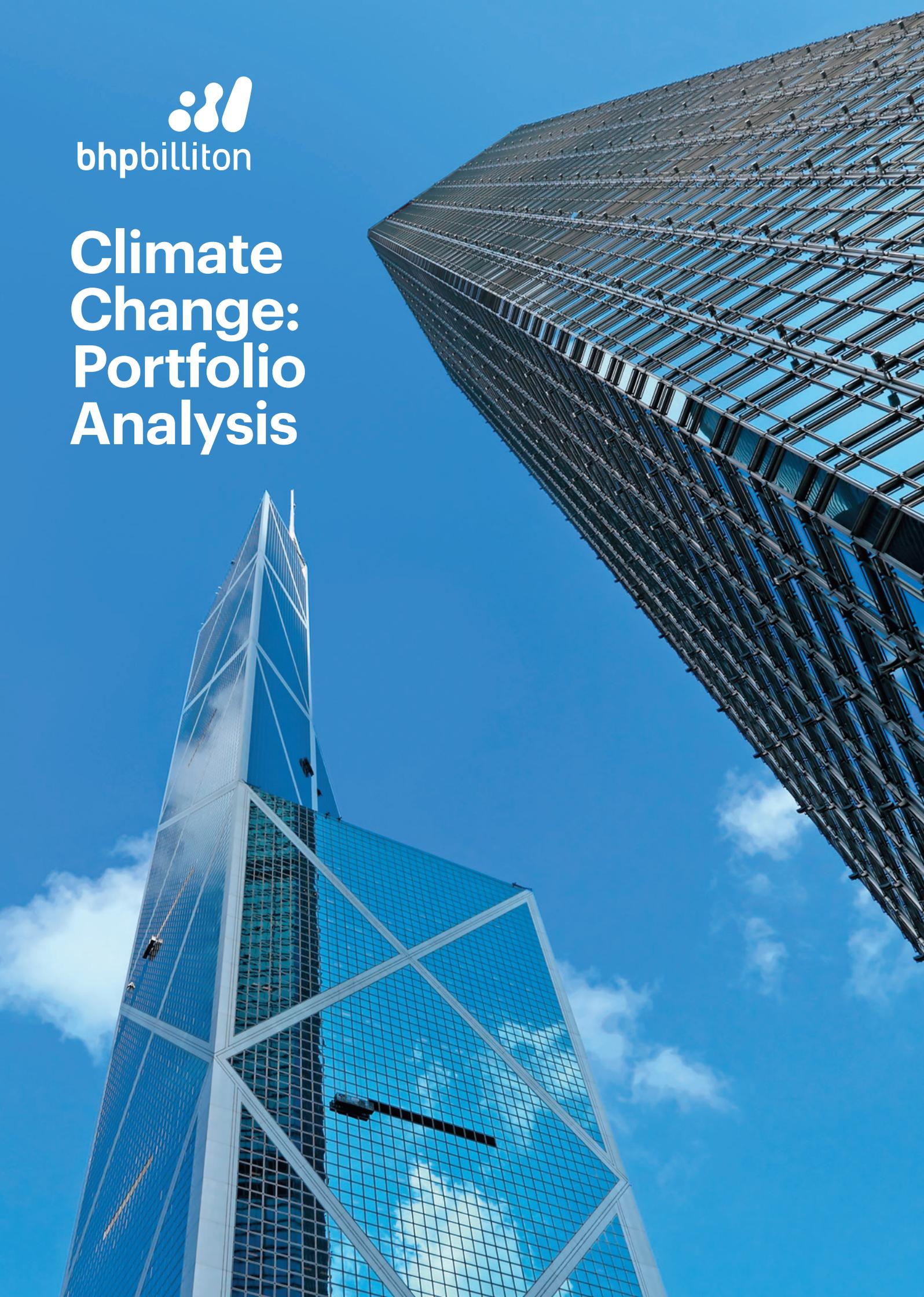




bhpbilliton

# Climate Change: Portfolio Analysis



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

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.

Readers are cautioned not to place undue reliance on forward-looking statements. The Group does not undertake any obligation to publicly update or review any forward-looking statement.

# Introduction



I am pleased to present BHP Billiton's *Climate Change: Portfolio Analysis*.

The world is facing two critical challenges. As the global population steadily grows, the continued development of emerging economies depends on access to affordable energy. At the same time, limiting climate change requires the global average temperature increase to remain below 2°C relative to pre-industrial levels. Successfully addressing these challenges will result in substantial changes to the global economy. Companies in all sectors will have new market opportunities and face new competitors. All will need to find new ways of working.

These dual challenges provide the context for this report, which:

- reaffirms BHP Billiton's perspective on climate change;
- outlines a range of tangible actions we have taken and plan to take;
- describes our approach to scenario planning and, in particular, the potential portfolio implications of a transition to a 2°C world; and
- discloses the range of internal carbon prices we use to inform our decision-making.

In a well-managed transition, the most efficient producers in growth markets will do best. Our analysis shows that BHP Billiton will continue to create substantial value for shareholders in this scenario. The demand for most of our products will continue to rise. Our commodity diversification, the competitiveness of our production and the quality of our resource base minimises the risk of stranded assets. And we have the option of buying and selling assets to improve our performance.

The opportunities and risks associated with climate change will not be spread evenly between businesses. More disclosure will inform investors, policy makers and regulators and support the companies that manage change most effectively. With the release of this document, we are providing more information than ever before about how we are addressing climate change and how climate risk might affect the portfolio.

As global decision makers prepare to gather in Paris for the next Conference of the Parties (COP21) in late 2015, we strongly support efforts to reach an agreement consistent with achieving the 2°C goal. Industry and governments must continue to work together to achieve this outcome.

We are committed to taking action on climate change, and we recognise that there is still more to do. We look forward to continuing to be part of this critical global debate.

A handwritten signature in black ink, appearing to read 'Dalla Valle'.

**Dean Dalla Valle**  
Chief Commercial Officer

# Executive summary

This document describes BHP Billiton's scenario planning approach, including the potential portfolio implications of a transition to a 2°C world, where the global average temperature increase stays below 2°C relative to pre-industrial levels.

Our analysis shows that the portfolio is resilient due to long-term demand, high-quality resources, low production costs and rapid payback periods of growth projects. In a 2°C world, we believe there is a likelihood of upside for uranium, high-quality metallurgical coal and iron ore.

In addition, we expect that copper is resilient and would offer continued opportunity for growth. The Company's gas exposure

may also provide significant opportunities during a transition to a lower emissions economy although in the long run, emissions from the use of natural gas will also need to decline. In aggregate, we anticipate these commodities are robust and mitigate potential negative impacts on other commodities.

Depending on the speed of transition and the energy choices made, we will have opportunities to mitigate the impacts on the value of our portfolio through selectively investing in the commodities that will benefit from structural market changes.

The document has four chapters, each providing additional insight into BHP Billiton's approach to climate change, actions we are taking and analysis of potential impacts on our portfolio.

