



bhpbilliton

# Climate Change: Portfolio Analysis Views after Paris



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## Forward looking statements

This document contains forward looking statements, including statements regarding trends in commodity prices and demand for commodities, assumed long-term scenarios; potential global responses to climate change; regulatory developments; the potential effect of possible future events on the value of the BHP Billiton portfolio and the plans, strategies and objectives of management.

Forward looking statements can be identified by the use of terminology such as 'intend', 'aim', 'project', 'anticipate', 'estimate', 'plan', 'believe', 'expect', 'may', 'should', 'will', 'continue', 'annualised' or similar words. These statements discuss future expectations concerning the results of operations or financial condition, or provide other forward looking statements.

When this document was prepared there were reasonable grounds for making the forward looking statements that have been included. However, many of the forward looking statements in this document are based on the Group's scenario planning process. While scenario planning is a useful tool, there are inherent limitations and we are unable to predict which, if any, of the scenarios may eventuate. While the scenarios represent possible future events, they are not a prediction of likely events and do not constitute preferred outcomes for BHP Billiton. Additionally, forward looking statements are not guarantees or predictions of future performance, and involve known and unknown risks, uncertainties and other factors, many of which are beyond our control, and which may cause actual results to differ materially from those expressed in the statements contained in this document. Readers are cautioned not to place undue reliance on forward looking statements.

There are a number of factors that may have an adverse effect on our results or operations, including those identified in the risk factors discussed in BHP Billiton's filings with the US Securities and Exchange Commission (the 'SEC') (including in Annual Reports on Form 20-F) which are available on the SEC's website at [www.sec.gov](http://www.sec.gov).

Except as required by applicable regulations or by law, the Group does not undertake any obligation to publicly update or review any forward looking statements, whether as a result of new information or future events.

Past performance cannot be relied on as a guide to future performance.

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# Introduction

**At BHP Billiton, we continually monitor and analyse potential impacts of climate change risks and opportunities on our company. Effectively managing these potential impacts is an important part of our commitment to long-term shareholder value.**

In 2015, we launched our **Climate Change: Portfolio Analysis** report which described our approach to portfolio evaluation and scenario planning, including the implications of a transition to a lower emissions future for our portfolio. The report has been of considerable interest to stakeholders since it was launched. One area of particular interest was how we monitor ongoing external developments and factor them into strategic planning.

This new document, **Views after Paris**, describes some of our observations from the past 12 months and their potential portfolio impacts. It also provides further details on some of our key climate change related assumptions and an update on recent actions we have taken related to climate change.

**Views after Paris** is a further demonstration of our commitment to climate change-related disclosures. It describes:

## 1 Our approach to strategic planning

The processes and tools we use to inform decision-making.

## 2 Our insights

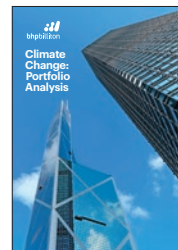
The latest signals we are seeing in the external environment which indicate how the world is tracking towards a lower emissions outcome.

## 3 Portfolio implications

The implications these signals could have for BHP Billiton.

## 4 Our actions

The actions we are taking to manage climate change risk.



In BHP Billiton's **Climate Change: Portfolio Analysis** report, released in September 2015, we described two pathways to a lower emissions world. The report highlighted that our uniquely diversified portfolio of high-quality, low-cost assets is robust under both an orderly and a more rapid transition to a global average temperature increase of less than 2°C, relative to pre-industrial levels (a '2°C outcome').

Since the release of that report, a new international deal on climate change was reached at the Conference of the Parties in Paris in December 2015. We welcome the agreement and believe it provides a solid, long-term foundation for further progress. We will continue to actively advocate for a less than 2°C outcome.

## Our position on climate change

We accept the Intergovernmental Panel on Climate Change (IPCC) assessment of climate change science, which has found that warming of the climate is unequivocal, the human influence is clear and physical impacts are unavoidable. We believe the world must pursue the twin objectives of limiting climate change to the lower end of the IPCC emission scenarios in line with current international agreements, while providing access to reliable and affordable energy to support economic development and improved living standards. We do not prioritise one of these objectives over the other – both are essential to sustainable development.

Under all current plausible scenarios, fossil fuels will continue to be a significant part of the energy mix for decades. Therefore, an acceleration of effort to drive energy efficiency, develop and deploy low emissions technology and adapt to the impacts of climate change is needed. We believe there should be a price on carbon, implemented in a way that addresses competitiveness concerns and achieves lowest cost emissions reductions.

To support this position we have an integrated climate change strategy that focuses activity across five key areas:

- **Portfolio evaluation** – Testing the resilience of our portfolio and strategy.
- **Low emissions technology** – Working in partnership to accelerate the development and deployment of low emissions and renewable technologies.
- **Mitigation** – Reducing greenhouse gas (GHG) emissions.
- **Adaptation** – Building the resilience of our operations, communities and ecosystems to climate change impacts.
- **Stakeholder engagement** – Seeking to enhance the global response to climate change by engaging with investors, governments, industry and civil society.

# 1 Our approach to strategic planning

We have a robust strategic planning process that tests the resilience of our portfolio and investment decisions against a range of possible future scenarios. The diversity of our portfolio uniquely positions us to manage and respond to changes and capture opportunities to grow shareholder value over time.

We have a corporate planning framework that is rigorous yet flexible. It gives us the capability to respond and adapt to a dynamic external environment. It makes sure strategic insights from across BHP Billiton are captured and considered as part of investment decisions and capital allocation. Our approach to climate change is fully integrated and aligned with our corporate strategy and planning framework.



For more details on our Corporate planning framework, please refer to Section 1.6.2 of our *Annual Report 2016*.



