# BP's 2016 Energy Outlook to 2035: Overview and analysis

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## Executive summary

This paper examines BP's 2016 Energy Outlook to 2035 and analyses key themes that underpin the demand forecast, applying research and analysis from expert bodies and individuals including Oil Change International, Carbon Tracker and leading environmental advisor Tom Burke. The paper finds that by underestimating the potential speed of the decoupling of global economic growth and fossil fuels, BP could be exposing itself and its shareholders to a high risk of value destruction.

BP's 'base case' outlook is premised on a demand for fossil fuels that vastly exceeds the carbon budget for limiting temperature rises to 1.5 – 2°C, taking a very conservative view on growth in low-carbon technologies, the prospective scaling-up of governmental action, and overlooking the material impacts that such a level of climate change would have on the demand for fossil fuels. The 'faster transition' example offered in the Outlook also understates the potential demand destruction that fossil fuels could face under a rapid decarbonisation. Whilst consistent with the IEA Bridge scenario, the 'faster transition' example falls short of the level of ambition required to secure the objective of COP21 to limit global temperature rises to 'well below 2°C, with an ambition for 1.5'.

Investors are encouraged to engage with BP regarding long-term strategic planning premised on the bullish 'base case', and on transitioning the company's portfolio of assets to mitigate risk of value destruction.

*Key questions*:

- Is BP basing decisions about capital expenditure for project development and R&D on the projections contained in the Outlook?
- How is BP managing the risk of demand destruction in the case that neither the 'base case' nor 'faster transition' scenario reflect the scale and speed of global decarbonisation? How does this risk management inform capital discipline?
- How does BP's portfolio of assets (including current exploration projects) align with a demand scenario consistent with limiting temperature rises to 1.5 – 2°C? How is BP preparing for strategic resilience under such a scenario?

**Overview of BP's 2016 Energy Outlook**

The Energy Outlook outlines the forecast BP considers 'most likely' for the global energy landscape to 2035.[1] This 'most likely' scenario is reflected in BP's 'base case', underpinned by three themes:

1. Growing energy demand

*Energy demand will continue to increase, driven by growth in population and GDP in non-OECD countries, particularly emerging Asian economies. Growth in liquid fuels is driven by transport and industry, with the global vehicle fleet doubling, predominantly in non-OECD countries. This demand will be met by US shale, tight oil, Brazilian deepwater, Canadian tar sands and biofuels.*

2. A shifting fuel mix

*The fuel mix continues to shift, although fossil fuels remain the dominant source of energy, supplying 60% of the energy increase and accounting for almost 80% of total energy supplies in 2035. Gas is the fastest growing fossil fuel, supported by strong supply growth in US shale production and liquefied natural gas (LNG). Renewables account for 9% of primary energy used for power generation by 2035, up from 3% today. Globally, growth in coal slows down, but overall demand grows by 0.5% by 2035.*

3. Changing outlook for carbon emissions

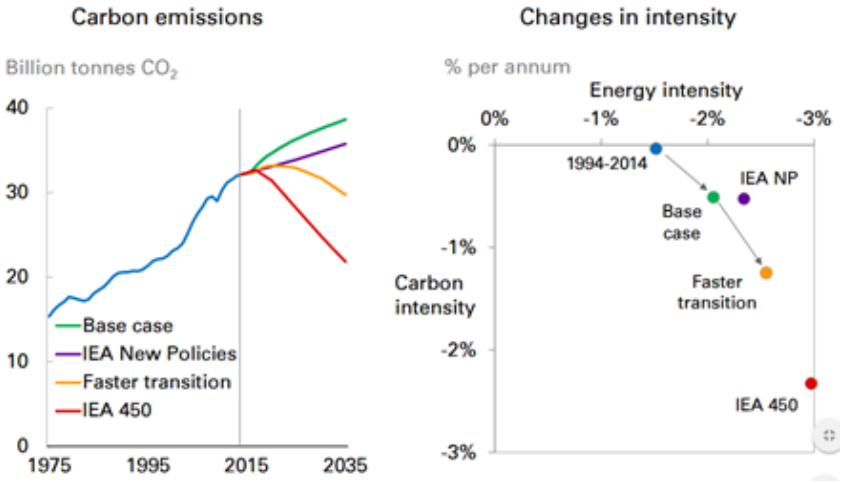
*The outlook for carbon emissions changes to reflect gains in energy efficiency and a shift to low carbon fuels. Despite this, under the base case, emissions increase by 20% by 2035, vastly exceeding the carbon budget required for limiting temperature rises to 1.5 – 2°C, agreed by governments at COP21.*