## 1 Our perspective on climate change

Sustainable development requires both the continued growth of emerging economies and a significant reduction in global greenhouse gas (GHG) emissions. Even as the world addresses climate change, independent experts such as the International Energy Agency (IEA) expect that fossil fuels are likely to continue to supply the majority of the world's energy needs for decades to come, including in a 2°C world. Therefore, to meet these dual goals, the world must find ways to improve energy efficiency, reduce emissions from the use of fossil fuels and increase the share of alternative energy sources like renewables and nuclear power.

## 2 Our action on climate change

Although the scale of the climate challenge is great, the Intergovernmental Panel on Climate Change (IPCC) highlights that the world has the means to address it. As a major producer and consumer of fossil fuels, we are taking action by reducing emissions, adapting to the impacts of climate change and working with others, including industry and governments, to enhance the global response. We recognise the importance of addressing operational emissions and those from the downstream use of our products. We are investing in the development of low-emissions technologies and supporting market mechanisms that provide financial incentives for emissions reductions and sustainable development.

## 3 Our approach to portfolio management

As well as taking action to reduce emissions, build resilience to the physical impacts of climate change, develop and deploy low-emissions technologies and support an effective global response, we continue to identify and assess the impacts of climate change on our portfolio.

We have developed four long-term scenarios to test the resilience of the portfolio and investment options. These scenarios include plausible and divergent ranges in global growth, levels of trade, geopolitics, technological innovation and responses to climate change to provide snapshots of how the world might look over coming decades. Although we test the resilience of the portfolio across a range of scenarios, this document focuses on the impacts of a transition to a 2°C world.

A price on carbon is a key input in BHP Billiton's scenario planning analysis and we have applied it to valuations since 2004.

## 4 Portfolio impacts in a 2°C world

The analysis highlights that the Company's uniquely diversified portfolio of high-quality assets is robust in a 2°C world. As the world addresses climate change, we expect more efficient resource use and substitution between sources of energy. However, we still see demand growth in absolute terms for most of the commodities we produce.

We will continue to assess external opportunities to strengthen the portfolio and, depending on signposts and triggers, the focus will be matched to those commodities that are most likely to provide opportunities for future growth and that are aligned with BHP Billiton's strategy.

# 1 Our perspective on climate change



BHP Billiton supplies the mineral and energy commodities that are crucial for all stages of economic growth. Emerging economies require construction materials like steel as their populations expand and new cities and heavy industry develop. As economies grow and people become wealthier, a consumer economy emerges and steel intensity slows while demand increases for materials that are used in consumer goods, such as copper. Increased income leads to a demand for agricultural commodities, including potash. The products in our portfolio are the raw materials that fuel change and support an improvement in living standards for people in many parts of the world.

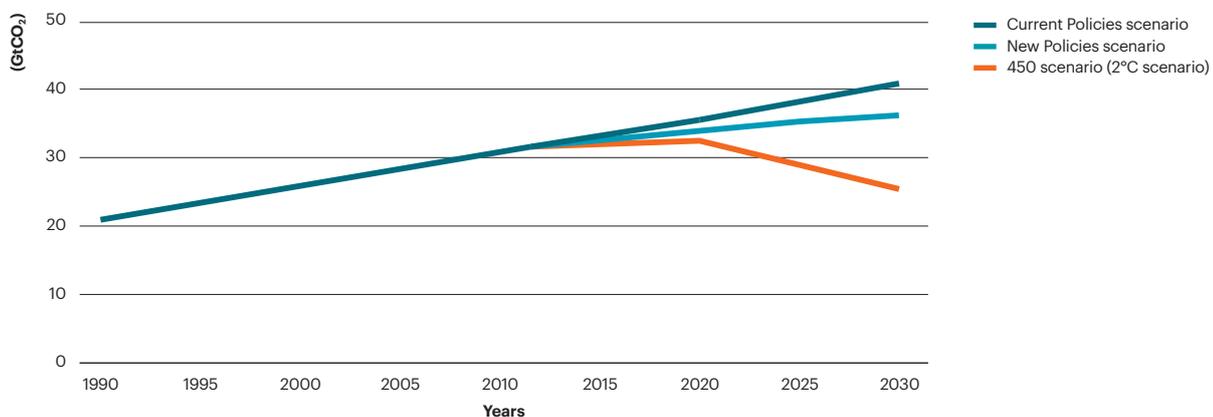
BHP Billiton accepts the IPCC's assessment of climate change science, which has found that warming of the climate is unequivocal, the human influence is clear and physical impacts are unavoidable. Through the United Nations Framework Convention on Climate Change (UNFCCC), governments have committed to keep the global average temperature increase below 2°C relative to pre-industrial levels. As stated by the IPCC, achieving this goal will require an urgent and fundamental departure from business as usual, and the longer the world waits to take

action, the more it will cost and the greater the technological, economic, social and institutional challenges we will face.

Figure 1 shows the scale of the reduction in global CO<sub>2</sub> emissions required to remain on track to achieve the 2°C goal based on the IEA's World Energy Outlook 2014. The IEA's Current Policies scenario takes into account only those policies and measures that had been formally adopted as of mid-2014 and is broadly consistent with a long-term global temperature increase of 5.5°C<sup>(1)</sup>. The New Policies scenario takes into account adopted policies and policy proposals as of mid-2014, even if specific measures to put them into effect had yet to be fully developed. It is consistent with a long-term global temperature increase of 3.6°C. The 450 scenario sets out an energy pathway that is consistent with a 50 per cent chance of limiting the global average temperature increase to 2°C.

BHP Billiton believes that sustainable development requires both the continued growth of emerging economies and a significant reduction in global GHG emissions. The world needs increased supplies of reliable, affordable energy to support higher living standards for more people and lower GHG emissions to achieve the 2°C goal. We do not prioritise one of these requirements over the other. Both are essential.

Figure 1: World energy-related CO<sub>2</sub> emissions<sup>(2)</sup>



(1) Energy Technology Perspectives 2015 © OECD/IEA 2015, IEA Publishing.

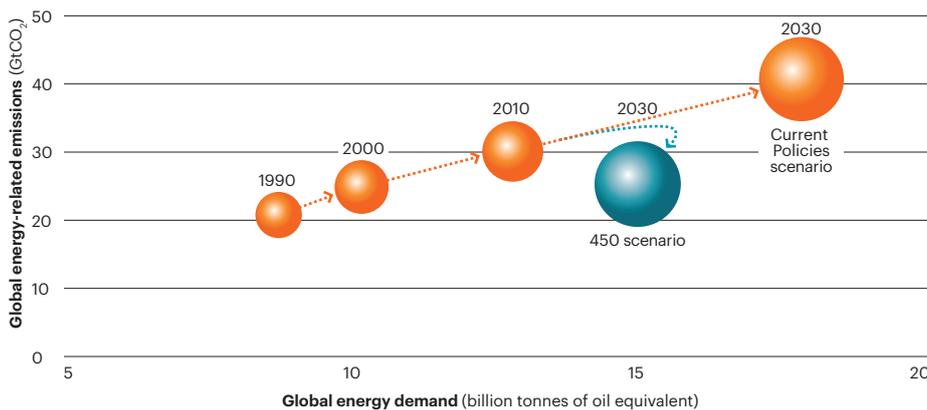
(2) Based on IEA data from the World Energy Outlook 2014 © OECD/IEA 2014, IEA Publishing and modified by BHP Billiton. For Figures 1-3, licence: <http://www.iea.org/t&c/termsandconditions/>; note that modification refers to the way data is presented, not to underlying data itself.