## Tools that we use

We apply a well-developed and sophisticated approach to recognise and address the dynamism and complexity of the external environment. As part of this, we use a range of tools in our approach to strategic planning, which have been honed over time to help us assess uncertainty and identify plausible future outcomes.

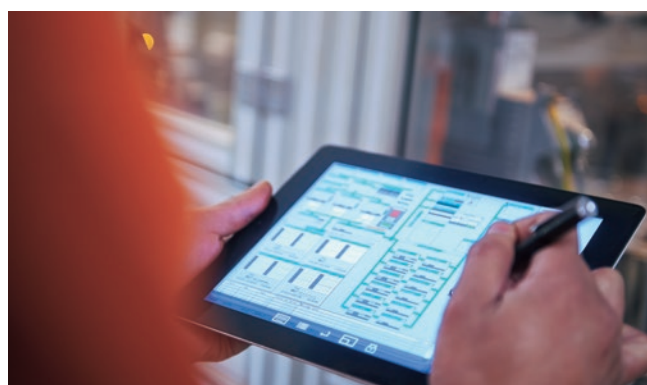
### Commodity price forecasts

Commodity price forecasts, including carbon, reflect our best view of price ranges given uncertainties in our world. These forecasts incorporate our views on macro-economic factors and result in a range of potential prices. These forecasts are integrated with each other and are an essential input to investment decisions and plans.

While many others in industry also forecast potential future prices, we take a long-term view of risks and opportunities across our diversified portfolio. We assess the impact of shifts in demand, changes in productivity, advances in technology and many other factors.

### Central case

The Central case is our forecast of what we expect to happen. It is built through an in-depth, bottom-up analysis using rigorous processes, and is benchmarked with external views. For example, we recently updated the Central case assumptions to reflect lower long-term economic growth projections and stronger growth from renewables. While our long-term plans are based on the Central case, we recognise that it is subject to uncertainty and that the world could move in any number of ways. We use long-term scenarios and shock events to test the resilience of the portfolio across a range of possible futures.



## Scenarios

Scenarios provide a way to factor uncertainty into our strategic planning process and help us to answer 'What would we do if "X" unfolds over the next 25 years?'. They also assist us in testing the robustness of our decisions and identifying new opportunities and alternatives. Our set of scenarios is designed to be divergent and considers a range of contrasting, internally consistent and plausible potential future worlds. As more fully described in the **Climate Change: Portfolio Analysis** report (2015), while the scenarios are plausible long-term future states, there are inherent limitations with scenario planning and it is difficult to predict which, if any, of the scenarios might eventuate.

The difference between how we expect the portfolio to perform in the Central case, and how it could perform in a scenario, helps us to understand risks and opportunities and what we might do differently if the world were to move towards a particular scenario. Along with scenarios, we test the portfolio against shock events. These are unlikely and extreme events which are typically short term but may have associated longer-term impacts.

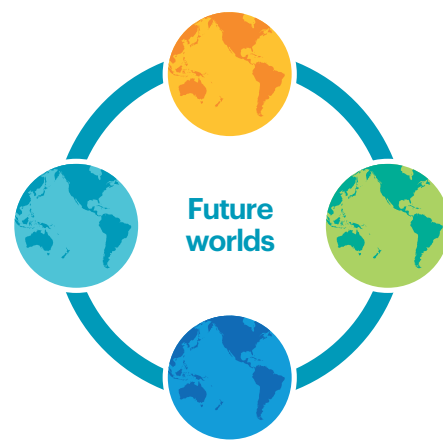
In FY2016, an external review of our scenario planning framework by leading independent scenario experts confirmed the value of the set of scenarios as a tool to test the resilience of our portfolio. Recommendations made by these independent experts are now being implemented to help us better inform the development and evaluation of our strategy. We plan to build an updated scenario set that better captures the evolving key themes, uncertainties and complexities in the macro environment today.

The Central case and scenarios do not constitute preferred outcomes for us. We do not assign probabilities to our scenarios. What we do is monitor the emergence of one over another through our signals tracking.

## Signals tracking

Signals, including signposts (trends) and triggers (events), across the external environment are tracked to provide timely insights into the potential impacts on our portfolio. These signposts and triggers provide an indication of which scenarios are becoming more or less dominant through time. This offers us a powerful decision-making tool that enables us to act early.

Our approach to scanning the external environment for signals is further discussed in our **Prospects** blog.

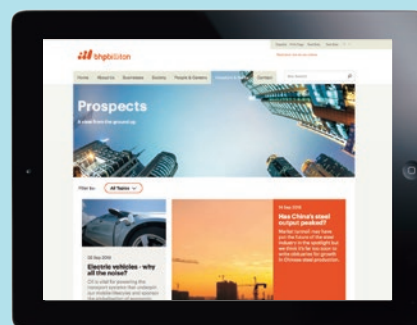


## Prospects blog

At BHP Billiton, we provide resources for a growing world. Products based on the commodities we sell are used by billions of people every day. As a result, we focus on learning how people's lives are changing around the world.

We have people on the ground tracking usage and monitoring trends across the entire value chain, with a particular focus on the commodities we sell.

This rich blend of information gives us a distinctive view of the world and its prospects. We will use our new blog 'Prospects' to highlight the major economic and commodity market trends that we are watching. [www.bhpbilliton.com/investors/prospects/](http://www.bhpbilliton.com/investors/prospects/)



### Role of BHP Billiton's Board and senior executive

Climate change is treated as a Board-level governance issue and is discussed regularly at the BHP Billiton Board. The Board Sustainability Committee also spends a significant amount of time considering climate change issues relating to the resilience of, and opportunities for, the Company's portfolio.

The Board and Executive Leadership Team (ELT), frequently meet to discuss strategic issues, including at the Board Strategy Forum. The Strategy Forum is an annual event where the Board and ELT discuss the Company's strategy and test if the portfolio remains appropriate. Much of the content contained in this document was addressed at the most recent Strategy Forum, with analysis from signals tracking, scenarios review and commodity forecasts provided as key inputs into the discussion.

