Energy Challenges – 2035 and Beyond

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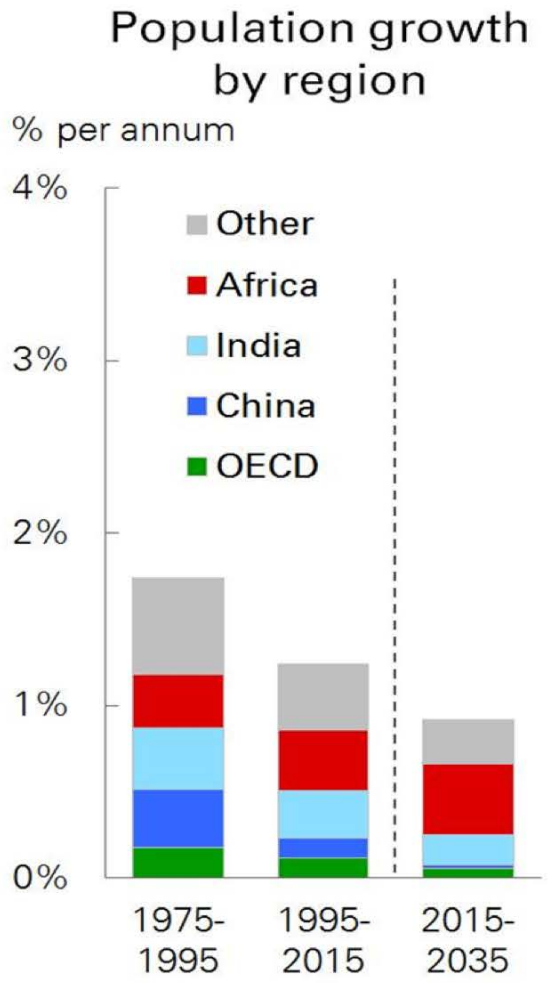
What I'll Cover Today

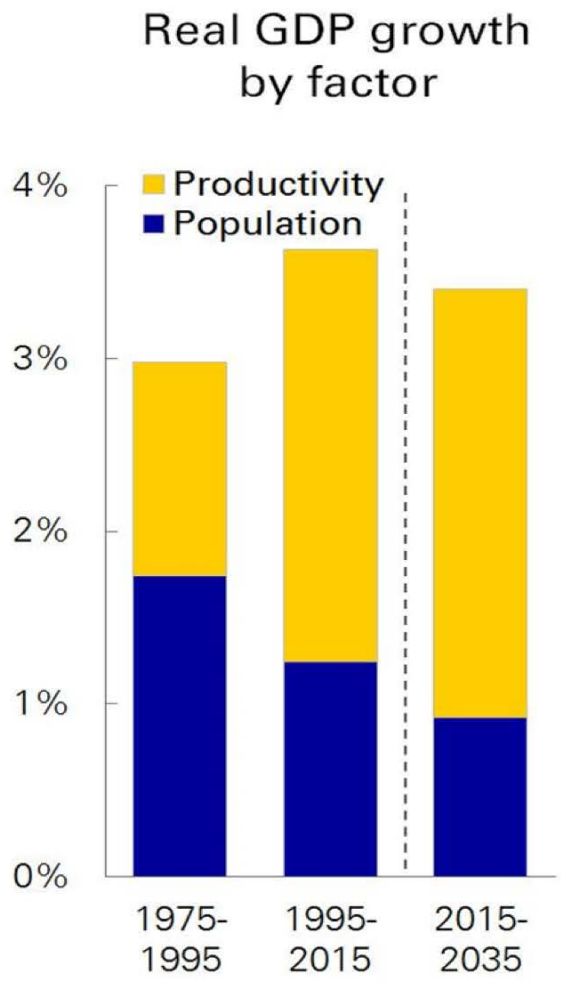
- Key energy trends to 2035 and main implications
- Challenges implicit in this new reality
- Imperatives to meet challenges
- Implications for large Oil and Gas companies
- BP new ventures case studies
- Questions

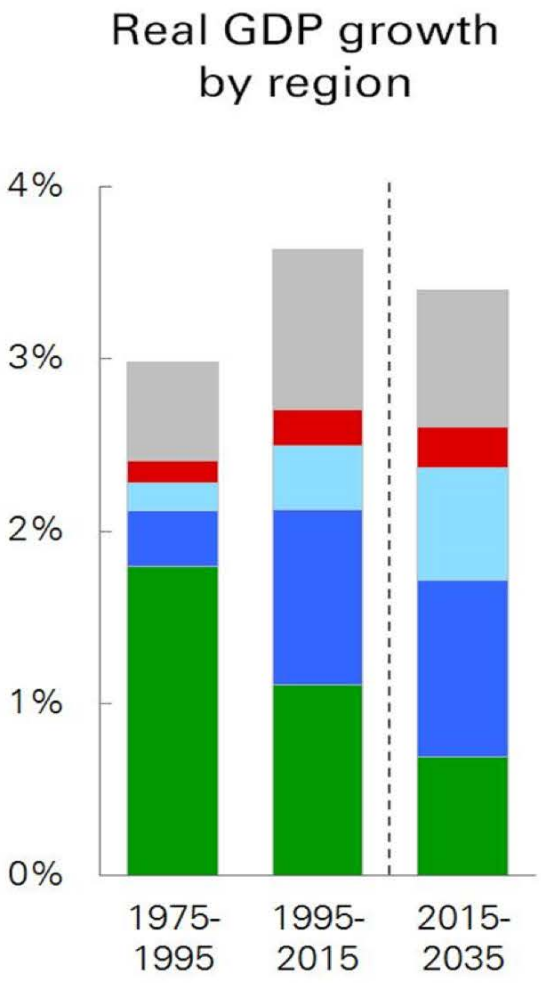
Key energy sector trends to 2035 - implications

- Population and GDP growth, disparate energy intensity and development levels across regions will drive growth in energy demand
- Resource abundance and technology advances are driving energy costs down
- This trend is similar if not more marked across renewables
- Rising living standards and energy affordability will drive energy use
- Energy sources will shift over time, but the transition will take time
- The speed of transition is impacted by numerous factors
- Even in the most rapid transition scenarios, a dual challenge exists: balancing CO_2 emissions with greater energy demand