## Achieving a 2°C world requires a change in the relationship between emissions and growth

Historically, population growth and economic development have driven energy demand. This energy has largely been supplied by fossil fuels, resulting in increasing GHG emissions. Even allowing for significant improvements in energy efficiency, energy demand is expected to increase as the global population grows and living standards improve. It is expected that the global population will increase by over 15 per cent, or 1.2 billion

people, between now and 2030. At the same time, increasing economic activity and disposable income will drive consumption and utilisation of machinery and appliances, particularly in developing countries. Figure 2 shows the extent to which the relationship between emissions and energy demand must change to meet the 2°C goal.

Figure 2: Relationship between global GDP, energy demand and CO<sub>2</sub> emissions<sup>(3)</sup>

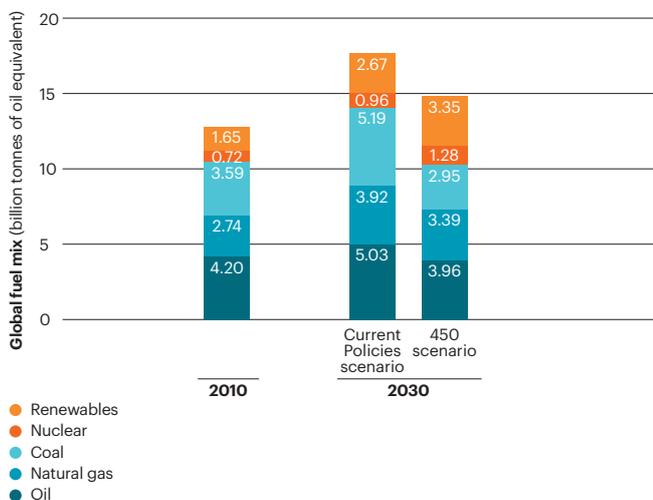


The size of bubble represents global GDP

At the same time, fossil fuels remain an affordable, reliable and accessible way of meeting energy demand and they currently provide more than 80 per cent of the world's primary energy. To meet development and climate goals, the world must find ways to significantly improve energy efficiency, reduce emissions from the use of fossil fuels and increase the share of alternative energy sources such as renewables and nuclear power.

Figure 3 shows how global total primary energy supply changes in the IEA's Current Policies and 450 scenarios in 2030 compared to 2010. In both scenarios, fossil fuels continue to provide the majority of global energy supply. In the 450 scenario, there is a significant increase in the contribution of renewables and nuclear to the overall fuel mix. However, fossil fuels are still expected to supply around 70 per cent of global primary energy needs in 2030 and 60 per cent in 2040.

Figure 3: Total global primary energy supply<sup>(4)</sup>



Energy source	450 scenario demand in 2030	Change in demand 2010-30
	Billion tonnes of oil equivalent	% change
Renewables	3.35	103
Nuclear	1.28	78
Coal	2.95	(18)
Natural gas	3.39	24
Oil	3.96	(6)

(3) Based on IEA data from the *World Energy Outlook 2014* © OECD/IEA 2014, IEA Publishing and modified by BHP Billiton; from *Energy Balances* © OECD/IEA 2013, IEA Publishing and modified by BHP Billiton; and IHS Global Insights.

(4) Based on IEA data from *Energy Balances* © OECD/IEA 2013, IEA Publishing and modified by BHP Billiton and from *World Energy Outlook 2014* © OECD/IEA 2014, IEA Publishing and modified by BHP Billiton.

## 2 Our action on climate change

Although the scale of the climate challenge is great, the IPCC highlights that the world has the means to address it. Businesses are looking for ways to improve energy efficiency, reduce emissions across their operations and supply chains, and invest in low-emissions and renewable technologies. Non-governmental organisations are demanding more action from investors, business and government. Through the UNFCCC, governments have committed to keep the global average temperature increase below 2°C relative to pre-industrial levels. We support this commitment and believe all stakeholders have a role to play in ensuring it is achieved.

As one of the world's leading resources companies, we recognise our responsibility to shareholders and society to play an active role in addressing climate change. We have a comprehensive and integrated strategy to prepare for the risks that climate change poses to the Company and are taking action to bring about the changes required to deliver an effective global response. We are reducing operational GHG emissions, adapting assets to the physical impacts of climate change and managing investments to maximise returns for shareholders as the markets for our products, and society's expectations, evolve. We promote change by supporting the development of long-term policy frameworks that can deliver a measured transition to a lower-emissions economy. We are investing in technologies that can materially reduce global emissions, and supporting market mechanisms that provide financial incentives for the private sector to achieve emissions reductions and sustainable development.

### We are reducing our operational emissions

As a major producer and consumer of fossil fuels and energy that is focused on sustainable development, reducing GHG emissions and improving energy efficiency are a priority for us. We have been setting GHG targets for the Company since 1996. The current, ambitious target is to keep absolute FY2017 emissions below the FY2006 baseline. As we grow, this target encourages us to look for ways to improve energy efficiency, increase productivity and implement additional emission reduction projects across the Company. In FY2015, BHP Billiton's GHG emissions were 38.3 million tonnes and remained below the FY2006 baseline, as shown in Figure 4.

All our Businesses are required to identify, evaluate and implement suitable GHG reduction opportunities, including during project design and equipment selection. In FY2015, our Businesses implemented projects that delivered almost 680,000 tonnes of annualised GHG emission reductions. For example, the BHP Billiton Mitsubishi Alliance (BMA) coal mines in Queensland, Australia, reduced GHG emissions by 86,000 tonnes by improving resource identification, overburden blast control and removal as well as increasing mine productivity and equipment utilisation. We are committed to continued focus on the delivery of opportunities to further reduce operational GHG emissions and transparent reporting of performance.

Figure 5 shows how total GHG emissions compare to production. Emissions remain below the FY2006 baseline, despite having grown output by over 37 per cent on a copper equivalent basis since FY2010, demonstrating that we are changing the relationship between emissions and growth.