Framed as a Board-level governance issue requiring experience of managing in the context of uncertainty and an understanding of the risk environment of the Company, all of the Non-executive Directors bring relevant experience to bear in our climate change discussions.

Board members bring significant sectoral experience, which equips them to consider potential implications of climate change on our operations, markets and society. They possess extensive experience in energy, governance and sustainability. There is also wide-ranging experience in finance, economics and public policy, which helps BHP Billiton to understand the nature of the debate and the international policy response as it develops. In addition, there is a deep understanding of systemic risk and the potential impacts on our portfolio.

Collectively, this means that the Board has the experience and skills to assist the Company in the optimal allocation of financial, capital and human resources for the creation of long-term shareholder value. It also means that the Board understands the importance of meeting the expectations of stakeholders, including in respect of the natural environment.

In addition, the Board has taken a number of measures to ensure that its decisions are appropriately informed by climate change science and expert advisors. The Board seeks the input of management, including Dr Fiona Wild, our Vice President Sustainability and Climate Change, our Forum on Corporate Responsibility, which is made up of nine highly respected civil society leaders who advise the Board on sustainability issues, and other independent advisers.

**The strategic issues facing the Company change over time. Our priority is always to ensure that the Board and ELT are able to identify these issues and access the best possible advice to manage them. We have a robust corporate planning framework and a range of tools that we use to help inform strategic discussions and decision-making. Our framework and tools are regularly reviewed to ensure we remain well-equipped and sophisticated in our approach.**

### Flexibility of our business

Given the dynamic nature of the external environment, it is important to note that our portfolio is not static. Part of the strategic advantage of having a diverse portfolio, which includes energy and non-energy commodities, is that it is resilient to a variety of outcomes and has the flexibility to evolve over time.

This agility improves our resilience under a range of scenarios and outcomes. With the option to reshape our portfolio to respond to changing conditions, which has been a part of BHP Billiton's operating model for over 130 years, we will be well-positioned to continue to maximise value.

Recent examples of how we have reshaped the organisation include:

- Further simplification of the portfolio to focus on long-life, tier one assets including the divestment of New Mexico Coal and IndoMet Coal.
- Increasing our exploration focus in Copper and Petroleum.
- Simplifying our operating model to safely accelerate productivity and create value.
- Enhancing our capital management framework to preserve balance sheet strength and align it to the industry's cyclical nature.

## 2 Our insights

One of the ways we gain insights from the external environment is by tracking signals. We use these as inputs to inform our strategic decision-making. There are two clear climate change-related signals that we have observed from our tracking over the past year: the emerging alignment of global climate change policy and the continuing transition to lower emissions energy.



For more details on our insights, please visit our [Prospects](#) blog.

### Climate change policy

Negotiations at the United Nations Framework Convention on Climate Change (UNFCCC) Conference of the Parties in Paris (COP21) concluded with a new international deal (the 'Paris Agreement') that is more substantial and ambitious than many observers expected.

The Paris Agreement created a common framework that commits countries to outline the steps they will take to address climate change and to review these in the years ahead. For the first time, Parties are required to report regularly on their emissions performance and progress made towards implementation of their Nationally Determined Contributions (NDCs). We believe the Paris Agreement provides a solid, long-term foundation for further progress in the global response to climate change.

Of recent significance is the joint announcement from the United States and China, the world's largest greenhouse gas emitters, that they will formally become Parties to the Paris Agreement. In addition, they have committed to deepen their ongoing bilateral cooperation on climate change through a number of frameworks.

At the regional level, we see the emergence and strengthening of domestic policies that have the potential to impact future emissions. Efficiency is incentivised through tighter government standards on sources of emissions and energy use while reverse auctions in power sectors are supporting the continued uptake of renewables at lower cost. In addition, momentum in carbon pricing schemes has been building recently. For example, with an anticipated start date of 2017, China's national emissions trading scheme will cover nearly 10,000 companies with aggregate annual emissions of more than 4 GtCO<sub>2</sub>e.

We have also noted an increasing trend for investors, working with other stakeholders, to be actively engaged on climate change. The discussion between investors, companies and policy makers now takes place much more publicly. As investors become more attuned to engaging with companies and policy makers around the world, so the scope for their collective engagement grows.

While these signals seem to support global development and alignment of climate change policy, it is important to note that political developments in specific countries – for example, where voters support increasingly protectionist measures across their national economy – may impact the scale and pace of this alignment. Any increase in protectionism and constraints on trade and inter-country policy linkages has the potential to limit international cooperation on global climate change policy and carbon market linkages.



#### Paris Agreement: Key commitments

- Achieving net zero emissions in the second half of the century.
- A global stocktake of progress in 2023 with individual countries to reassess NDCs in 2025.
- In-principle support for market mechanisms to meet targets.
- Provision of financial support to developing countries for both adaptation and mitigation at a minimum of US\$100 billion per year from 2020 to 2025 with two-yearly reviews of progress.
- Provision to develop a technology framework and strengthen technology transfer.
- Support for reducing emissions from deforestation and forest degradation (REDD+).

The Paris Agreement reaffirms the commitment to limit the increase in global average temperatures to well below 2°C and to pursue efforts to keep the temperature increase to 1.5°C. It will come into force following formal ratification by at least 55 countries, covering at least 55 per cent of global emissions.

## Energy transition

The emissions intensity of the global economy is decreasing compared with a business-as-usual case, a trend which started even before the Paris Agreement was adopted. However, over the past year, a number of signals have emerged which suggest that the world is continuing its transition towards lower emissions energy. Two key areas of growth are prevalent: lower emissions power generation (renewables) and increasing electric vehicle (EV) penetration.