Population and GDP growth…

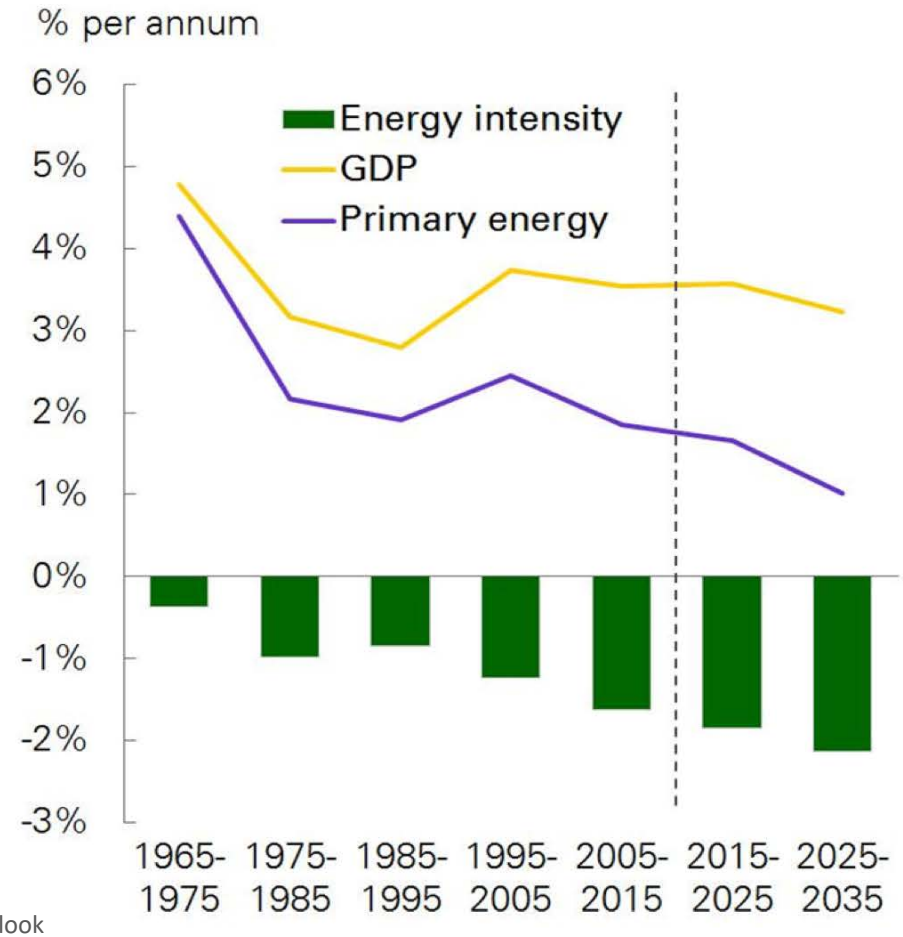




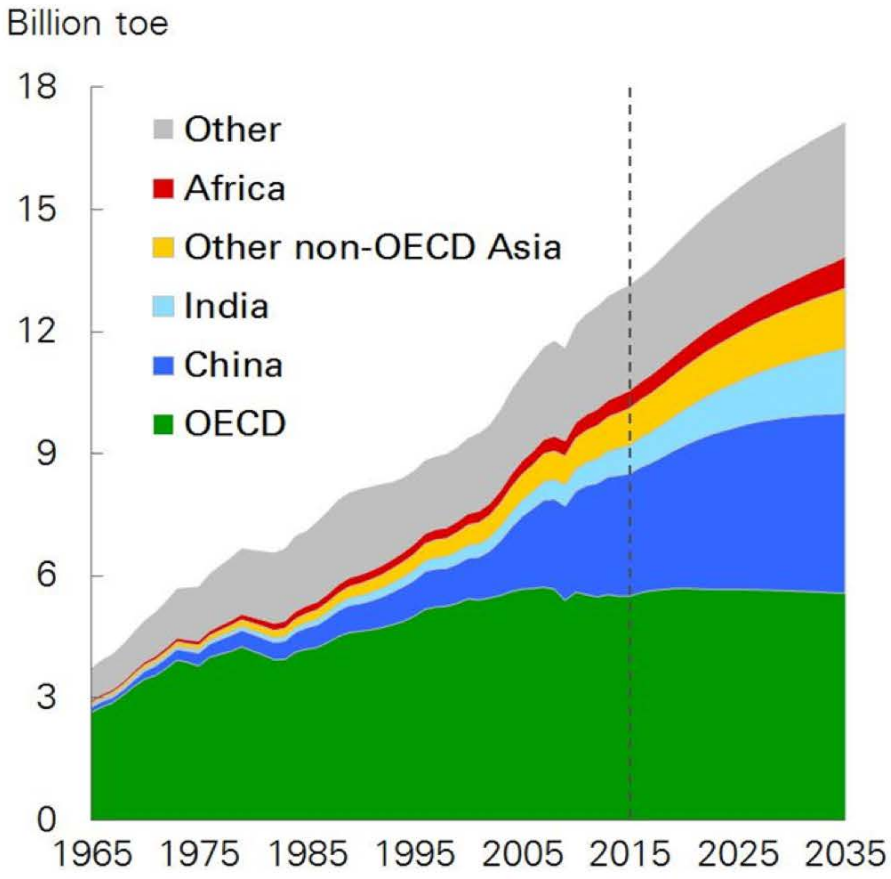


…and disparate energy intensity across regions will drive growth in demand

Growth in GDP and primary energy

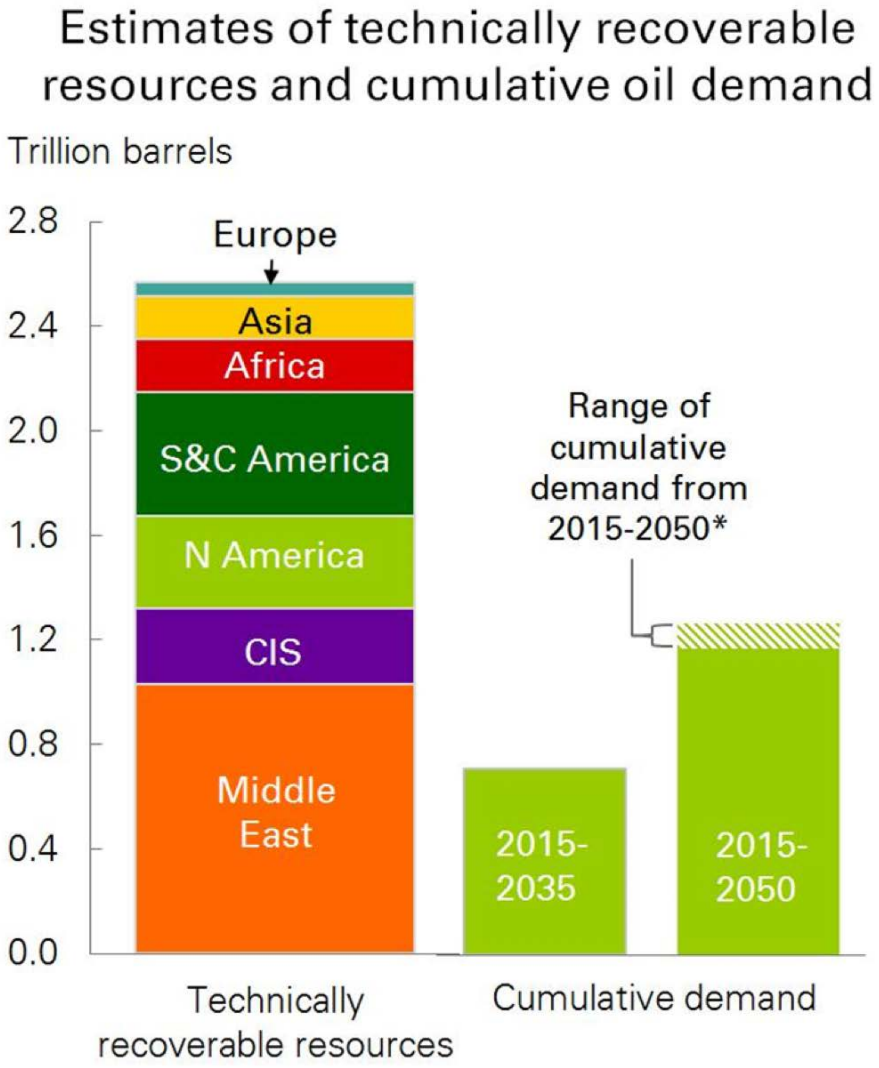


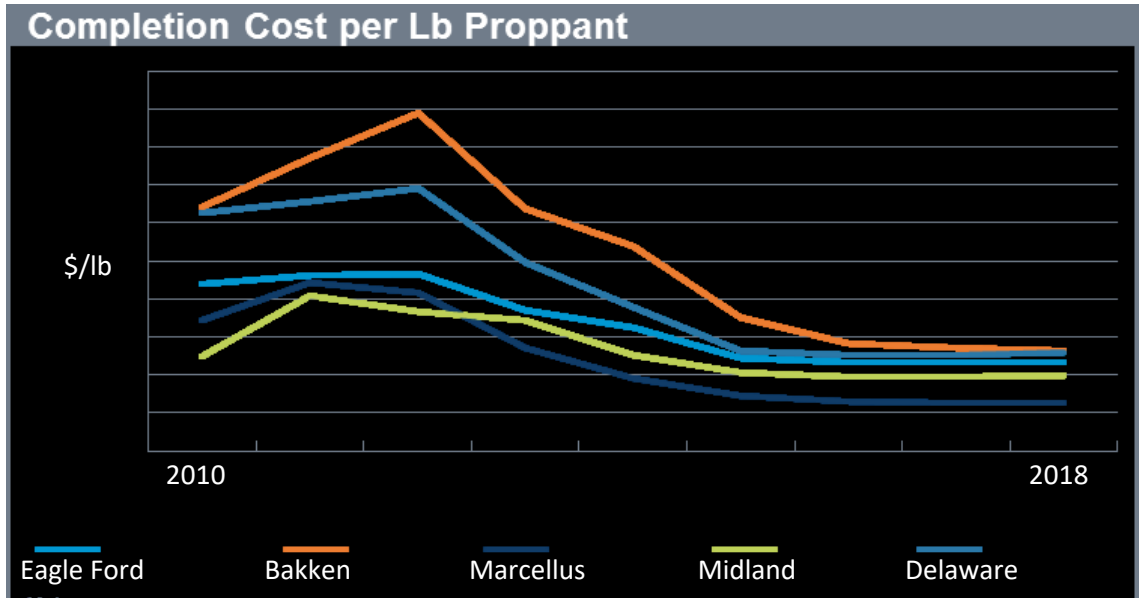