**Challenges to the 'base case'**

BP highlights three uncertainties in the 'base case'. These include slower global GDP growth, faster transition to a low-carbon world (the 'faster transition' scenario), and shale oil and gas having greater potential than predicted. Under the 'faster transition' case, emissions peak in 2020. As the graph beneath shows, neither the 'base case' nor 'faster transition' forecast are consistent with the IEA 450 scenario – which leaves a 50% chance of limiting temperature rises to 2°C. The 'faster transition' forecast is consistent with the IEA Bridge Scenario, which retains a possibility of limiting temperature rises to 2°C in the case of austere climate policies after 2030 and the successful development and deployment of 'negative emission technologies'.[2]

[1] The report is available online here: http://www.bp.com/content/dam/bp/pdf/energy-economics/energy-outlook-2016/bp-energy-outlook-2016.pdf

[2] The prospects of success for BECCS (Bio-Energy with Carbon Capture and Storage) and negative emissions technology have been questioned within academic literature [For more information, see: http://www.nature.com/ngeo/journal/v8/n12/full/ngeo2559.html]




**Analysis of BP 2016 Energy Outlook**

## BP's 'base case' and the carbon budget for staying beneath 2°C

Investors astute to the portfolio-wide harm of unmitigated climate change have cause for concern that BP's 'base case' undermines the possibility of limiting global temperature rises to 'well below 2°C, with an ambition for 1.5°C', as agreed at COP21. Strategic decision-making underpinned by the strong demand expectations of the 'base case' could lead to capital being deployed to high-cost projects such as deepwater and tar sands. A combination of market and regulatory changes to meet the 1.5 – 2°C carbon budget could render these assets stranded, i.e. no longer able to earn an economic return prior to the end of their economic life.

If this carbon budget is not met, deployment of capital to these projects will contribute to a broader 'carbon lock-in' and its associated economy-wide harm. Issues like drought, flooding, natural hazards and disease outbreak are highly vulnerable to climatic changes and ecosystem disruption, and can compound existing issues of conflict, poverty and migration. Taking a longer-term outlook, research from The Economist indicates that 6°C of warming represents value losses worth US$43trn – 30% of the entire stock of the world's manageable assets.[3]

Such material effects are likely to have further social and political implications for the fossil fuel demand that BP predicts under the 'base case'. Energising a political and social will to enact more forceful policies, tighter emissions legislations could be enforced for example through the COP21 'ratchetting' mechanism.[4] The European Systemic Risk Board has recently highlighted the high financial cost of a late and sudden low-carbon transition in response to such physical climatic impacts.[5]

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[3] http://www.economistinsights.com/sites/default/files/The%20cost%20of%20inaction.pdf

[4] The 'ratchetting mechanism' is a policy device wherein countries would submit new "Intended Nationally Determined Contributions" (INDCs) every five years, outlining how much they intend to reduce emissions. Each submission would be more ambitious than the last, namely, ratcheting up. For more information, see: http://www.carbonbrief.org/explainer-the-ratchet-mechanism-within-the-paris-climate-deal

[5] https://www.esrb.europa.eu/pub/pdf/asc/Reports_ASC_6_1602.pdf

When asked at the Outlook launch whether analysis had been performed on the downside implications these climate effects might have on BP's forecasts for GDP growth and demand for fossil fuels, the response was that these considerations had not been accounted for.

**Assumptions about fossil fuel demand and economic development**

The 'base case' sees energy demand driven by strong economic growth and population expansion in emerging economies. BP finds that demand must be met by fossil fuels: whilst renewables and low-carbon technologies grow, they do not do so on the scale needed to meet this burgeoning demand.

As Oil Change International highlights, BP's methodology for arriving at this conclusion assumes that future trends are continuous with present ones, thus reducing the firm's ability to foresee deviations to historical trends that challenge business as usual (BAU) assumptions.[6] Such an approach can leave companies blinkered to rapid market shifts, exposing firms and their investors to the risk of value destruction.

As highlighted by the recent Carbon Tracker report, 'Lost in Transition', there are a number of BAU assumptions that can be challenged from a considerable evidence base.[7] These include:

- Renewable energy technologies do not penetrate at speed or scale – including both energy for electricity generation, and the electrification of the global vehicle fleet
- Global population and GDP will maintain recent growth rates
- The energy system will see only incremental change, not transformational shifts

Any one of these challenges to BAU could shift the demand outlook, and a combination of these factors would transform the landscape. Below, a number of these assumptions are considered in more depth.

