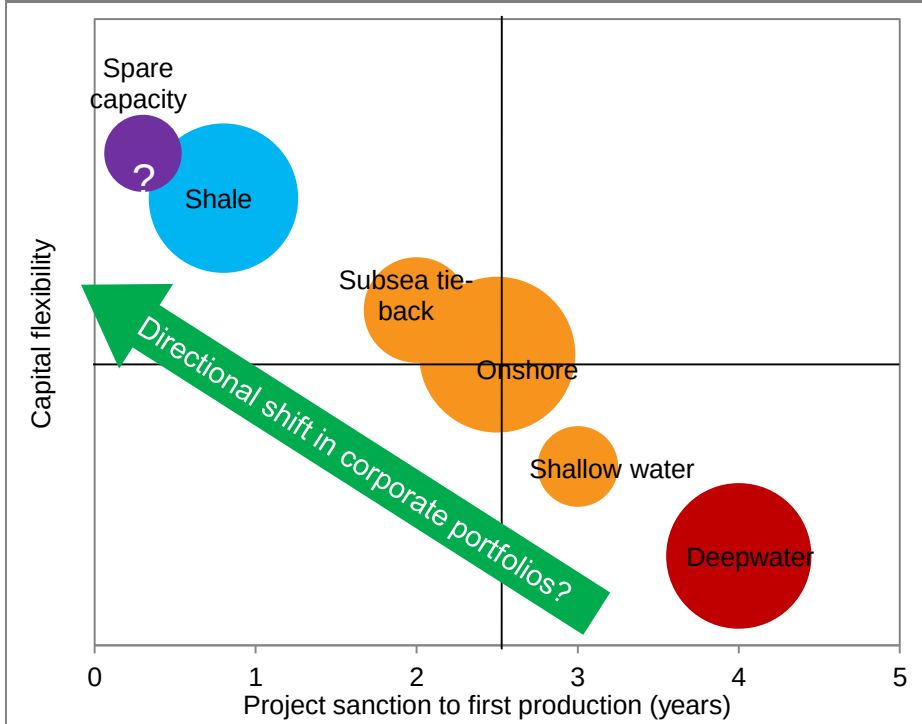
- High-Potential Gulf Projects (Iraq/Iran/Saudi)
- Sustainable Return of Political Barrels (Libya/Nigeria)
- EOR, Tie-backs, Brownfield Expansions

Long-Cycle (3-8 yrs)

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

Considerations of project cycle times and capital flexibility increasingly impact the decisions on the future of oil supply

Illustrative Capital Flexibility and Project Cycle Times



Source: IHS Markit

Note: Bubble sizes are indicative for unsanctioned volumes through 2023.

“Decarbonization”: Finance is a key enabler of a “transition to a low-carbon energy system