Energy consumption by region

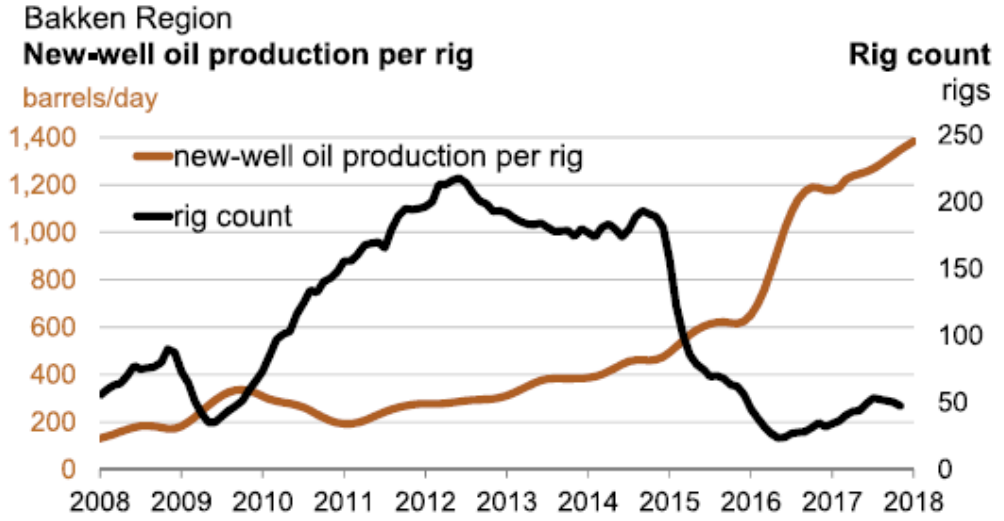


BP 2017 Energy Outlook

Resource abundance and technology advances are driving costs down

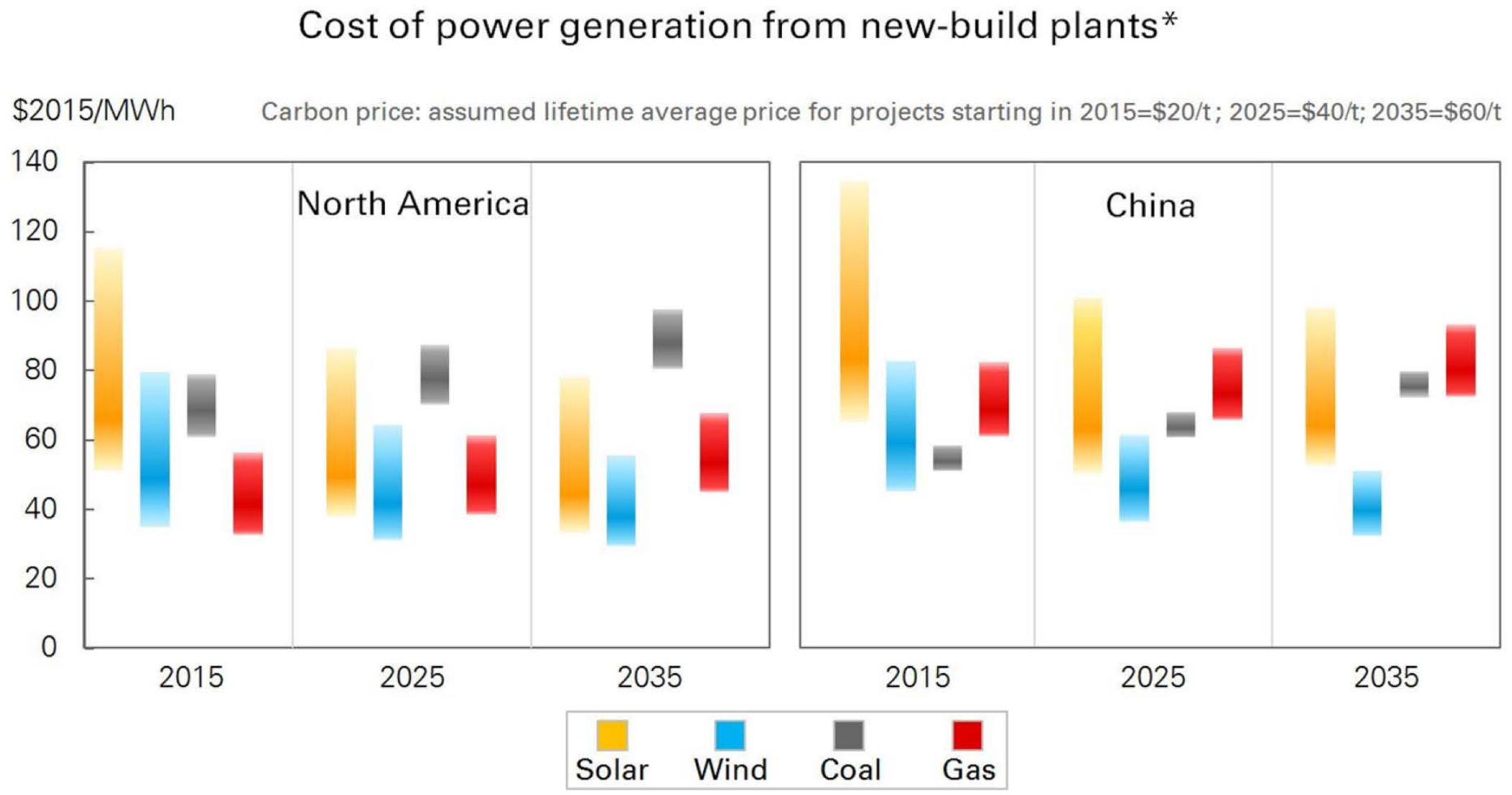






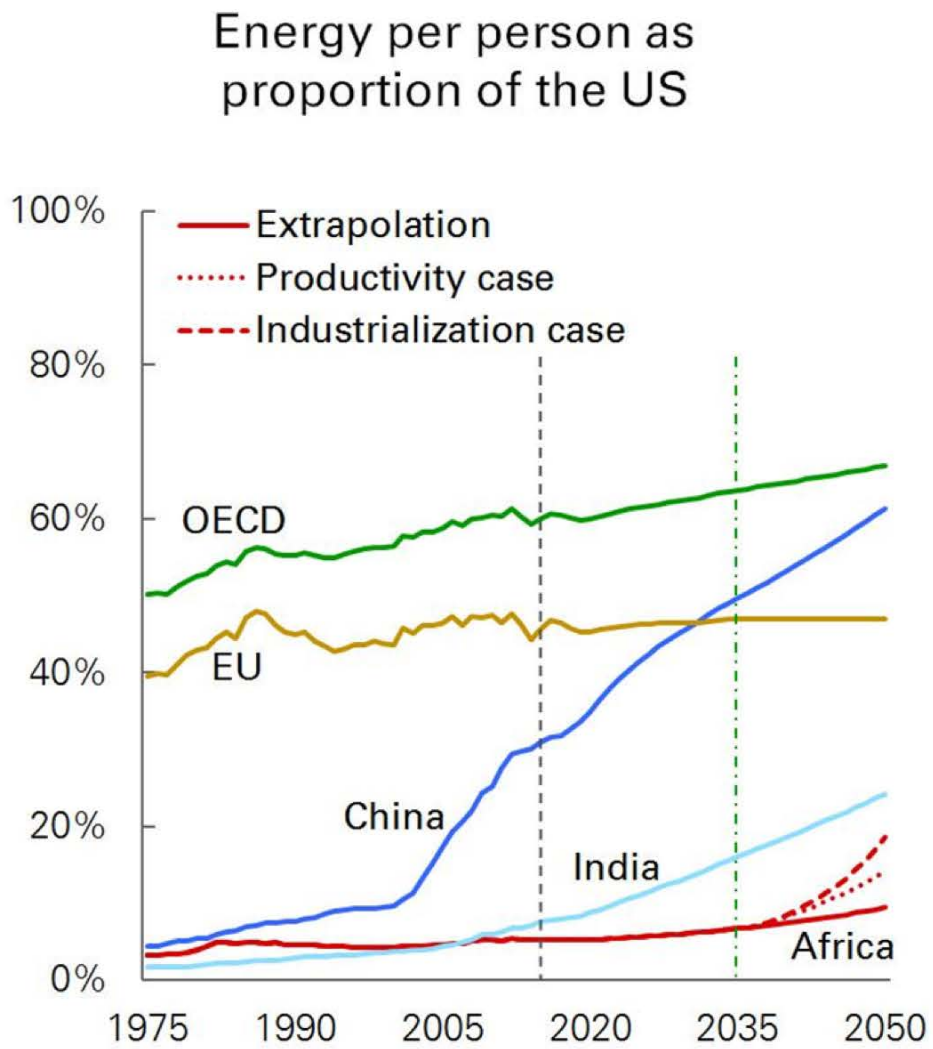
Source: EIA

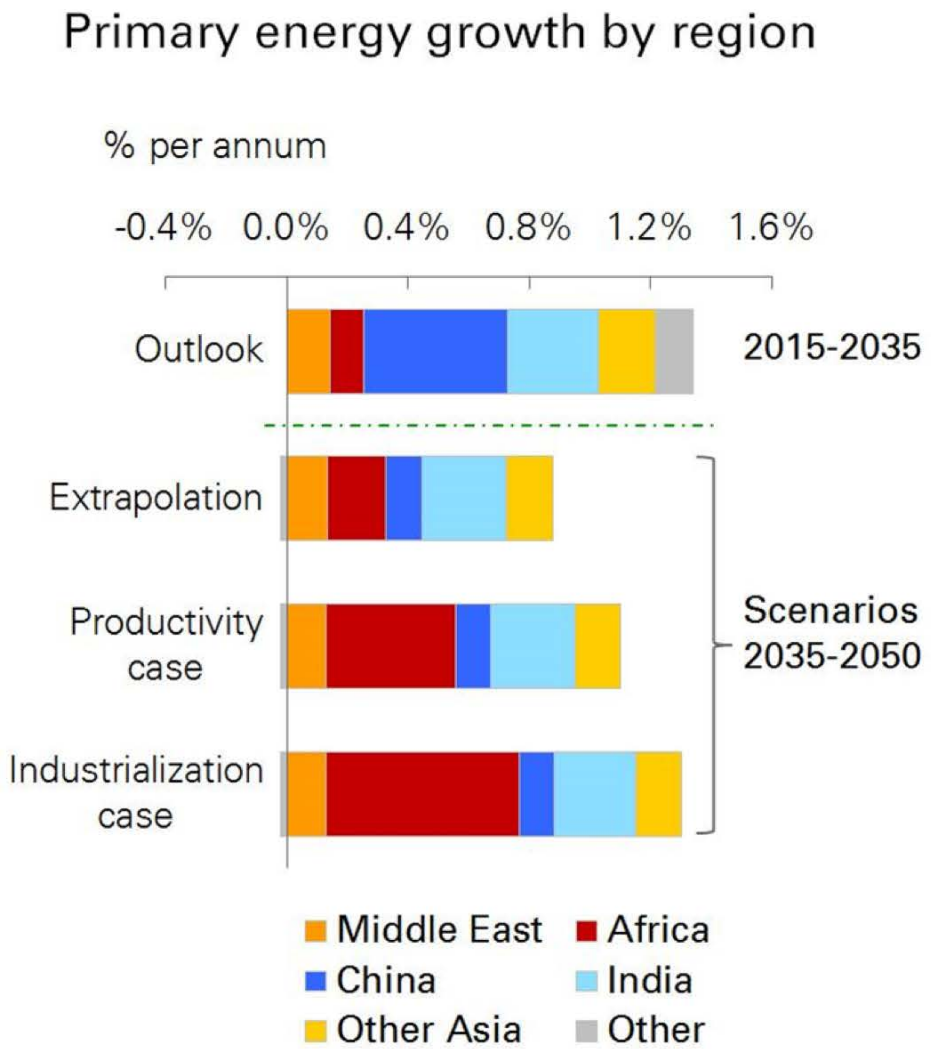