<u>Underestimating the take-off of low-carbon energy</u>

BP has historically underestimated the growth of renewables, having to scale up predictions every year. The 2016 Energy Outlook again takes a conservative outlook on renewables, with the 'faster transition' case assuming they will provide just 15% of the base energy production by 2035. This assumes the growth rate will drop to 10.5% per annum in the next five years, and 6.6% in the following decade – a steep fall from the current average growth rate of 17.4%.[8]

This prediction is divergent to forecasts of exponential growth many anticipate for renewables, due to rapidly falling costs of development and deployment. For instance, Citi estimates the cost of solar could fall by as much as 45% between 2013 and 2020[9], and Bloomberg New Economic Finance (BNEF) projects that utility-scale solar costs will fall by 46% between 2015 and 2040, becoming competitive with conventional power generation by 2026. This leads BNEF to project that renewables will account for around 46% of electricity generation by 2040, and leaves fossil fuels providing 44% of electricity generation by 2040, compared to BP's predication that they will provide just under 60% by 2035.[10]

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http://www.businessgreen.com/bg/opinion/2446759/the-clean-energy-transition-will-be-faster-than-bp-thinks

[7] http://www.carbontracker.org/wp-content/uploads/2015/10/Lost-in-transition-Exec-Sumary_221015.pdf

[8] http://www.businessgreen.com/bg/opinion/2446759/the-clean-energy-transition-will-be-faster-than-bp-thinks

[9] https://www.citivelocity.com/citigps/ReportSeries.action?recordId=21

[10] http://about.bnef.com/content/uploads/sites/4/2015/06/BNEF-NEO2015_Executive-summary.pdf

A faster decoupling of economic growth from fossil fuels in non-OECD countries – where BP predicts much of the future demand will result from – would also fundamentally challenge BP's projections. Advances in disruptive technologies are already leading many to forecast a more rapid transition in these economies. For instance, the China 2050 High Renewable Energy Penetration Scenario and Roadmap Study has shown the economic and technological feasibility of renewables accounting for 60% of the total energy consumption and 85% of electricity by 2050,[11] growing at a much faster rate than BP's predicted ~20% by 2035. Similarly, a study by KPMG indicates that the market penetration of solar power in India is likely to disrupt traditional utilities.[12]

As noted by Tom Burke, a leading environmental advisor, a further issue associated with BP's modelling assumptions around renewables is the use of 'billion tonnes of oil equivalent' (btoe) as the measurement for estimating demand growth.[13] This conceals how different energy sources deliver energy services with different efficiency rates: with around 60% of the primary energy from fossil fuels lost prior to being delivered to consumers. Thus, whereas the oil industry predicts that renewables need to be scaled up 800% in the next thirty years to meet demand, taking efficiency savings into account more than halves this to around 350% - a figure that current trends indicate is much more realistic.

Over-estimating the demand growth from the transport sector

BP foresees transport contributing greatly to the projected growth in demand for fossil fuels. Indeed, the assumption that the global vehicle fleet doubles would substantiate an increased production of liquid fuels, including – the 2016 Outlook indicates – high cost projects like tar sands and deep-water.

A potential disruption to this comes from electric vehicles (EVs). Queried about this trend at the Outlook launch, BP said it expects that EVs will not be cost-competitive until after 2035. This contradicts the research of Bernstein, which finds that EVs could be cost-competitive with internal combustion engine cars by 2025.[14] Indeed, the costs of Tesla's recent Model-S were at least five years ahead of the industry average. Similarly, General Motors has just announced an affordable, long-distance EV which will go on sale in 2017.[15] As costs continue to fall and battery technology makes rapid improvements, there are predications that EV demand will continue on an exponential growth trend.[16]

In China and India – where BP foresees the largest increase in vehicle ownership – air pollution resulting from increasing transport is leading policy makers to rapidly introduce tighter legislation around vehicle emissions.[17] The environmental health costs of BP's estimated doubling of the vehicle fleet could trigger additional tightening of legislation, further undercutting the structural demand for liquid fuels.

[11] http://www.efchina.org/Reports-en/china-2050-high-renewable-energy-penetration-scenario-and-roadmap-study-en
[12] https://www.kpmg.com/IN/en/Press%20Release/FINAL-PRESS-RELEASE-Nov16-2015.pdf
[13] These figures come from analysis by Tom Burke – http://www.businessgreen.com/bg/opinion/2444372/of-oil-and-stones-why-the-oil-industry-is-overestimating-the-scale-of-the-renewables-challenge
[14] http://www.carbontracker.org/wp-content/uploads/2015/10/Lost-in-transition-Exec-Sumary_221015.pdf
[15] http://www.ibtimes.co.uk/general-motors-lays-down-gauntlet-tesla-affordable-ampera-e-electric-car-1543208
[16] http://www.autosinsight.com/industry-trend-analysis-electric-vehicles-continue-exponential-growth-trend-jan-2016
[17] http://www.theicct.org/update-early-adoption-china-5-v-guangdong

Global GDP will maintain recent growth rates

In BP's base case, world GDP more than doubles. In analysis of a scenario of lower growth, BP sees GDP growing at rates of 3% p.a., 0.5% below the base case. The slower growth of global GDP reduces the overall increase in energy demand by around a third relative to the base case – a significant fall which would vastly affect the profitability of projects with high to medium break-even prices. Lower than expected growth in GDP, compounded with a decoupling of economic growth from fossil fuels, could lead to much lower rates of demand than the Outlook forecasts.