### Renewables



Wind and solar power generation have grown rapidly in the 21st century. Our projections see this strong growth continuing for the next few decades.

Combined, wind and solar power generation capacity has increased nearly 50 times since 2000. This capacity expansion has helped to reduce wind power costs by more than half and decreased the cost of solar panels by nearly 90 per cent. While cost competitiveness varies by region, wind and solar energy are expected to begin reaching cost-parity with existing technologies on a new-build, unsubsidised basis in about a decade. Some markets, such as Chile and Morocco, have already witnessed these tipping points. Figure 1 shows the Central case view on average breakeven cost differences between wind, solar and coal (index) in China.

The cost of renewables means that policy support continues to drive uptake of large-scale wind and solar. However, we are also seeing disruption occurring in retail electricity markets, particularly in developed countries, where traditional utility business models are challenged by distributed solar generation, as consumers install rooftop solar panels to reduce reliance on grid power.

The trillions of dollars already invested in existing conventional, long-life power plants will likely impact the speed of renewables take-up, but not the direction of change. Existing coal power assets in India and China and abundant gas in the US will influence their respective multi-decade generation mixes. However, the experience in Europe, where the uptake of renewables remains strong, shows there is plenty of headroom for renewables to grow before the constraints of current renewables technology begin to show.

Our views on renewables growth in the Central case are at the higher end when compared to benchmarks (Figure 2). However, we recognise that wind and solar still have challenges to overcome before they can become the dominant sources of power or even equivalent to the traditional sources of global energy supply. These include grid management, maintaining investment once subsidies are removed and addressing continued cost disadvantages against coal and gas in some markets. However, most of these challenges are expected to arrive only in the longer term and to not materially curb renewables growth in the medium term.

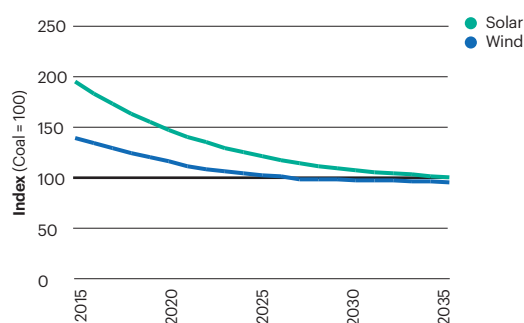


Visit [Prospects](#) for more about our views on renewables.

### Signals we have seen

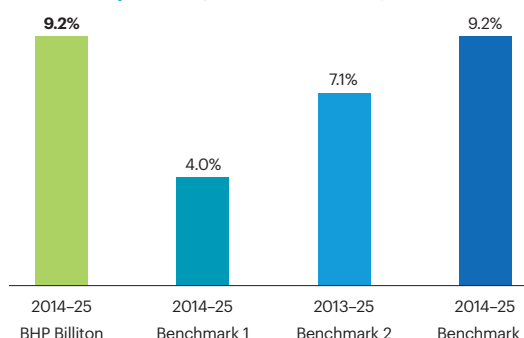
- Clean energy investments hit a record of US\$329 billion in 2015.
- The price of new-build (unsubsidised) renewable power generating capacity hit record lows of US\$3.0 c/kWh (onshore wind in Morocco) and US\$2.9 c/kWh (solar photovoltaic in Chile).
- The US approved the extension of tax credits for wind and solar.
- In 2015, China added a record amount of non-hydro renewable generating capacity (~US\$100 billion). This compares to ~US\$25 billion in thermal coal and gas.
- As the Chinese economy has been restructuring, power demand plateaued, along with thermal coal use and emissions.
- The International Energy Agency (IEA) increased its forecast for wind and solar PV contribution to global power generation in 2040 by +12 per cent.

Figure 1: Estimated average breakeven costs for new power plant in China per MWh<sup>(1)</sup> (Central case view)



(1) Source: BHP Billiton analysis. Costs are presented as indexed long-run average costs. Excludes grid integration costs and direct subsidies.

Figure 2: Estimated annual global growth rate of non-hydro renewable power<sup>(1)</sup> (Central case view)



(1) Benchmarks are either from large multinational resources companies or industry analysts.



## Electric vehicles<sup>(1)</sup>



Oil is vital for powering the transport systems that underpin mobile lifestyles. However, this is beginning to change. We are monitoring improvements in the efficiency of internal combustion engines (including hybrids), uptake of alternative fuels and penetration of electric vehicles. Over the past 12 months, one of the most noteworthy signals is the rise of mass market electric vehicles.

The Tesla Model 3 and Chevrolet Bolt, both of which are expected to be fully launched in 2017, will be the first mass market EVs that can be driven for 200 miles on a single charge, the minimum many commentators say is needed if they are to meet mainstream needs in the US.

Today there are about 1.1 billion cars in the world's light duty vehicle fleet, of which fewer than 1 million are EVs. By 2035, we expect that there will be approximately 140 million EVs on the roads, or eight per cent of the total fleet of 1.8 billion. Our EV projections require sales to grow by around 25 per cent per annum between now and 2035, lifting their share of sales from approximately 0.5 per cent today to 13 per cent in 20 years.

Our projections on EVs in the Central case put us at the higher end when compared to benchmarks (Figure 3). The major impediment to greater uptake of EVs to date has been the high cost of batteries. For the compact vehicle segment, which dominates the European, Chinese and Indian markets, the higher share of the battery cost in the total vehicle price is even more prohibitive. Our assumption is that these costs can be cut in half in the coming decade.

It is important to note that the impact of EVs on GHG emissions will be dictated by the source of the electricity that is utilised to power EVs. If this is an emissions intensive source, such as coal, then the benefit of switching from a combustion engine to an EV is reduced. However, there are indications that the transition to EVs is increasing consumer awareness over how power is generated. This in turn can further help to promote lower emissions power generation.