Figure 4: BHP Billiton's total GHG emissions since FY2010<sup>(5)</sup>

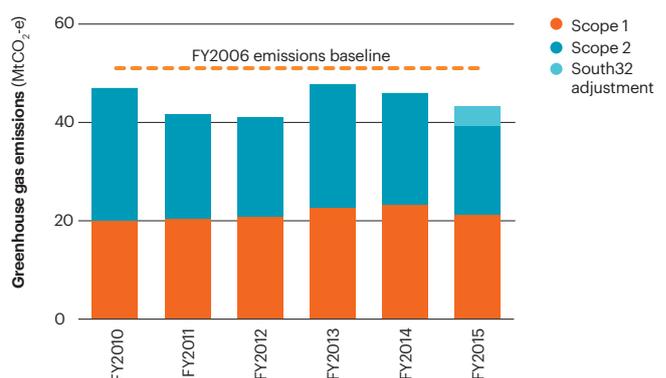
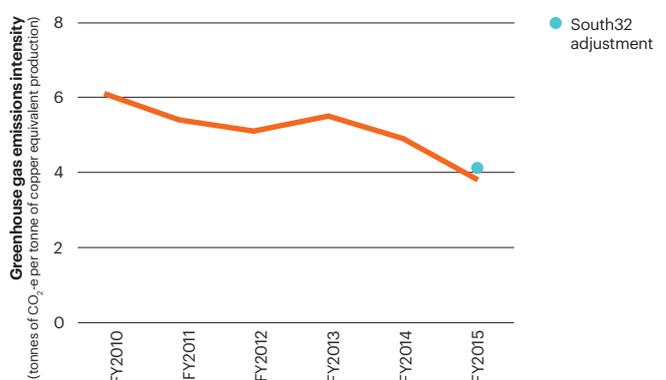


Figure 5: BHP Billiton's total GHG emissions intensity since FY2010



Note: In order to provide year-on-year comparison in Figures 4 and 5, we have shown outcomes with South32 assets included for the full FY2015.

(5) Scope 1 refers to direct GHG emissions from controlled operations. Scope 2 refers to indirect GHG emissions from the generation of purchased electricity and steam that is consumed by controlled operations.

### We are adapting to climate change impacts



Building resilience to the physical impacts of climate change is vital for the long-term sustainable growth of the business. We take a multifaceted approach to climate change adaptation, building the resilience of BHP Billiton's operations, investments, communities and ecosystems.

Our analysis has found that climate change will exacerbate existing risks while also exposing our Businesses to new risks. For example, cyclone management is critical for Western Australia Iron Ore (WAIO) and maintaining adaptive management practices will allow WAIO to respond to an expected increase in cyclone intensity in the Pilbara region. All new projects must also assess risks associated with the forecasted impacts of climate change. For example, during project design, the identification and assessment of increasing storm intensity and storm surge levels resulted in the construction of a higher loading facility at the Hay Point coal terminal in Queensland, Australia, as part of expansion plans.

Effective analysis of climate science is critical to informing resilience planning. We are currently working with the CSIRO (Australia's national science agency) to obtain regional analyses of climate science. This will inform climate resilience planning at an asset level, improving understanding of the material climate vulnerabilities that face our Businesses. The most appropriate response will vary depending on the life of the asset, its exposure to climatic factors and its criticality of function. For assets or infrastructure with a life of 20 years or less, an adaptive approach that can be modified based on learnings from climate events may be most effective in the near term. For long-lived assets, designing infrastructure with intentional failure zones to reduce the costs of full rebuild following extreme events may be more appropriate.

We are also committed to contributing to community and ecosystem resilience. In May 2015, BHP Billiton and the Great Barrier Reef Foundation announced a new A\$7 million partnership to support critical marine research and rehabilitation works at remote Raine Island, located off the Cape York Peninsula, Australia. Raine Island is the world's largest green turtle rookery and home to a major Coral Sea seabird nesting population. This investment will also enable the development of an overarching Reef Resilience framework to direct critical research to increase the reef's ability to adapt to all the threats it faces, including climate change.

### We are accelerating the development and deployment of low-emissions technologies



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.

We have invested over US\$400 million in research, development and deployment of low-emissions technologies (LET) since 2007. We now focus on technologies that have the potential to lead to material emissions reductions in our operations and supply chains, align with the Company's skills and expertise, but are currently not available at commercial scale or acceptable cost. This includes carbon capture and storage (CCS), technologies to reduce fugitive emissions from coal and petroleum operations, battery storage, high-efficiency/low-emissions (HELE) power generation and transportation.

Although using technology to reduce our own emissions and associated costs is vital, working in partnership with others to develop technologies that can reduce emissions from the use of our products can offer more material benefits, as these emissions are significantly higher than BHP Billiton's operational emissions.

These investments demonstrate a credible response to the global challenge of meeting development and climate goals and through our experience, we can advocate for appropriate regulatory responses to support further deployment.

SaskPower's Boundary Dam project, in Canada, is the world's first commercial scale, coal-fired power plant to be retrofitted with CCS capability, capturing 1 million tonnes of CO<sub>2</sub>-e per year. BHP Billiton and SaskPower recently announced a partnership to accelerate the development of CCS by enhancing global access to the data, information and lessons learned from the Boundary Dam project and associated test facilities. Improving access to the outcomes of this unique project can influence the design of future CCS projects, drive down costs and provide answers to the challenging questions that must be resolved in order to stimulate broader deployment of CCS.

## We are supporting mechanisms to finance global emissions reductions



We are committed to being responsible stewards of the natural resources we develop and use in our operations and seek to minimise our environmental impact.

Forests are a critical part of global efforts to reduce GHG emissions. Emissions from deforestation and land degradation are cumulatively responsible for nearly 20 per cent of global GHG emissions, and are the largest sources of GHG emissions in many developing countries. Forests also contain some of the world's most important ecosystems and provide livelihoods for local communities, so the avoidance of deforestation can deliver benefits to societies, economies and the environment.

We believe businesses can play an important role in financing sustainable development, with private sector capital best mobilised through market mechanisms that provide financial incentives for emissions reductions. For example, REDD+ provides an international mechanism that supports developing countries to reduce GHG emissions from deforestation.

We have an integrated REDD+ strategy that focuses on project support, improved governance and enhanced market stimulation for carbon credits. There are three key reasons why supporting REDD+ makes sense for BHP Billiton: it provides an opportunity to access low-cost credits with multiple benefits to the environment and communities; it delivers immediate GHG reductions; and it can bridge the developed and developing world divide in climate change policy negotiations.

In FY2015, BHP Billiton supported the development and launch of *The Consolidated Guide to the REDD+ Rules under the UNFCCC*, in conjunction with Baker & McKenzie, an international law firm. It is the first of its kind to be published, and consolidates key rules on REDD+ into a simple yet comprehensive document that governments and other interested parties can use in international negotiations or when implementing REDD+ domestically. We are also working with the International Finance Corporation to identify ways of stimulating demand for REDD+ credits to support forest protection and conservation.

## We are working with others to enhance the global response to climate change



Our strategic approach to climate change is underpinned by engagement and we are committed to transparent and open communications with a broad range of stakeholders, including investors, governments, industry and non-governmental organisations.