This trend is similar if not more marked for renewables



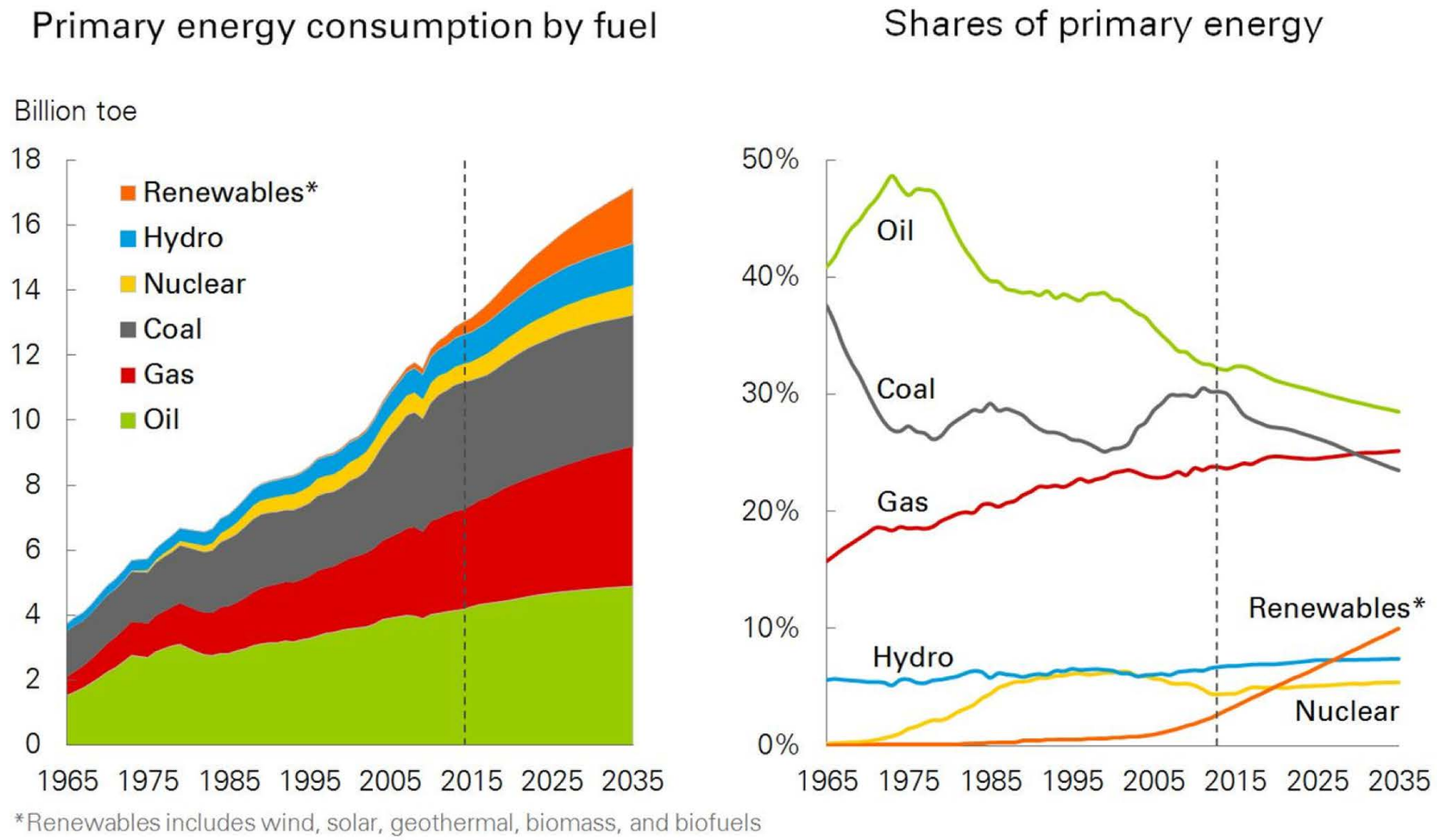
*Levelized cost of power over the lifetime of a plant. Ranges reflect the impact of low/high estimates for: cost of capital; load factors for solar and wind; fuel prices for gas and coal. Solar and wind include estimates of system integration costs