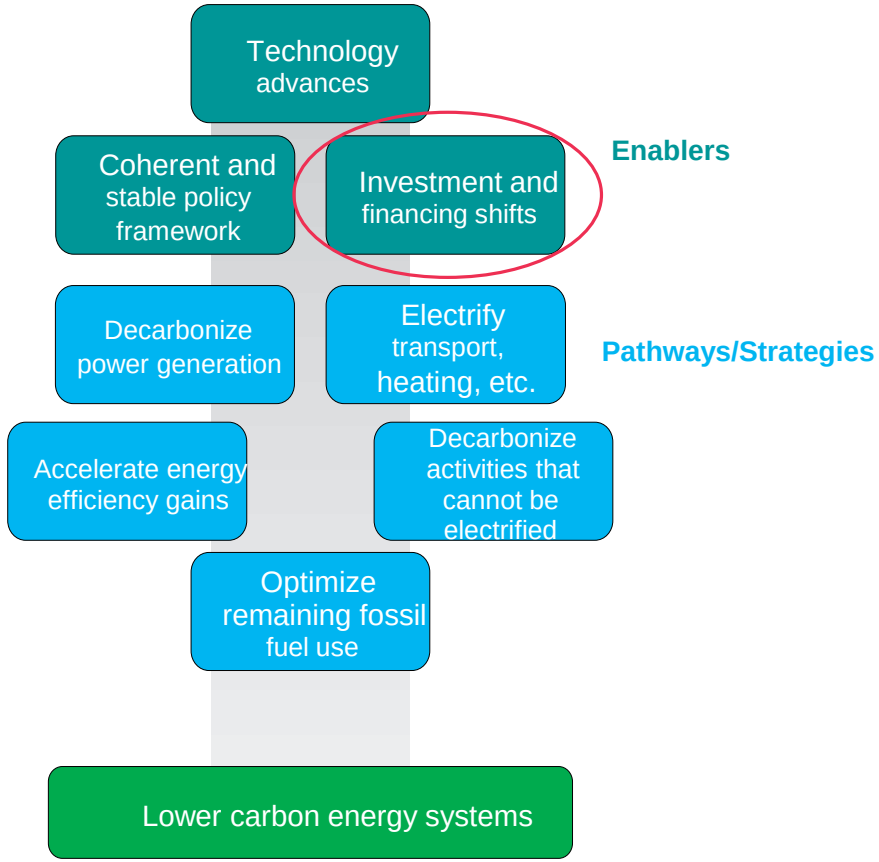
Paris Agreement, Article 2

- This Agreement, in enhancing the implementation of the Convention, including its objective, aims to strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty, including by:

  (a) Holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 °C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change;

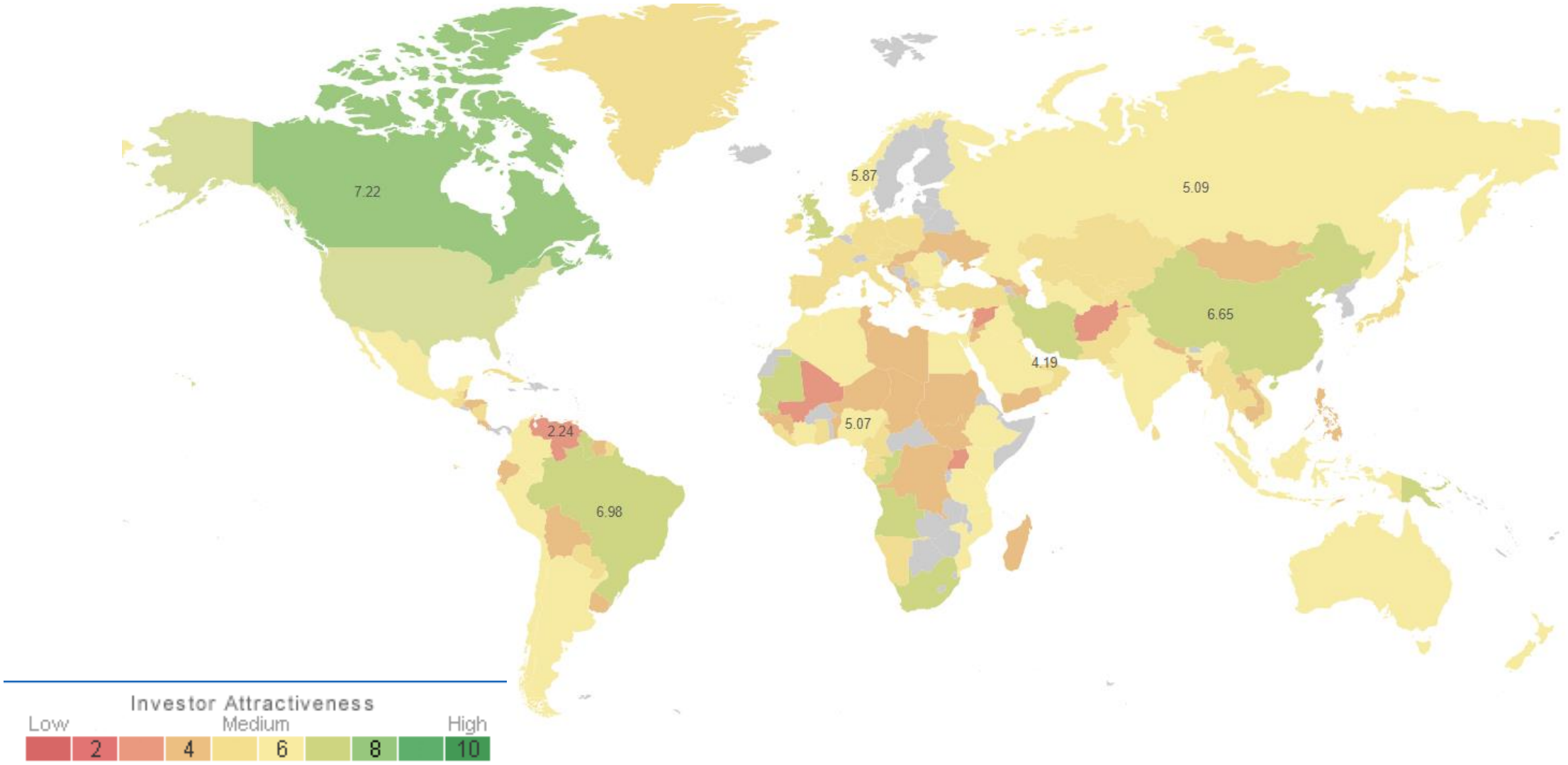
  (b) Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production;