We have an ongoing program of engagement with investors and have progressively enhanced our disclosure, for example through an annual voluntary submission to CDP's Investor Request. CDP is the primary investor benchmarking tool for climate change performance, and we have seen an improvement in the Company's rating across both performance and disclosure measures since 2013.

We believe industry has a key role to play in climate change 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. An effective policy framework should include a complementary set of measures including a price on carbon, support for low-emissions technologies, energy efficiency and measures to build resilience. We continue to engage with policymakers in the countries where we operate. For example, in FY2015, we made two climate policy submissions in response to the Australian Government's discussion papers *Setting Australia's Post-2020 Target for GHG Emissions* and *Emissions Reduction Fund: Safeguard Mechanism*, sharing our perspective on the importance of this issue.

We are committed to sharing experience and expertise with stakeholders and identifying solutions that can drive emissions reductions at the lowest cost. Consistent with this view, we signed the World Bank's *'Putting a Price on Carbon'* statement, which was presented at the 2014 United Nations Climate Summit in New York and we are a member of its Carbon Pricing Leadership Coalition. In September 2015, we signed the *CEO Statement on Business and Climate Change and the Paris Negotiations* along with seven other major companies representing a diverse cross-section of the Australian economy and emitting around 12 per cent of the country's GHG emissions.

# 3 Our approach to portfolio management



As well as taking action to reduce emissions, adapt to the physical impacts of climate change, develop and deploy low-emissions technologies and support an effective global response, we continue to identify and assess the impacts of climate change on the portfolio.

At BHP Billiton, we have a robust annual corporate planning process that underpins the development and delivery of our strategy. This process starts with the construction of a 'central case' – a forecast built through an in-depth, bottom-up analysis using rigorous processes and benchmarked with external views. The current central case assumes the US economy continues

to recover and strengthen, progressive development of China and India, integration of emerging economies into a multi-polar economic environment, and action on climate change centred on national policies. In the central case, our estimates show the world heading towards 3°C warming relative to pre-industrial levels.

A 20-year plan is prepared based on input from our Businesses' long-term plans and is then tested under both long-term scenarios and 'shock' events.

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## The portfolio is tested across a range of scenarios and shock events

While the central case is our forecast of what we expect will happen, we recognise that this forecast is subject to uncertainty and that the world could move in any number of ways in the future.

To understand the impact of this uncertainty on the BHP Billiton portfolio, the corporate planning process uses scenario analysis to encompass a wide spectrum of potential outcomes. Designed to interpret external factors, including technical, economic, political and governance trends facing the global resources industry, the scenarios offer a means by which to explore potential portfolio discontinuities and opportunities, as well as to test the robustness of decisions.

The scenarios do not constitute preferred outcomes for BHP Billiton. They represent a range of possible long-term future states. While these are possible futures, there are inherent limitations with scenario planning and it is difficult to predict which, if any, of the scenarios might eventuate. They are designed to be divergent, but also plausible, spanning unique potential future business environments. The scenarios use a consistent set of assumptions which are applied across the range of commodities. Every scenario includes an assumption that climate change occurs – what varies between them is the extent of the global response.

Tracking of signposts (trends) and triggers (events) across scenarios is integral to the planning process. These signposts and triggers provide an indication of which scenarios are becoming more or less dominant through time, offering us a powerful decision-making tool that would enable us to act early. For example, a potential trigger event would be a breakthrough in low-cost CCS for power generation.

Along with scenario analysis, 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.

While we optimise the 20-year plan based on the central case, we use long-term scenarios and shock events to test the resilience of the portfolio across a range of possible futures. The difference between how we expect the portfolio to perform in the central case, and how we forecast it could perform in a scenario, helps us to understand the risks and opportunities and what we might do differently if the world were to move towards a particular scenario.

The key characteristics of the four scenarios are summarised below:



### A New Gear

Innovation delivers step-change growth in developed economies

High, sustainable economic growth unlocked by productivity gains in advanced economies. Reform success in India achieves high transformative growth. Restricted resource access in some areas. Rapid production rates for some commodities deplete basins with costly reserve replacement. Technology development focuses on highly differentiated products. Less technology transfer from major economies to emerging economies. Developed economies rely primarily on regulation to enforce reduction in emissions. Globally, the initial focus is on reactive adaptation, with some proactive investment followed by a longer-term shift towards mitigation.



### Closed Doors

National self-interest drives economic policy leading to low growth

A future state enmeshed in economic decline and protectionism. Nationalism drives economic policy rather than reform. Security of supply drives resources investment policy. Limited global cooperation. Research and development dwindles with low private sector capacity and government support. Food and water supply shortages provoke instability in some economies. Climate change commitments are abandoned in favour of adaptation.



### Global Accord

Unified focus on limiting climate change

Robust global economic growth sustains strong impetus to develop and implement cleaner, more energy efficient solutions that support growth. Unified societal action to address climate change leads to high cooperation and commitment to limit emissions. Technology plays a pivotal role with breakthroughs in new, next generation clean energy technologies. Higher-cost options are often deployed to meet lower emissions targets. There is an orderly transition to a 2°C world.



### Two Giants

US and China-led hubs drive technology-enabled growth

Strong global growth led by China and US regional centres that enable greater liberalised trade. Reform success in Latin America underpinned by high intra-regional trade integration. Coordinated policy response and agricultural productivity gains ease water and food constraints. Significant investment in research and development and rapid transfer of technology within the two centres. Focus on stronger mitigation and proactive adaptation to climate change.

### 3 Our approach to portfolio management continued

#### We test portfolio resilience in a 2°C world

We recognise that there is increasing interest in how companies are approaching climate change risk management. It is becoming common for investors to ask companies in which they own significant holdings to outline how a carbon-constrained future would impact the business. While we test the resilience of the BHP Billiton portfolio across all four scenarios, which represent a range of plausible and divergent outcomes, this analysis is focused on providing further insight into the impacts of a transition to a 2°C world.

The Global Accord scenario and the underlying assumptions behind it represent one possible outcome for a 2°C world.

In practice, there are many ways the world could limit global temperature rises to 2°C within this century. Global Accord considers the impacts of an orderly transition where emissions align with the levels indicated by the IPCC after 2030.

Along with scenario analysis, we also test the portfolio against shock events. These are unlikely and extreme events that are typically short-term but may have associated longer-term impacts. We have developed a shock event based on Global Accord that describes a much more rapid shift to a 2°C world where emissions align with the levels indicated by the IPCC by 2030, driven by very aggressive policy measures and technology developments.

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#### Global Accord describes an orderly transition to a 2°C world

In the Global Accord scenario, there is stronger climate policy action than we see today, as well as successful technological innovation to achieve emissions reductions. Global Accord envisions a strong impetus to develop and implement cleaner, more energy efficient solutions to support growth in developing economies and address intensified activism and public concern in developed economies.

As a result, a more diverse energy supply mix prevails, with significantly increased use of nuclear energy and renewables in power generation and alternative fuel vehicles in transport. Unified societal action, with high cooperation and commitment to reduce emissions, creates high demand and prices for carbon. Binding emissions targets for developing economies give time for technology to transfer and prove that emissions cuts and economic growth are not mutually exclusive.