Rising living standards and energy affordability will drive energy use



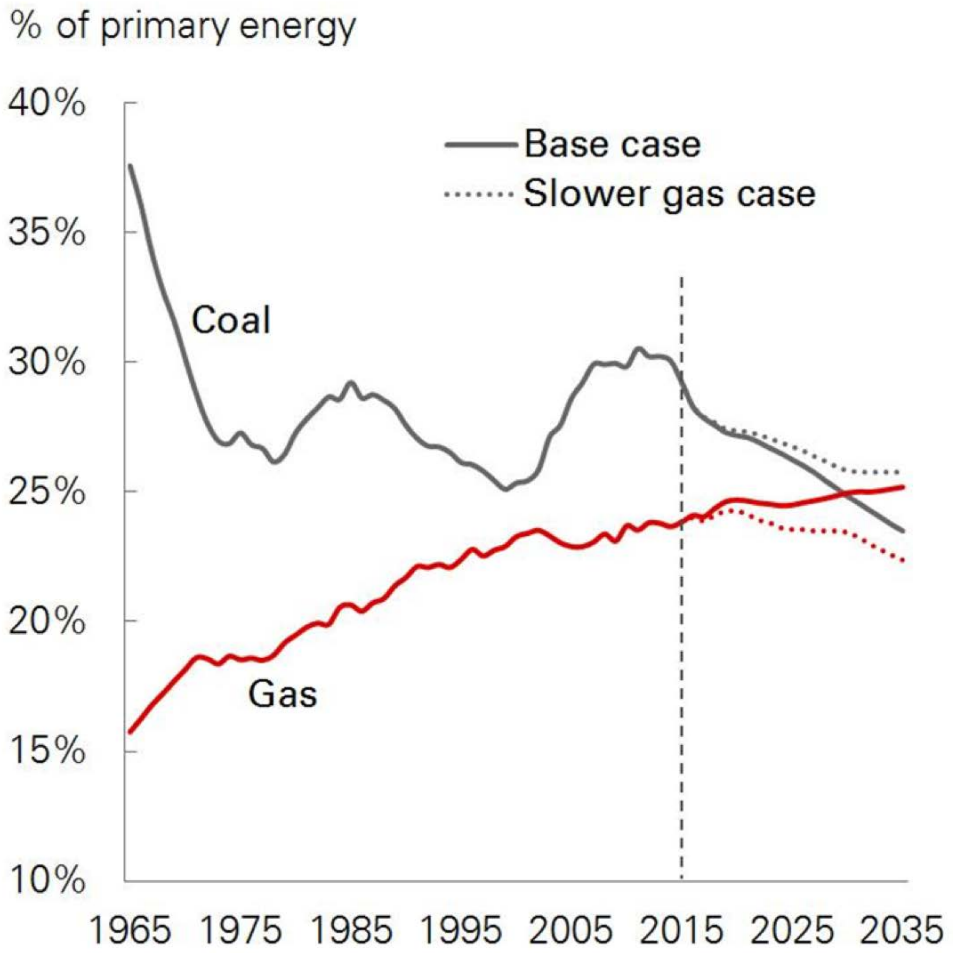


Energy sources will shift over time, but the transition will take time

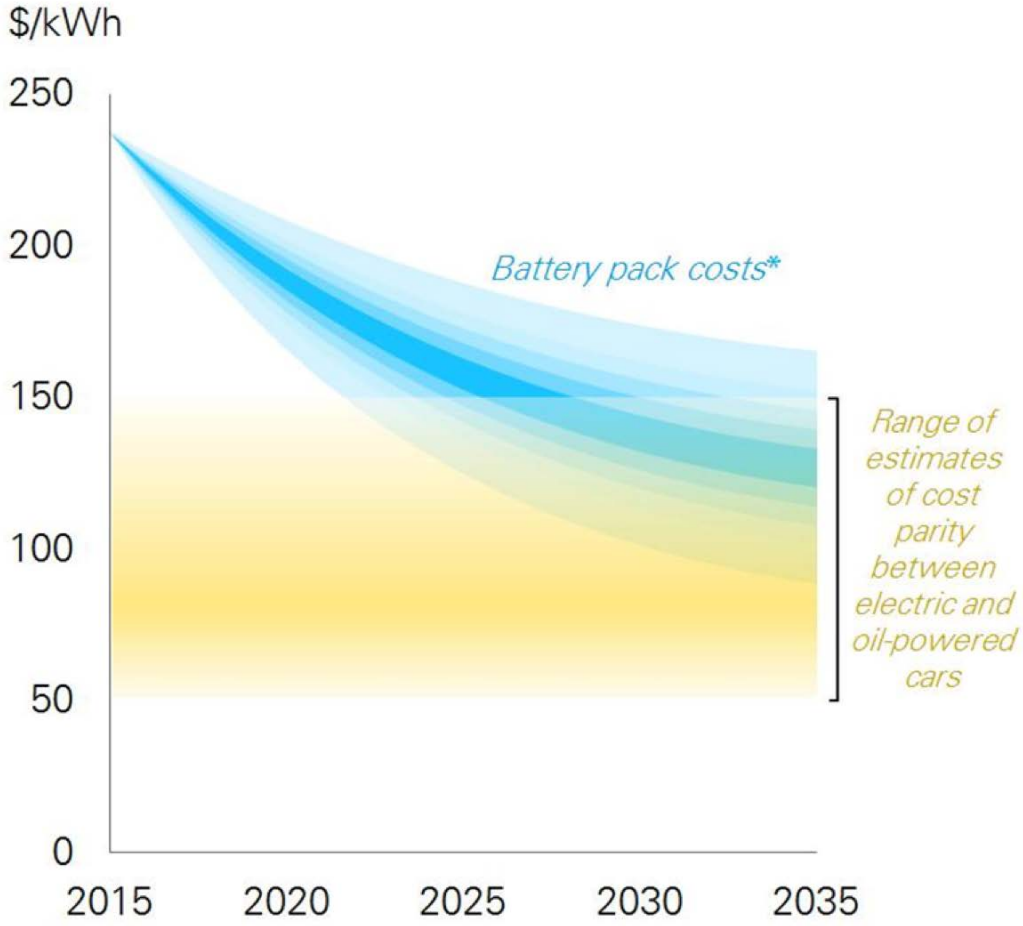


The speed of the transition is impacted by numerous factors

Shares of global primary energy

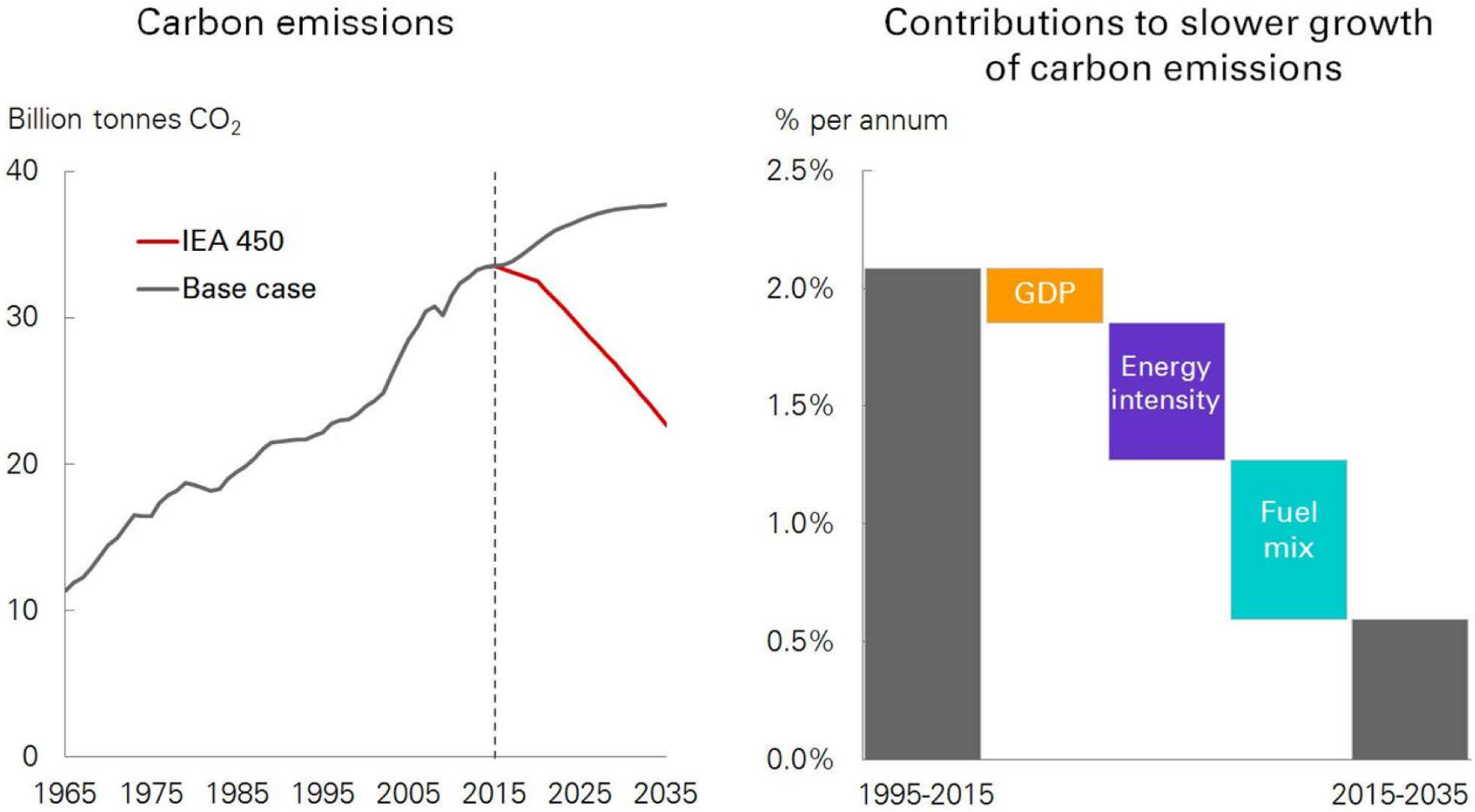


Illustrative path for battery pack costs



BP 2017 Energy Outlook

Dual challenge: balancing CO2 emissions with greater energy demand

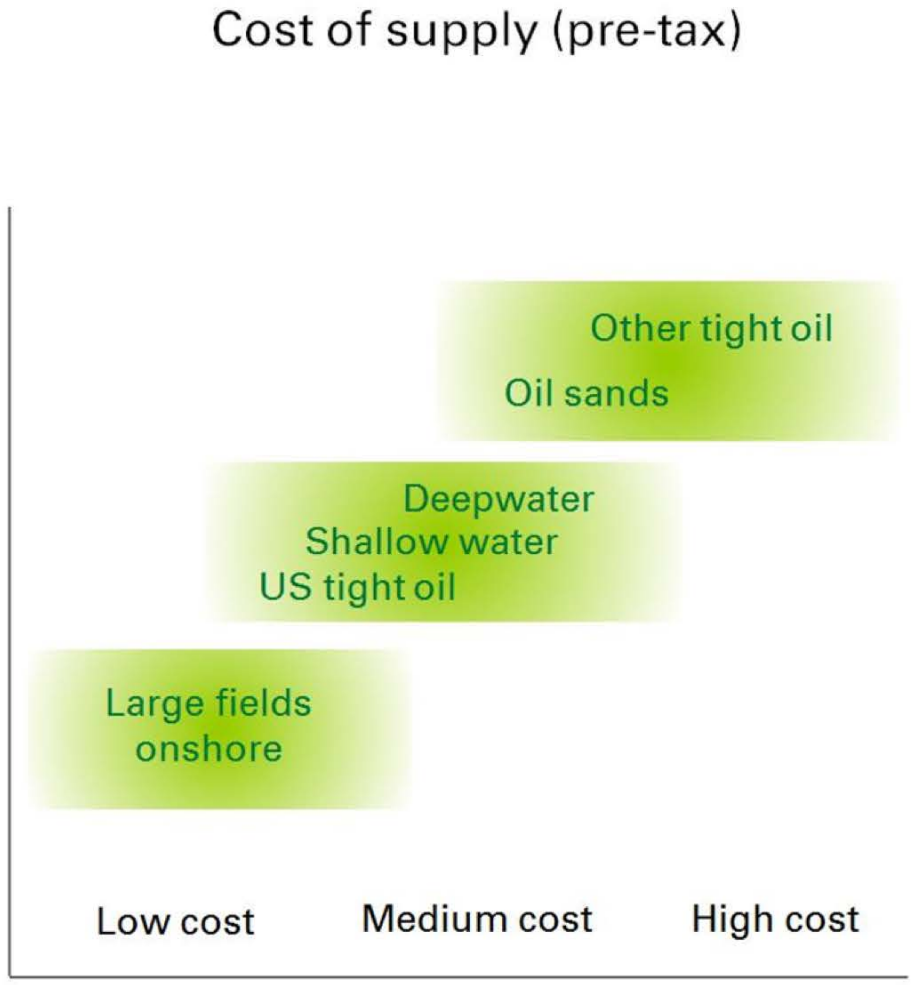


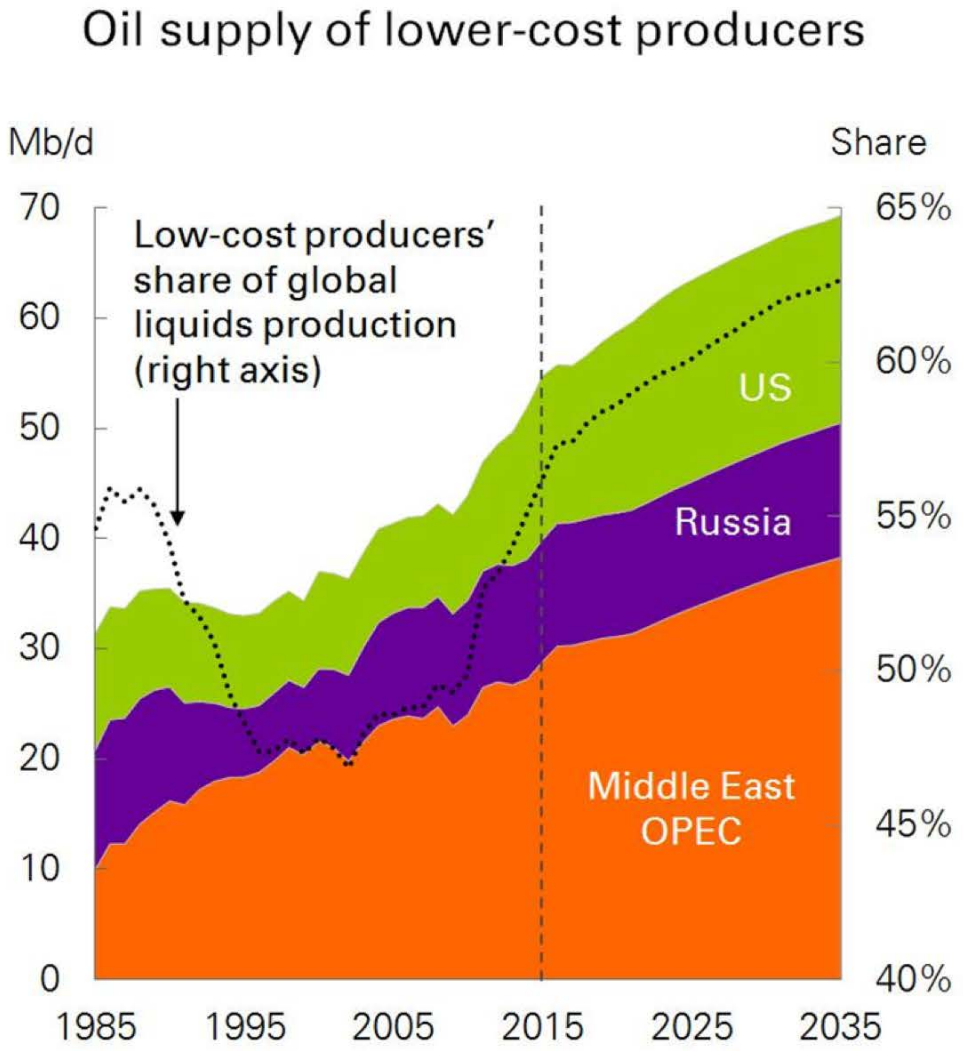