  (c) Making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development.



Source: IHS Markit based on multiple descriptions of the transition to a low-carbon energy system

Back with a vengeance: Above-ground risks facing E&P investors in 2018



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The rise of “specialists,” basin/commercial masters

1 USA

Buyer	Seller	Notes
EQT	RICE ENERGY	Marcellus
ExxonMobil	Bass Companies	Permian entry
RANGE RESOURCES	Memorial Resource	Haynesville/LNG
noble energy	Clayton Williams	Permian
PARSLEY ENERGY	Double Eagle Energy	Permian
RICE ENERGY	Vantage Energy	Marcellus
RSP PERMIAN	Silver Hill	Permian
eog resources	Yates Petroleum	Permian entry
DIAMONDBACK Energy	Brigham Resources	Permian
SANCHEZ ENERGY CORPORATION	Anadarko	Eagle Ford

2 Canada

Buyer	Seller	Notes
cenovus ENERGY	ConocoPhillips	FCCL Oil Sands JV
Canadian Natural	Shell	AOSP Oil Sands JV
Seven Gen. Energy	Paramount Resources Ltd.	Montney Deep Basin assets
Tourmaline Oil	Shell	Montney Deep Basin assets
Teine Energy	PennWest	Saskatchewan assets
Paramount /Cardinal	Apache	CDN business exit
SUNCOR ENERGY	MURPHY OIL CORPORATION	5% of Syncrude
Athabasca Oil Corp.	Statoil	Oil Sands business
Sinoenergy Inv. Corp.	LONG RUN EXPLORATION	Corporate deal
Spartan Ene	ARC RESOURCES LTD.	Saskatchewan

3 North Sea

Buyer	Seller	Notes
Neptune Oil & Gas	ENGIE	70% of Engie E&P
Solveig Gas Norway	Statoil	24% of Gassled JV
Chrysaor Holdings	Shell	UKCS assets
DEA/L1 Group	e·on	Norwegian E&P
AkerBP	bp	Norwegian assets
Delek Group	ITHACA ENERGY	Stella field
Ineos Group	DONG energy	14% of Omen Lange field
Antin Infra. Partners	Shell	63% of CATS
Total	MAERSK	UK, Norway, Denmark
AkerBP	HESS	Valhall, Norway

Shareholder activism or shareholder revolt?

"…we still have grave concerns about many of the things this board of directors has permitted to happen at XXXXX. We believe the current directors were remiss in attempting to ram through a dilutive, overpriced and value-destroying acquisition without at the very least reaching out and discussing this with the company's shareholders."

"Additionally, we question why you refuse to hold XXXXXX accountable for his history with XXXXX during a period of massive value destruction, including an ill-advised acquisition binge, a bankruptcy filing, XXXXX presiding over a $90 million payout to the former CEO, and taking over $50 million in compensation for himself, all while the shareholders suffered."

"Further, your attempt to entrench yourselves by adopting an unorthodox poison pill intended to prevent large shareholders from talking with one another to oppose the XXXXX acquisition would make a totalitarian dictator blush."

"However, be assured that if you continue to turn a blind eye to the interests of shareholders, we will not hesitate to take whatever actions we deem necessary to protect our investment."

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Mind the (value) gap: Innovative deal structures have unlocked M&A