 Visit [Prospects](#) for more about our views on EVs.

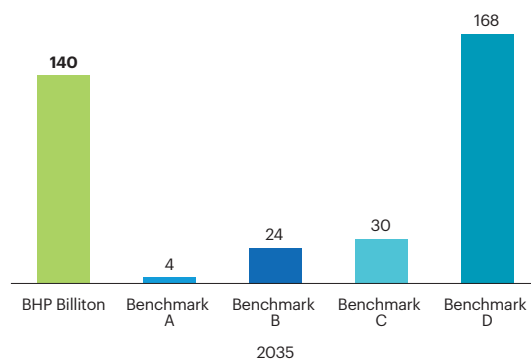
While national policies have driven significant investment into renewables, and improved battery technologies have led to EVs becoming a regular sight on the streets, it is important to consider the impact of slow global economic growth on these signals. For example, although this is the first time we have seen global emissions stop growing in the absence of a global recession, this was likely driven in part by low economic growth. If this low growth continues, it may indicate that other catalysts, beyond financial incentives for low emissions energy, will be required to drive the transition to a lower emissions economy.

**Signals, including signposts (trends) and triggers (events), are regularly tracked to provide timely insights into the potential impacts on our portfolio. As discussed, these signals are indicating the emerging alignment of global climate change policy and a continuing transition to lower emissions energy. Tracking these, and other signals, and providing meaningful analysis about what they represent, is critical to our strategic planning process. We will continue to monitor developments and update our scenarios, forecasts and strategy as appropriate.**

### Signals we have seen

- The Tesla Model 3 received 276,000 orders in the first three days, demonstrating strong consumer interest in EVs.
- Battery technology continued to improve while costs declined, suggesting that in the longer term EVs will be cost competitive with internal combustion engines and this technology may ultimately be applied at a large scale.

**Figure 3: Estimated global fleet of electric light duty vehicles (million vehicles)<sup>(1)</sup> (Central case view)**



(1) Figure presents only pure battery powered plug-in light duty vehicles. Benchmarks are from industry analysts. Benchmark A only includes passenger vehicles.

(1) The term EVs refers only to pure battery powered plug-in vehicles. Hybrids are considered part of the conventional fleet.

# 3 Portfolio implications

To support strategic discussions, the Board and ELT are regularly provided with analysis of signals which potentially support or oppose our scenarios, as well as updates on broader market trends and potential impacts to our portfolio.

 For more details on our approach to scenario planning and the potential portfolio implications of a transition to a 2°C world, please refer to the **Climate Change: Portfolio Analysis** report (2015).



## Climate change policy

The policy changes that we have witnessed over the past year are supportive of an orderly transition towards a lower emissions economy. COP21 in Paris proved to be significant in ambition with regard to emissions reduction, but the Nationally Determined Contributions (NDCs), which described each nation's plans to achieve these targets, were still relatively modest. While the sum of NDCs presented will bring the global emissions trajectory down from the pre-COP21 path, the trajectory still sees total emissions rising through to 2030. Given the NDCs remain voluntary and do not yet meet the requirements for a less than 2°C average global temperature increase, the global policy focus now needs to be on the long-term frameworks and mechanisms that will deliver this goal while providing stability for business and encouraging investment in low emissions technology. We expect that regular progress assessments and new policies will lead to increased ambition levels over time.

The wider implications of the Paris Agreement were anticipated and already incorporated in our long-term commodity forecasts and our Central case remains informed by the NDCs. We will continue to track developments, including the release of the Intergovernmental Panel on Climate Change report on a global emissions trajectory consistent with keeping the global average temperature increase to 1.5°C, expected in 2018.

### Our policy position

Effective integration of climate change policy and energy policy is essential in order to provide a solid basis for future investment, deliver emissions reductions in line with international commitments, support continued economic growth and improve energy security.

Our position on climate change policy is clear and consistent. An effective, long-term response must include a range of complementary measures including a price on carbon, support for low emissions technology and energy efficiency, and measures to build resilience to climate change impacts. At the same time, the world must provide access to reliable and affordable energy to support economic development and improve living standards. These two objectives must go hand in hand.

We believe industry has a key role to play in climate change policy and energy policy development by working with governments and other stakeholders to inform the development of long-term policy frameworks that deliver a measured transition to a lower emissions economy. We encourage governments to develop policy frameworks that include complementary measures and align with their strategic priorities.



## Energy transition

Global primary energy use is expected to continue to grow to 2040<sup>(1)</sup> and be met by a wide range of energy sources. In our view, this will be primarily influenced by:

- **Non-hydro renewables:** We expect that non-hydro renewables, principally wind and solar, will gain market share in the power sector, mainly at the expense of thermal coal. This uptake will triple the combined share of wind and solar in the power mix in the next 25 years. Despite rapid growth in renewables, by 2040, the world will still require roughly four-fifths of its growing total energy needs to come from non-renewable sources.
- **Increasing EV uptake and internal combustion engine (ICE) efficiency:** We expect demand growth for oil to decrease due to the rise in EVs and the increase in fuel efficiency of ICE vehicles. By 2030, we expect that a one-third increase in the fuel efficiency of ICEs (including hybrids) will lower demand by 9 million barrels per day (mbpd), equivalent to around 10 per cent of current global demand. A rise in the fleet of EVs from 1 million today to 140 million in 2035 would displace 2.3 mbpd of oil in that year, equivalent to around two per cent of current global demand.
- **Energy efficiency:** Through a combination of structural change in the world economy and technological progress, we expect energy efficiency to more than double by 2040. This would halve the long-run growth rate for global energy demand to one per cent (down from two per cent in the 1990 to 2013 period).