In Global Accord, CCS becomes mature and scalable to help meet long-term climate goals. In an orderly transition, the role of CCS is limited out to 2030, given the large scale of investment and the time required to reach material penetration from today's levels. Post-2030, the role of CCS increases, both in power generation and in industrial sectors.

The Global Accord scenario relies on a high level of openness and trade, geopolitical stability and low levels of resource nationalism. This promotes the development and deployment of new technology and facilitates the high level of international cooperation required to establish effective policy.

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#### A shock event describes a rapid transition to a 2°C world

Our shock event describes an initial delay in coordinated climate change action followed by a faster than expected move to a largely decarbonised world. It simultaneously considers the impacts of several significant technology developments, such as rising renewables and battery penetration, increasing energy efficiency and ambitious climate policies to put the world on an accelerated track to achieve the 2°C goal.

In the shock event, CCS takes on a more important role, backed by stronger and earlier support from governments and the private sector. Nevertheless, the technology's contribution to global emission reductions remains significantly below that of renewables, energy efficiency and fuel-switching, at least prior to 2030.

## Analysis includes a price on carbon

BHP Billiton has applied carbon prices in valuations since 2004. In our carbon price modelling, the long-term demand for emissions reductions represents the difference between the current emissions trajectory and cuts the world must make to meet agreed climate goals. As such, we conduct an assessment of current and potential future commitments of governments to reduce emissions. Given that most countries' current ambitions remain below what is required in a 2°C world, we assume that their ambitions will increase over time.

On the supply side, we do a granular assessment of the cost and availability of global emissions reduction potential. The assessment is carried out by sector and by country, taking into account several detailed characteristics, such as the ability to import and export emissions reductions in the form of tradable credits. The output of this analysis is an explicit carbon price, which we expect to arise as existing carbon markets are expanded and new markets are set up.

It represents the marginal inducement cost of the emissions reductions required to meet government targets. BHP Billiton was an early adopter in applying an internal price on carbon in investment decisions and portfolio evaluation.

In the central case, we have a long-term carbon price forecast of US\$24/tCO<sub>2</sub>-e by 2030 as shown in Table 1. In Global Accord, we expect the global average carbon price to reach US\$50/tCO<sub>2</sub>-e by 2030. This reflects key global economies such as China, the United States and the European Union going beyond their current climate commitments and significantly increasing demand for long-term emissions reductions. The higher ambitions are matched by stronger policy support to help deliver emissions reduction potential. In the unlikely and extreme shock event, the carbon price rises up to US\$80/tCO<sub>2</sub>-e by 2030, driven by very ambitious government targets.

**Table 1: Overview of emissions targets and carbon prices by 2030**

Assumed government emissions targets (% reduction relative to 1990 or peak year)	Central case (~3°C trajectory)	Global Accord scenario (2°C trajectory post-2030)
European Union (EU)	40% by 2030	50% by 2030
United States (US)	15% by 2030	30% by 2030
Other developed countries	Similar to EU/US	Similar to EU/US
Advanced developing economies	Peak emissions in 2030	Peak emissions in 2025
Other countries	Peak emissions after 2030	Peak emissions in 2030
<b>Global long-term carbon price forecast (US\$/tCO<sub>2</sub>-e, real 1 July 2015)</b>	<b>24</b>	<b>50</b>

Carbon prices today are relatively low compared to where we see them in Global Accord, and markets with significant liquidity are limited to few jurisdictions, such as the European Union and parts of North America. In Global Accord, we expect carbon markets to expand and become key drivers of cost-effective emissions reductions together with other low-carbon measures, including support for energy efficiency and renewable energy. In saying this, the Two Giants scenario, while not a 2°C world,

highlights that credible alternative paths leading to an effective climate change response are possible. In Two Giants, a positive climate change response is driven primarily by open trade flows facilitating technological advances and transfer of technology rather than relying heavily on regulatory or policy initiatives to drive the technology changes required to materially reduce future dependence on fossil fuels.

## 4 Portfolio impacts in a 2°C world

Given the many uncertainties facing not only the resources sector but the world in general, accurately predicting how the world will respond to the challenge posed by climate change is difficult. BHP Billiton's planning approach endeavours to consider a range of potential plausible outcomes and shock events in order to understand the impacts on the portfolio and the critical signposts we must monitor in order to respond in a timely and effective way.

We recognise that there are a number of ways that the world could transition to a 2°C world and the orderly Global Accord and more rapid shock event describe just two of these potential pathways. Table 2 highlights some key uncertainties that could impact commodity demand in the transition to a 2°C world, and the relative impact. For example, the range and rate of penalties imposed on low-quality coal supply for power generation would directly impact demand for energy coal, with greater penalties likely to result in increased demand for our high-quality product.

**Table 2: Critical uncertainties impacting demand for BHP Billiton's commodities in a 2°C world**

Commodity	Critical uncertainties
<b>Energy Coal</b>	<ul style="list-style-type: none"> <li>⬆ Economic carbon capture and storage solution</li> <li>⬆ Penalties for lower quality coal supply/minimum quality standards for power generation</li> <li>⬇ Switch from coal to gas in power generation</li> <li>⬇ Renewables capacity additions for power generation</li> </ul>
<b>Metallurgical Coal</b>	<ul style="list-style-type: none"> <li>⬆ Penalties for lower quality coal supply</li> <li>⬇ Increased rate of steel scrap collection</li> <li>⬇ Materials substitution</li> </ul>
<b>Copper</b>	<ul style="list-style-type: none"> <li>⬆ Energy efficient machinery</li> <li>⬆ Renewables capacity additions for power generation</li> <li>⬆ Increased adoption of electric vehicles</li> <li>⬇ Increased rate of copper scrap collection</li> <li>⬇ Materials substitution</li> </ul>
<b>Iron Ore</b>	<ul style="list-style-type: none"> <li>⬆ Penalties for lower quality iron ore supply</li> <li>⬇ Increased rate of steel scrap collection</li> </ul>
<b>Potash</b>	<ul style="list-style-type: none"> <li>⬆ Increased focus on balanced fertiliser nutrition</li> <li>⬇ Improved fertiliser efficiency and crop nutrient recycling</li> </ul>
<b>Gas</b>	<ul style="list-style-type: none"> <li>⬆ Switch from coal to gas in power generation</li> <li>⬆ Economic carbon capture and storage solution</li> <li>⬆ Increased use of gas in transportation</li> <li>⬇ Energy conservation in buildings and industry</li> <li>⬇ Renewables capacity additions for power generation</li> </ul>
<b>Oil</b>	<ul style="list-style-type: none"> <li>⬆ Higher level of economic activity and disposable income</li> <li>⬇ Energy conservation in buildings and industry</li> <li>⬇ Energy efficiency in transport</li> <li>⬇ Increased adoption of electric vehicles</li> </ul>
<b>Uranium</b>	<ul style="list-style-type: none"> <li>⬆ Governmental support of nuclear programs</li> <li>⬆ Successful implementation of small scale reactors</li> <li>⬇ Renewables capacity additions for power generation</li> <li>⬇ Less public acceptance following another nuclear power accident</li> </ul>

Note: Arrows show indicative impact on commodity demand within the range of pathways to a 2°C world.