This risk is particularly valid for China, where forecasters often overestimate the scale of GDP growth. For example, whilst in 2010 the IMF estimated that China's economy would grow 9.5%, 9.0% and 9.5% in 2011, 2012 and 2015 respectively – the realised GDP growth rates were 9.3%, 7.8% and 7%.[18]

*Questions*

- What impact would these alternate demand forecasts have on the economic viability of BP's current and projected portfolio of assets? What likelihood does BP attribute to these alternate scenarios?
- How is the risk of low-carbon disruptions to the energy system being integrated into BP's capital expenditure for future projects and R&D? What degree of capital discipline being applied in light of potential disruption risks?
- Is BP developing plans to transition towards a portfolio consistent with economic decarbonisation? In particular, is BP planning for strategic resilience under a scenario consistent with the target agreed at COP21 to limit temperature rises to 'well below 2°C, with an ambition for 1.5'?

**An even faster transition?**

Whilst the 'faster transition' example takes a more optimistic outlook on decarbonisation than the 'base case', this scenario is still conservative compared to alternative forecasts such as BNEF's. Other than coal, growth in demand for fossil fuels continues. Demand for gas is predicted to be almost as high as in the 'base case'. Oil grows by nearly 10%, only starting to slowly decline in the 2030s.

These predictions can be challenged. A recent study by the UK Energy Research Centre has queried the potential for gas to act as a bridge to a decarbonised economy,[19] and Carbon Tracker research finds that $283 bln of LNG projects are 'uneconomic' to 2025 under a demand scenario consistent with 2°C. Similarly, a faster take-off in EVs and tightening of vehicles emission legislation globally could cut into the oil demand foreseen under the 'faster transition' case.

Whilst the 'faster transition' case goes beyond the current Intended Nationally Determined Contributions (INDC) emission targets pledged before COP21 and could thus reflect a 'ratchetting up' of ambition; given that nations have agreed to upwardly revise the INDCs every five years, there remains scope for much greater policy ambition than foreseen in the 'faster transition' scenario. As the consequences of climate change become increasingly

[18] http://www.carbontracker.org/wp-content/uploads/2015/10/Lost-in-transition-Exec-Sumary_221015.pdf
[19] http://www.ukerc.ac.uk/publications/the-future-role-of-natural-gas-in-the-uk.html

material, and the political and social will for decarbonisation increase, the likelihood of legislation much more stringent than foreseen under 'faster transition' also grows.

*Questions*

- Has BP conducted demand analysis and scenario planning around an 'even faster' transition? How are these disruptive trends being relayed into strategic decision making?

**Overemphasizing the link between a low-carbon energy transition and carbon pricing**

In the Outlook and accompanying media promotion, a strong correlation is assumed between economic changes needed to limit temperature changes to 2°C, and an accompanying political framework. In particular, BP suggests that a strong carbon price will be essential – indicating that a price of $100 per carbon tonne in OECD countries is a necessary factor underpinning the 'faster transition'. The carbon price under the current EU Emissions Trading System (ETS) averages around €5.

Whilst a strong policy framework is an important component of a managed transition to a low-carbon economy, as the cost of development and deployment of renewables and EVs decreases, technology innovation and market forces will also play a critical role in reducing fossil fuel demand.

BP's advocacy for a strong carbon price can be commended, and the company should work to ensure that this position is communicated to its trade associations who have often sought to undermine schemes such as the EU ETS through lobbying against reducing the over-supply of carbon allowances, and in favour of subsidising high-emission industries. However, BP should also be astute to the possibility of a low carbon transition driven predominantly by technology innovation and market forces.

**Conclusion**

Deviations to the historical trends underpinning BP's 2016 Energy Outlook 2035 could vastly challenge the demand landscape, leaving the company and its investors exposed to the risk of value destruction. Investors are encouraged to engage with BP on its management of these risks, and seek a better understanding of how the company is preparing for strategic resilience under low carbon scenarios consistent with limiting temperature rises to 'well below' 2°C, with an ambition for 1.5.

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