We believe that both renewable energy and electrified transport will continue to grow at a substantial pace. However, given their small base, this shift will likely offset only a small amount of energy demand and we expect the majority will continue to be met by fossil fuels. For renewables and EVs to reach significant scale, a longer timeframe and increased government intervention may be required. As such, it is important to look at other options to reduce emissions from the production and use of fossil fuels, including low emissions technology, such as carbon capture and storage (CCS).

The energy transition trends indicate increasing long-term demand for copper due to the high intensity of its use in renewable power generation, as well as EVs and associated charging infrastructure. In turn, we expect global demand for fossil fuels to be further impacted by renewable generation displacement.

In developed countries, we expect demand for thermal coal to be most affected as gas-fired power generation produces lower emissions and acts as a balance to intermittent supply from renewables. However, in emerging economies, we believe thermal coal will continue to be favoured as a low-cost source of supply.

While oil demand will be displaced as EVs gain prominence, the impact over the next two decades is likely to be minor in comparison to the much greater anticipated impact from higher fuel efficiency.

(1) Based on IEA New Policies Scenario ©OECD/IEA 2015 World Energy Outlook, IEA Publishing. Licence: [www.iea.org/t&c](http://www.iea.org/t&c).

#### Retesting our portfolio

The signals we have observed this year are supportive of our Global Accord scenario (Figure 4). In this scenario, an orderly transition to 2°C has a negative price outlook for some of the commodities we produce. This is due to lower energy demand, higher recycling rates and greater regulatory and societal pressures. While the outlook for some of our commodities may be negatively impacted in this scenario, given the high quality of our assets within those commodities, our investment options remain attractive.

Table 1 illustrates the attractiveness of investment outlook for each of our commodities in the Central case and the change in attractiveness for each commodity under the Global Accord scenario when compared to the Central case. Attractiveness is a measure we use that considers a commodity's average industry margin, market size and diversification, resilience of price to demand and supply shocks, expected demand growth and available investment opportunities.

BHP Billiton's current strategy to invest in copper and oil remains sound due to the depletion profile of the industry's existing resource base, the scarcity of known high-quality development opportunities and expected demand growth, especially for copper. Investment in finding and developing high-quality opportunities in these commodities is likely to provide an attractive return even under the lower prices expected.

Figure 4




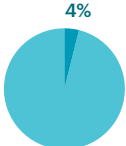



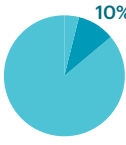



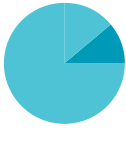







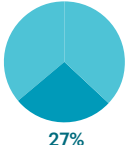



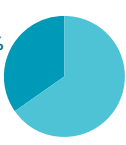


**In light of the changes we have observed in the macro environment and our revised Central case assumptions, we retested our portfolio and corporate strategy to ensure that:**

- **The commodities we produce remain attractive.**
- **The growth portfolio is competitive and resilient across a range of commodity and carbon prices.**
- **Our balance sheet can fund growth.**

**Based on this analysis, the Board concluded that all the commodities in the existing portfolio, including oil, gas and thermal coal, have strong future margins given our high-quality, low-cost assets. The Board continues to regularly consider the attractiveness and potential addition of new commodities to the portfolio.**

**As more fully described in the *Climate Change: Portfolio Analysis* report (2015), we continue to be well-placed to manage the transition to a 2°C outcome. We have a diverse range of high-quality, low-cost assets and the flexibility to test and adjust our portfolio, such as buying and selling assets, so we are well-positioned to continue to add value as external factors, including policy, technology and societal expectations, change.**

Table 1

Percentage contribution to FY2016 revenue <sup>(1)</sup>	Attractiveness of investment outlook <sup>(2)</sup> in Central case	Change in attractiveness of investment outlook <sup>(2)</sup> in Global Accord compared to Central case	Impacts under our Global Accord scenario
 <b>Thermal Coal</b> 4% 			<ul style="list-style-type: none"> <li>Remains competitive on the cost curve and generates acceptable returns.</li> <li>Careful consideration would be required before pursuing growth opportunities given the current returns and growing regulatory and societal pressures that could impact future asset values.</li> <li>Failure to achieve a breakthrough in commercialising low emissions technologies such as CCS would reinforce this view.</li> </ul>
 <b>Gas<sup>(3)</sup></b> 10% 			<ul style="list-style-type: none"> <li>Key transition fuel as concerted efforts to reduce emissions are expected to increasingly focus on utilising gas for power generation and transportation.</li> <li>This results in high demand for gas, particularly in the short to medium term, providing opportunities to invest in the quality gas resources in our portfolio.</li> </ul>
 <b>Metallurgical Coal</b> 11% 			<ul style="list-style-type: none"> <li>Although the sector is slightly less attractive, our higher quality assets remain very attractive compared to peers as penalties are applied to lower quality coals.</li> <li>Key consideration is around pace of material substitution (e.g. steel scrap in steelmaking) with the advent of tighter environmental regulations.</li> </ul>
 <b>Oil<sup>(4)</sup></b> 12% 			<ul style="list-style-type: none"> <li>By 2035, real crude oil prices are lower than our Central case primarily due to the higher penetration of EVs.</li> <li>While crude oil will likely remain competitive in its core transportation market, it is the most adversely impacted commodity in our portfolio. Lower oil prices in this scenario reduce returns, but our options remain relatively attractive.</li> <li>Due to the steepness of the oil supply cost curve, our existing oil growth projects remain very competitive with other options in the portfolio.</li> </ul>
 <b>Copper<sup>(5)</sup></b> 27% 			<ul style="list-style-type: none"> <li>Remains attractive due to growing demand driven by the growth in renewables and EVs, which generally require more copper to produce.</li> <li>Price is lower as higher demand is offset by higher recycling.</li> <li>Aluminium substitution is assumed to be no greater.</li> <li>Minimal impact on the copper growth portfolio as returns reduce minimally from the Central case and remain attractive.</li> <li>Increasing regulatory approvals for mines delay the supply of greenfield developments, an advantage for low-cost incumbents.</li> </ul>
 <b>Iron Ore</b> 34% 			<ul style="list-style-type: none"> <li>Sector remains attractive and has a minimal impact on our existing portfolio.</li> <li>Key consideration is around pace of material substitution (e.g. steel scrap in steelmaking) with the advent of tighter environmental regulations.</li> </ul>

(1) FY2016 revenue includes two per cent from other sources. Revenue is based on Group realised prices and includes third party products. Sale of third party products by the Group contributed revenue of US\$1,068 million and Underlying EBITDA of US\$55 million (2015: US\$1,179 million and US\$14 million).