Carbon emissions have been revised to align with the updated methodology in the Statistical Review of World Energy. As such, the projection is not directly comparable to estimates in previous Energy Outlooks

Challenges implicit in this new reality

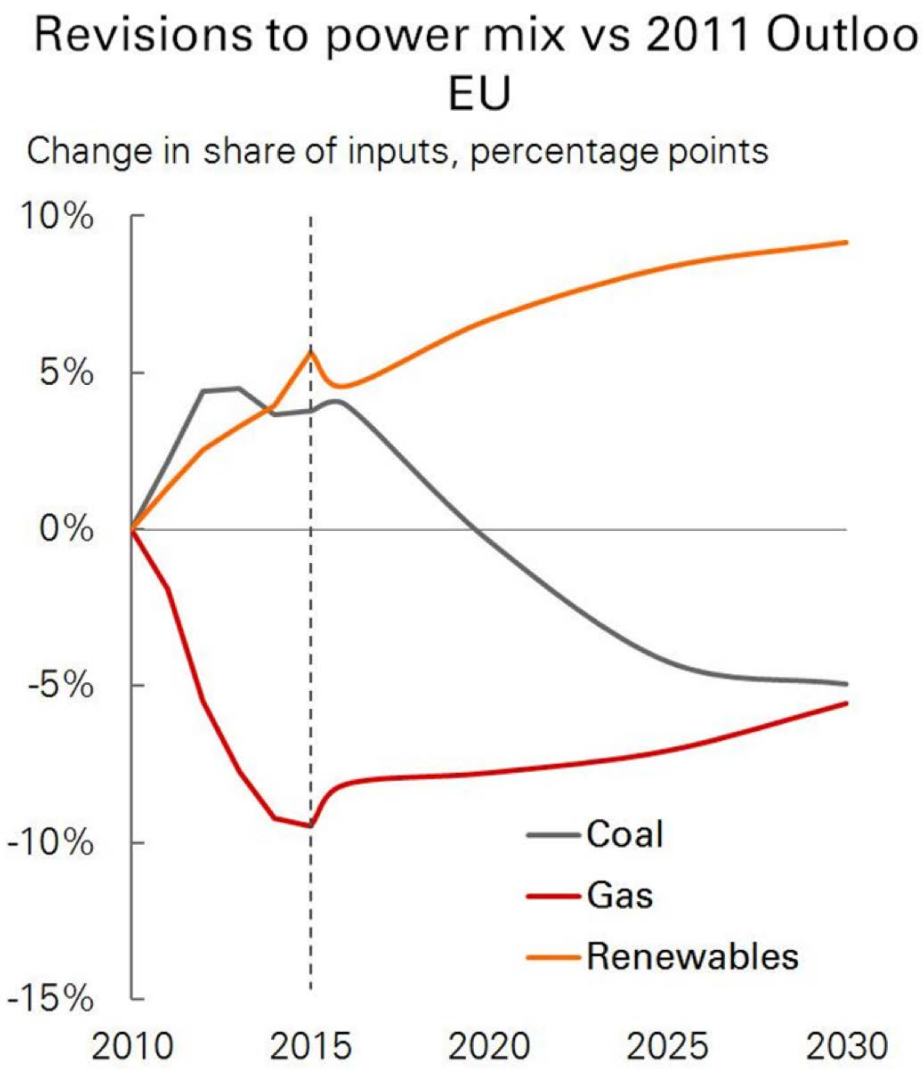
- Expect much greater levels of competition in the energy sector
- Uncertainty—rapid changes in a business that has traditionally had large capital requirements and long term pay backs
- Need to change behaviors and for society and governments to respond—globally and coherently