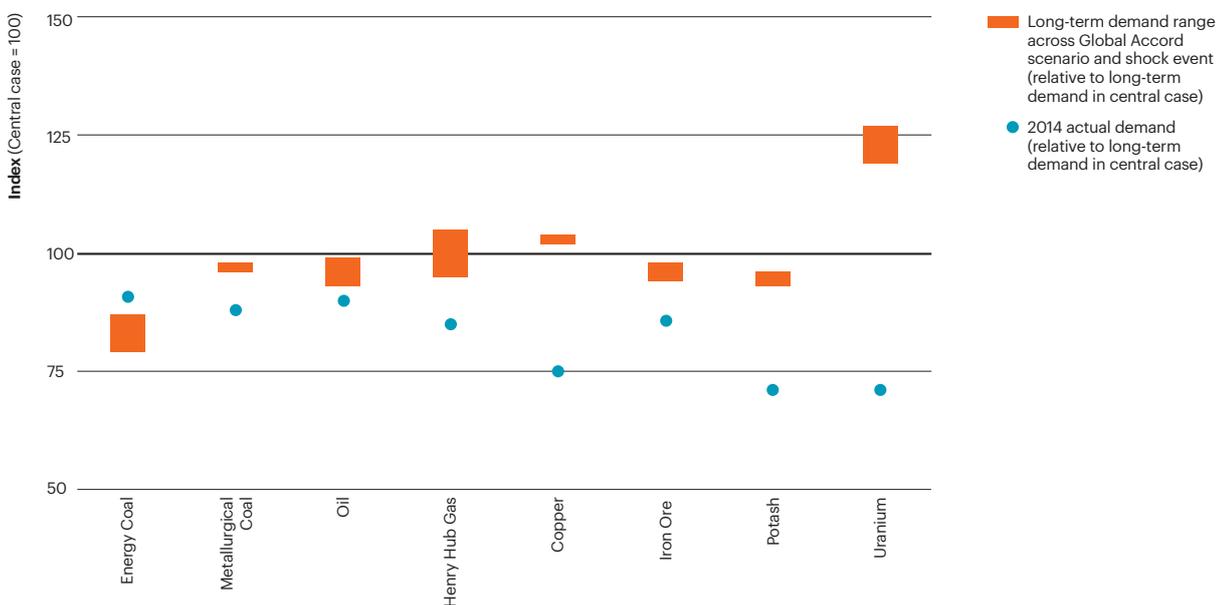
Figure 6 highlights the long-term demand with the range covering both the Global Accord scenario and the shock event. This long-term demand is shown relative to the central case forecast. The chart also shows actual demand in 2014, once again indexed to the long-term demand forecast in the central case. This highlights that even in an orderly or rapid shift to a 2°C world, we forecast growth in long-term demand for most of our commodities, although at a slower pace than in the central case.

The energy sector is most affected in a 2°C world as it is a key source of global emissions and likely to face a combination of strong environmental regulation leading to further efficiency improvements and increasing competition between fuels. For energy commodities, we forecast the share of renewable energy in the power mix to increase by almost 25 per cent in the Global Accord scenario compared with the central case. In the shock event, we also expect to see the rise of nuclear power to provide low emissions baseload power, increasing uranium demand by more than 50 per cent. In transport, several trends intensify in Global Accord compared to the central case, including improvements in the fuel economies of new vehicles and the rise in electric vehicles. Given the current low penetration of electric vehicles, combined with more efficient diesel and gasoline vehicles, it will take a decade before they become a material part of the global fleet.

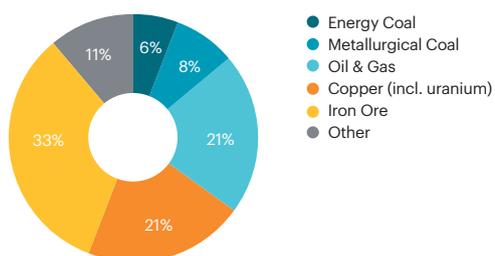
As a result, energy coal and crude oil are likely to be the most affected in the Global Accord scenario and the shock event. We forecast lower long-term demand for energy coal than in the central case. However, as shown in Figure 6, demand is not substantially lower than today and so additional quantities of energy coal are likely to be required in order to meet the world's energy needs. BHP Billiton's high-quality, low-cost energy coal assets have strong margins and therefore remain attractive despite the reduced demand. Natural gas demand initially finds support given the fuel's lower emissions intensity compared with energy coal, however in the long run, emissions from the use of natural gas will also need to decline in the 2°C world.

For non-energy commodities, we expect increased recycling and the rise in environmental costs to be key drivers. Global copper consumption increases in a low-carbon environment due to rising demand for energy efficient technologies such as copper-intensive solutions in the power and machinery sectors. High levels of steel recycling reduce iron ore and metallurgical coal demand. In the Global Accord scenario and the shock event, both sectors are also impacted by tighter environmental constraints and emissions costs. Potash demand growth is hampered by improved fertiliser efficiency and higher crop nutrient recycling through higher and more effective return of crop residues in the Global Accord scenario.

**Figure 6: Long-term commodity demand range in a 2°C world**



**2014 actual Business contribution to Group revenue**



### Our portfolio remains resilient

Our consideration of scenarios and shock events provides us with a divergent range of responses to reach the 2°C goal. This consideration of multiple pathways underlines the value of a scenario planning approach in that we do not consider a single view of a 2°C world, but rather a range of potential outcomes. This provides deeper, more valuable insights into the potential impacts on the portfolio and thereby improves our ability to respond where we see key signposts and triggers.

The analysis highlights that our uniquely diversified portfolio of high-quality assets is robust under both an orderly and a more rapid transition to a 2°C world.

In Global Accord, we believe there is a likelihood of upside for uranium and our high-quality metallurgical coal and iron ore. In addition, we expect copper to offer continued opportunity for growth. Gas may also provide significant opportunities during a transition to a lower emissions economy. Overall, we anticipate these commodities are robust and mitigate potential negative impacts on other commodities.