(2) Attractiveness of investment outlook for each commodity is a measure that considers a commodity's average industry margin, market size and diversification, resilience of price to demand and supply shocks, expected demand growth and available investment opportunities.

(3) Gas includes natural gas, LNG and natural gas liquids.

(4) Oil includes crude oil and other petroleum revenues.

(5) Copper includes other commodities produced within our Copper segment.

## 4 Our actions

As well as evaluating and building the resilience of our portfolio, an integrated approach to climate change risk management means we are investing in low emissions technologies, taking action to reduce emissions, adapting to the impacts of climate change and engaging in the public debate. We have been reporting on our actions for many years. Below are some examples of the actions we have taken over the past year.



For more details on our approach to climate change risk management and actions, please refer to our [Annual Report 2016](#) and [Sustainability Report 2016](#).



### Low emissions technology

Given increasing global energy demand and the ongoing role that fossil fuels are expected to play in meeting it, it is vital that technologies are developed to provide alternative energy sources and reduce emissions. But to meet this challenge, they must be developed and deployed far more quickly than the usual commercial time frames.

Our strategy is focused on working in partnership with others to develop and deploy low emissions and renewable technologies that can achieve material emissions reductions across our operations and value chains. Our approach to climate change has always been underpinned by engagement and the technology partnerships below provide examples of how industry can work together to identify solutions.

#### Carbon Capture and Storage (CCS)

CCS offers material emissions reduction opportunities across multiple sectors, including power generation and industrial processes. Following the establishment of the BHP Billiton SaskPower International CCS Knowledge Centre in Canada, we are now investigating the application of CCS in steelmaking. We will contribute approximately US\$7 million over three years to a project with Peking University to address key technical, policy and economic barriers to further deployment of CCS in the steel sector in China. Research outcomes will be shared widely and used to inform a roadmap for development.

Additionally, we are close to the agreement of a significant global partnership with a group of leading universities on research into the long-term geological storage of CO<sub>2</sub>. This research will help support our existing work in Canada and China.

#### Lakeland Solar and Storage

We believe battery storage technologies have the potential to revolutionise how the world delivers energy. For our business, it can change the way power is delivered to our operations, help manage the intermittency of renewable sources and provide security of supply. In August 2016, we committed to participate in the Lakeland Solar and Storage project, a 13 MW solar photovoltaic power plant incorporating 5.3 MWh of lithium-ion battery storage in a 'fringe-of-grid' area in far north Queensland, Australia. Although there have been significant advances in battery storage solutions at grid scale, it is still regarded as an experimental technology. Many of our operations are located in fringe-of-grid locations, and this project will be used to 'mimic' operational conditions and provide insight into minimising operational risk in future application.

#### GE Ecomagination

In October 2015, we began a partnership with GE as part of its Ecomagination program. We are working together to assess opportunities for significant emissions reductions in our business and value chains. We have identified 15 potential projects to develop and demonstrate opportunities in energy efficiency, renewable energy, and low emissions transport.

## Mitigation

As a major producer and consumer of fossil fuels and energy, we prioritise GHG emissions reductions and energy efficiency at our operations. However, GHG emissions will remain an inevitable part of BHP Billiton's business, even with low emissions technology becoming more effective and commercially viable. Identifying cost-effective and robust offsets (carbon credits) is important to meeting future GHG emissions reduction commitments so we are also supporting mechanisms such as REDD+<sup>(1)</sup>.

### Reducing operational emissions

We have set a target to keep total operational GHG emissions below our FY2006 baseline in FY2017<sup>(2)</sup>. In FY2016, the Company's total GHG emissions were 18 MtCO<sub>2</sub>-e, 13 per cent lower than the baseline, with performance driven in part by emissions reduction projects and improved productivity. Projects tracked since FY2013 as part of the GHG target achieved more than 950,000 tCO<sub>2</sub>-e of annualised abatement in FY2016 at our operations.

To help drive performance against our target, remuneration for the CEO and the Operations Management Committee, which forms part of the Executive Leadership Team, is linked to Health, Safety, Environment and Community (HSEC) performance. This performance is ordinarily assessed using a number of measures, including delivery of GHG emissions reduction projects. To reflect the importance the organisation places on HSEC matters, the short-term incentive opportunity attached to HSEC was increased from 20 per cent in FY2015 to 25 per cent in FY2016.

We are currently developing a new Company GHG target for the period after FY2017, taking into account GHG forecasts and reduction opportunities, low emission and renewable technology options, and the expectations of our stakeholders.

### Reducing Emissions from Deforestation and Forest Degradation (REDD+)

In June 2016, we confirmed our support for the Alto Mayo REDD+ project in Peru, managed by Conservation International. The area to be protected is approximately 182,000 hectares of globally significant threatened forests, containing Peru's three endangered primates, and is a key source of fresh water for much of the Peruvian Amazon. We will provide US\$5 million to the project over two years. This aims to contribute to alternative livelihood opportunities, including sustainable coffee growing and enhanced forest governance, and to generate 800,000 tonnes of carbon credits.