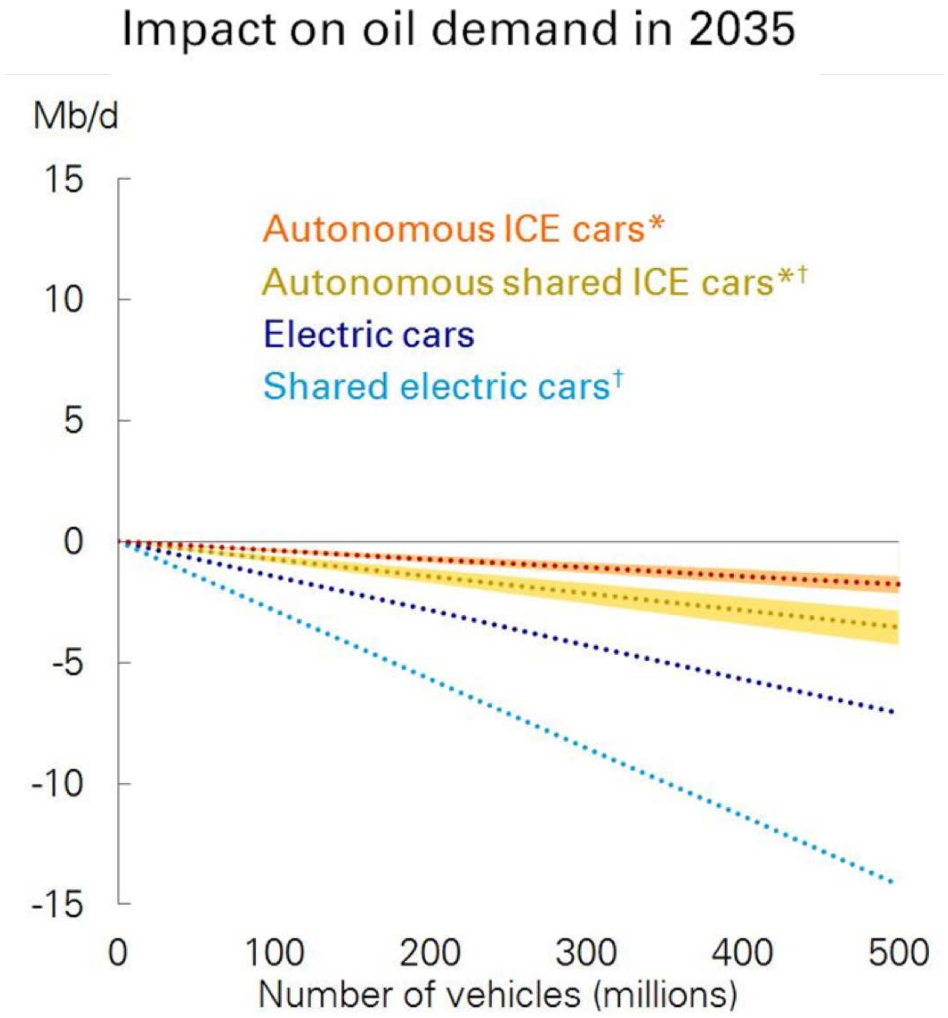
Much greater levels of competition in the energy sector





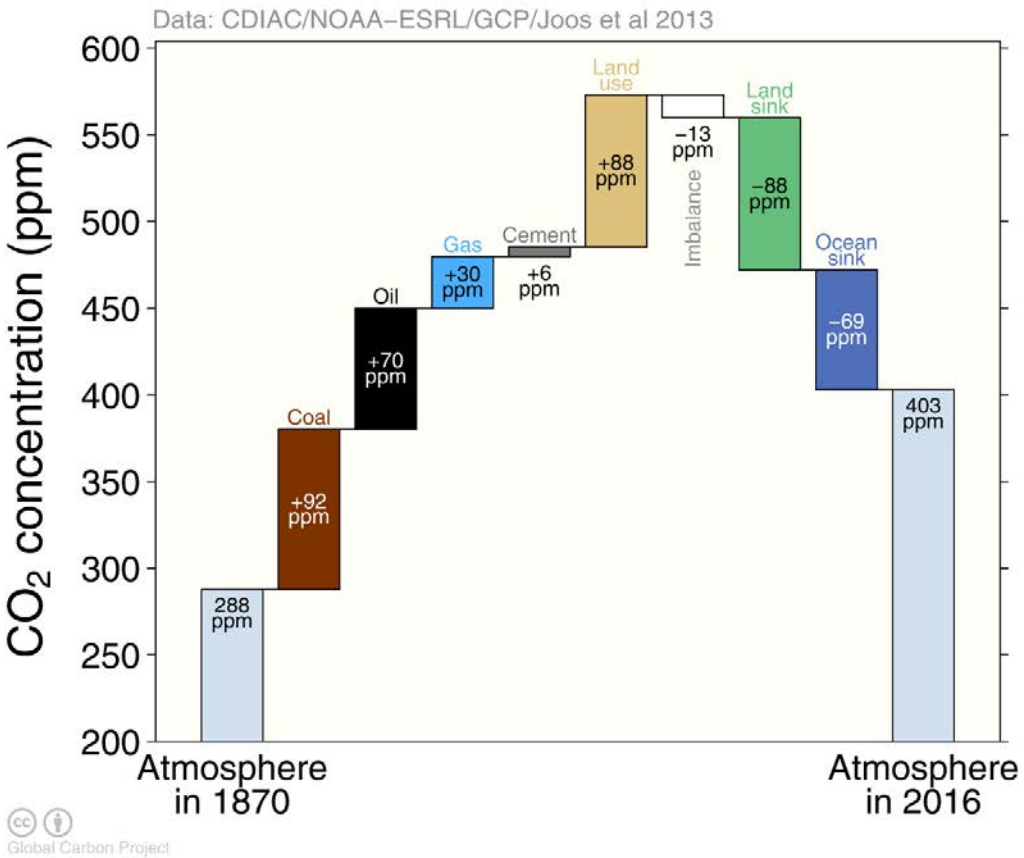
Uncertainty—rapid changes in the energy sector

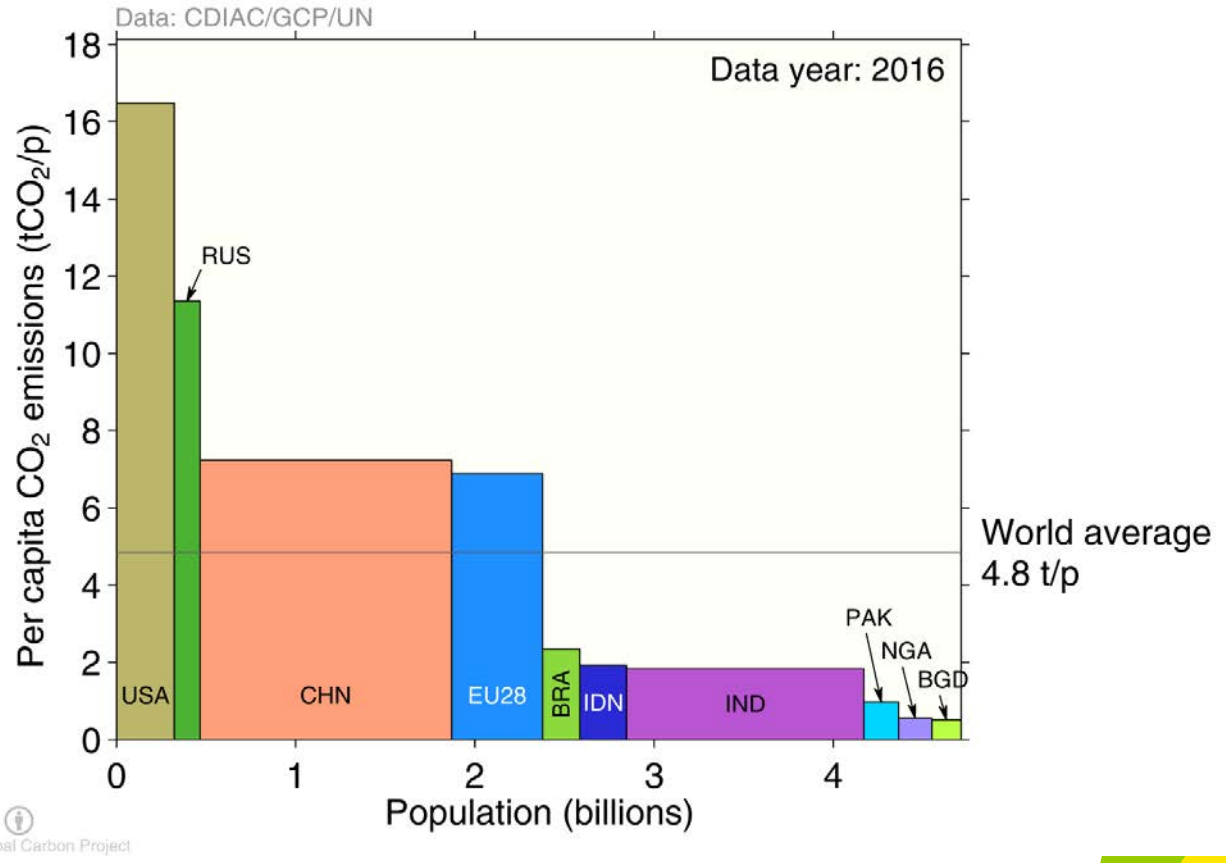




*Ranges depend on relative efficiency of human versus autonomous drivers
†Car sharing assumes each car is driven twice as many miles as a 'normal' car

Need to change behaviors and for society and governments to respond—globally and coherently