Additionally, in FY2016, we continued to engage with the International Finance Corporation to understand the role of finance mechanisms in supporting REDD+.

## Adaptation

Building resilience to the physical impacts of climate change is vital for the long-term sustainable growth of BHP Billiton's business. Our assets are long-lived, so we take a robust, multifaceted approach to climate change adaptation, building the resilience of our operations, communities and ecosystems.



Great Barrier Reef. Image by Gary Cranitch, Queensland Museum.

### Reef Resilience Framework

The Great Barrier Reef in Australia is already impacted by a changing climate and resilience-based management allows responsive adaptation to this challenge. Understanding the capacity of the reef to resist and recover from a broad range of threats is crucial for long-term protection. Launched in 2015, BHP Billiton is contributing A\$600,000 to a partnership with the Great Barrier Reef Foundation to enable experts in reef science and management to develop a globally applicable Reef Resilience Framework.

### Trinidad and Tobago adaptation project

In October 2015, BHP Billiton Trinidad and Tobago, in partnership with Conservation International and the Caribbean Natural Resources Institute, launched the Climate Action by Civil Society in Trinidad and Tobago (ACTT) project. The project aims to build capacity of civil society to implement adaptation actions. As a small island state, Trinidad and Tobago is vulnerable to the effects of climate change. Adapting to a changing climate and building economic, social and environmental resilience are critical. Each of the five civil society partner organisations will implement an adaptation project and the outcomes will be captured in a toolkit to allow other groups to learn from their experience.

(1) Reducing Emissions from Deforestation and Forest Degradation, as well as conservation, sustainable management of forests and enhancement of forest carbon stocks.  
(2) FY2006 baseline will be adjusted for material acquisitions and divestments based on asset greenhouse gas emissions at the time of transaction.



## Stakeholder engagement

Industry has a key contribution to make in climate change policy development by working with governments and other stakeholders to inform the development of an effective long-term policy framework that delivers a measured transition to a lower emissions economy. We are committed to engaging with stakeholders and articulating our view in a clear, constructive and consistent way.

We recognise there are a wide range of views across industry, civil society, governments and other stakeholders, on how to address climate change. BHP Billiton's views on climate change are clear, as outlined in this document and many other public contributions we have made. As we have regularly said, only BHP Billiton speaks for BHP Billiton.

### UNFCCC's Paris Pledge supporting the outcomes from COP21

We welcomed the Paris Agreement formalised in December 2015 at COP21. We believe the Paris Agreement provides a solid long-term foundation for further progress in the global response to climate change.

BHP Billiton joined major cities, regions, companies and investors from around the globe in signing the UNFCCC's Paris Pledge to quickly and effectively implement the Paris Agreement. The Pledge stated: *'We welcome the adoption of a new, universal climate agreement at COP21 in Paris, which is a critical step on the path to solving climate change. We pledge our support to ensuring that the level of ambition set by the agreement is met or exceeded.'*

### Energy Transitions Commission

Together with a group of government, industry and civil society leaders, we joined the Energy Transitions Commission (ETC) in 2015. The ETC aims to identify pathways for transition in energy systems to achieve improved economic and climate outcomes. The Commission's membership is global and diverse, including former and current national leaders, senior representatives of major companies and distinguished thinkers on energy issues. Current activity is focused on energy demand scenarios, the need for energy flexibility and the role of fossil fuels in a transition to a lower emissions economy.

### Financial Stability Board's Taskforce on Climate-related Financial Disclosures

As demonstrated by the **Climate Change: Portfolio Analysis** report (2015), our inclusion in CDP's Climate Disclosure Leadership Index and the disclosures contained in this document, we are committed to transparent reporting of climate-related information.

In the last year, we have seen strong support for action on climate change from the investment community, as seen by the announcement of the Financial Stability Board's Taskforce on Climate-related Financial Disclosures (TCFD). This industry-led group aims to develop voluntary, consistent climate-related financial risk disclosures that would be useful to lenders, insurers, investors and other stakeholders. The TCFD is chaired by Michael Bloomberg and comprises senior technical representatives from organisations that are both 'preparers' and 'users' of company disclosures. Our Vice President, Sustainability and Climate Change, Dr Fiona Wild, is a member of the TCFD. We see this as a strong endorsement of the work we have undertaken to date.



## Conclusion

As a leading global resources company, we take climate change seriously. Climate change is fully integrated into our robust framework for strategic planning and decision-making, supported by a range of tools. Many of the recent signals we have observed, such as emerging alignment of global climate change policy and a continuing transition to lower emissions energy, indicate that the world is tracking towards a lower emissions outcome.

Our scenario planning and portfolio evaluation indicate that under our Global Accord scenario, we are resilient and well-positioned to generate value for shareholders due to our diverse portfolio of high-quality, low-cost assets. Furthermore, as market structures change, we will have opportunities to adjust our portfolio, such as buying and selling assets, and reposition ourselves for future growth. As such, we continue to be well-placed to manage the transition to a 2°C outcome.

While we plan for a range of scenarios, we will continue to actively advocate for a less than 2°C outcome, in line with international commitments. This is demonstrated through investments in low emissions and renewable technologies, emissions reductions and engagement in the public debate to enhance the global response to climate change.



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Facsimile +27 11 688 5217

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## How to access information on BHP Billiton

BHP Billiton produces a range of publications that can be viewed or downloaded at [www.bhpbilliton.com](http://www.bhpbilliton.com).

If you are a shareholder, you can also elect to receive a paper copy of the Annual Report through the Share Registrar (above).

### Latest news, Reports and presentations

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Climate Change:  
Portfolio Analysis  
2015



Annual Report  
2016



Sustainability  
Report 2016



Economic  
contribution and  
payments to  
governments  
Report 2016