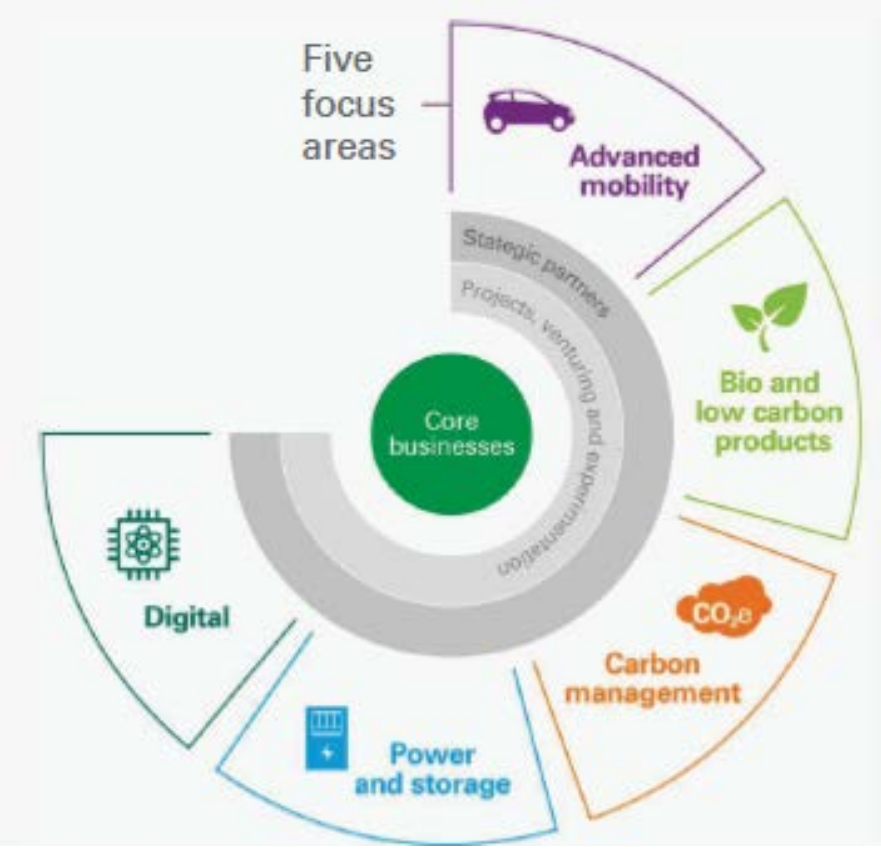
Imperatives to meet the challenges

- Energy Companies, governments and society cannot ignore the relevance of this challenge
- Our ability to meet the dual challenge will be highly dependent on technology and increases in productivity
- Science based economic and social policies are critical to ensure lowest cost of mitigation
- Cost pass through to consumers needed to drive change in behaviors

BP's Response

- Growing Gas and advantaged oil
- Market led growth in downstream
- Venturing and low carbon across multiple fronts
- Modernization of the company

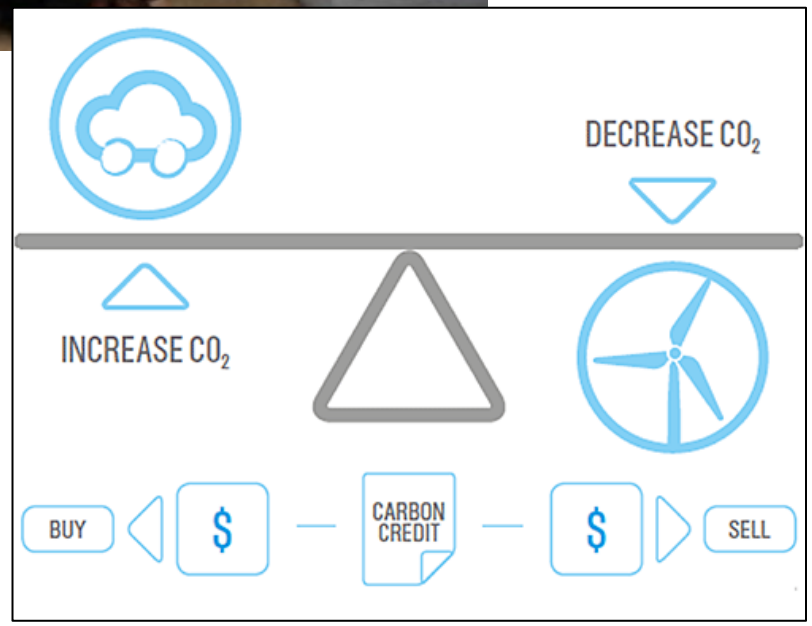
Building Low Carbon Businesses



Case Study – lightsource bp

- BP acquired 43% of lightsource—Europe's largest solar development company
- Business includes acquisition, development and management of large-scale solar projects
- 1.3 GW solar capacity commissioned, 2GW under LT contracts and 6GW growth P/L
- Synergies from adjacent businesses leveraging existing BP skills/strengths and global presence

Case Study – BP Target Neutral



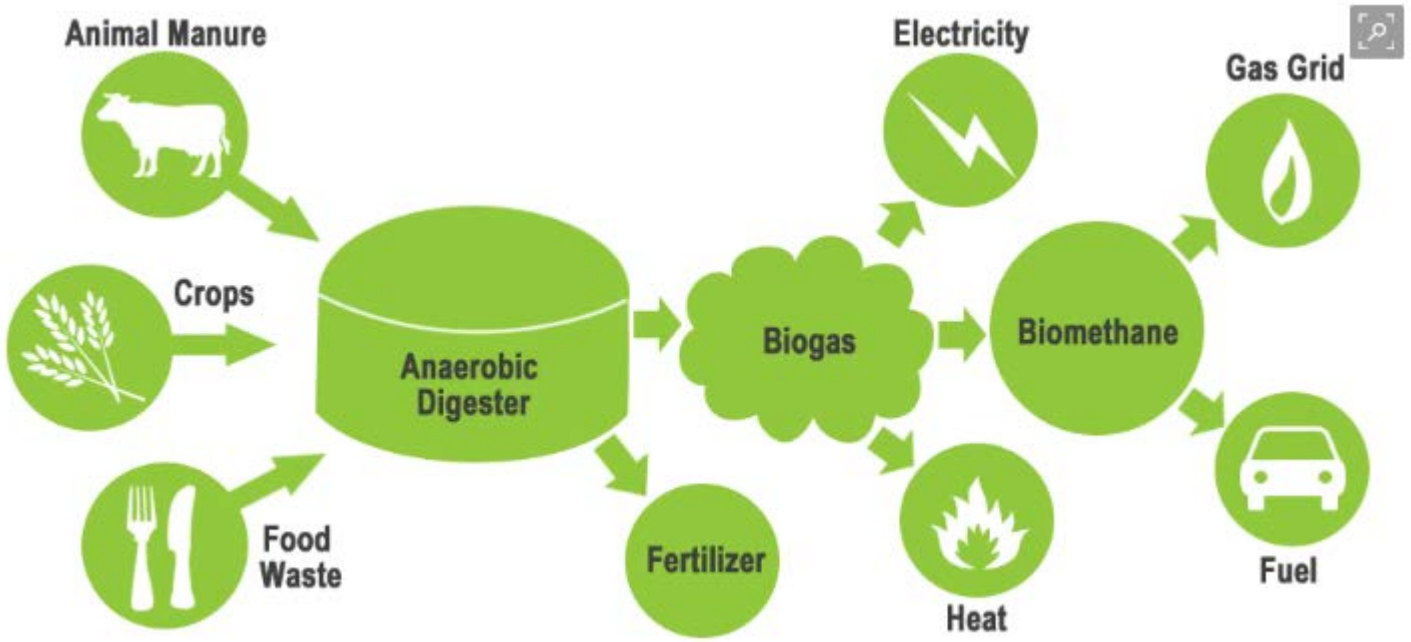
- Since 2006, Target Neutral has offset nearly 3m tonnes of carbon emissions1
- We buy ‘carbon credits’ from projects around the world which use the investment to reduce emissions
- We sell carbon neutral products and services to BP’s customers and partners
- Projects also help improve livelihoods in the communities: Biodigesters in China and India, cookstoves in Mexico and Peru, forest protection in Zambia, hydropower in China.

1 *Equivalent to taking around 1.2 million European cars off the road for one year*

Case Study – Fulcrum Bioenergy

- A strategic partnership between Air BP and Fulcrum BioEnergy
- Facilities include a FPF for MSW and a Biorefinery to process low carbon syncrude—to be operational by 2020
- BP has a 10 year offtake agreement with Fulcrum for 50 million gpy
- As a preferred partner, Air BP will distribute and supply biojet into aircraft at key hubs across North America
- Leverages BP's jet fuel expertise and market reach with Fulcrum's bio jet technology

Case Study – Clean Energy



- BP invested $155 million in Clean Energy's production facilities and third-party supply contracts for renewable natural gas
- Clean Energy will enter a long-term supply contract with BP and which will continue to operate the facilities
- BP leverages its position and market presence as North America's leading Natural Gas marketer

Questions