In the Global Accord scenario, we anticipate the impact on the current portfolio value will be minimal. This is due to portfolio diversification and diminishing contribution of fossil fuels as a proportion of portfolio value over time, in comparison with other commodities. We project the carbon price impact on the portfolio value would be less than two per cent. In the shock event, we predict there is likely to be more downside, but the

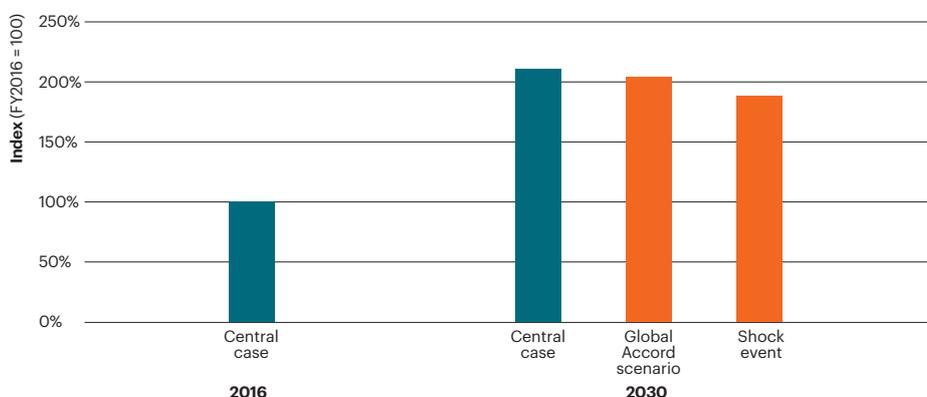
portfolio will nonetheless be resilient in spite of the very fast change in market conditions this event would entail. Once again, the carbon price impact on the total portfolio value is relatively small (<5 per cent), and the fossil fuel contribution to the portfolio is lower.

Depending on the speed of transition and the energy choices made during the transition, we expect there will be opportunities to mitigate the impact on portfolio value through selectively investing in those commodities that are preferred or advantaged due to policy or technological breakthroughs that eventuate or due to their lower emissions intensity (e.g. gas, copper, iron ore, metallurgical coal or uranium).

Without any mitigation or action to adapt our portfolio, our overall portfolio value is lower in the Global Accord scenario and the shock event, however we still expect the Company to grow in absolute terms compared with today.

We have a strong project pipeline with many capital-efficient growth options that continue to generate high shareholder value in a 2°C world. The return on our organic projects remains high, with an overall project pipeline internal rate of return reducing slightly relative to the central case, but still averaging around 20 per cent in both the Global Accord scenario and the shock event. The resilience of our portfolio in a 2°C world is highlighted in Figure 7, which shows how earnings before interest, taxes, depreciation and amortisation (EBITDA) grow relative to FY2016 in the central case, the Global Accord scenario and the shock event.

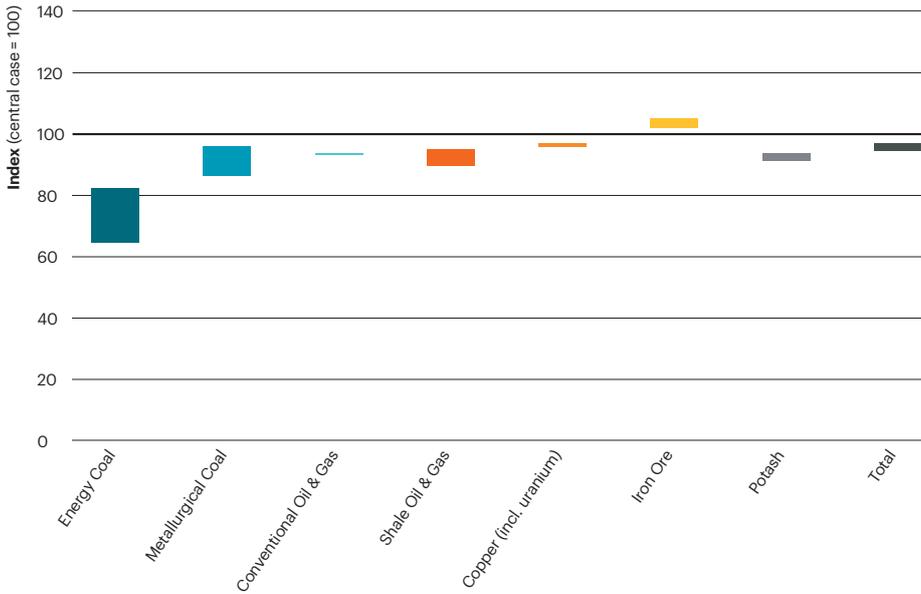
Figure 7: EBITDA



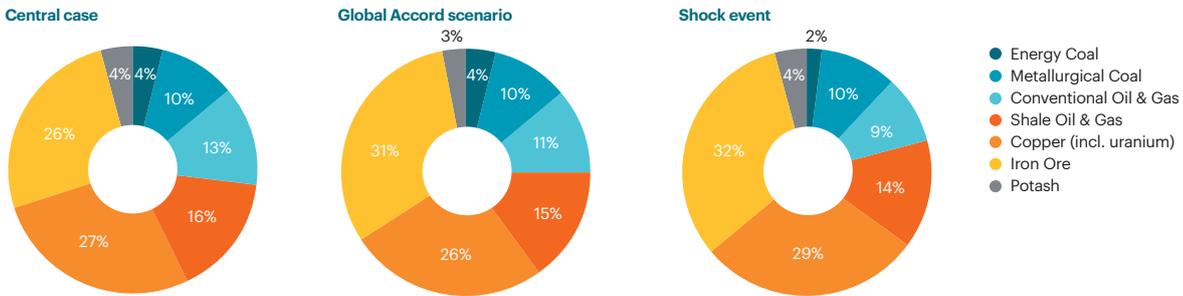
Our current operations consist of high-quality, low-cost assets with strong margins. As Figure 8 indicates, the combined Group EBITDA margins are not impacted significantly in the Global Accord scenario or the shock event, highlighting the resilience of the portfolio. Some commodities, notably fossil fuel commodities, are likely to be more impacted than others due to lower prices and higher costs, including carbon costs.

However, these impacts are potentially offset by iron ore given the potential for price increases resulting from a demand for higher-quality product that will reduce emissions in steel manufacturing. The contribution of each commodity to the overall Group EBITDA is also shown below, highlighting how the composition could change in the Global Accord scenario or the shock event.

**Figure 8: 20-year average EBITDA margin ranges in a 2°C world**



**20-year average Business EBITDA contribution**





### Conclusion

Transparency across all parts of our business is critical for shareholders, policy makers and regulators to make informed decisions. This document is another step forward in our efforts to increase the level of disclosure on how we manage climate change.

There will be many opportunities and risks as the world continues to respond to climate change, and they will be faced by companies in all sectors, albeit to varying degrees. With the right market settings, including a price on carbon, the greatest opportunities will emerge for those who can produce the lowest cost and most efficient solutions, in line with the expectations of communities and policy makers.

BHP Billiton's approach to investment decisions and portfolio planning is robust. When combined with our uniquely diverse mix of assets, low-cost production, high ore grades and quick payback growth opportunities, this means we are well placed to respond to the opportunities and risks ahead.

Our scenario planning process tests our portfolio under multiple pathways, with a range of potential outcomes, to determine impacts on demand and earnings. In a transition to a 2°C world, we see continued demand for fossil fuels and increasing market share for renewable energy sources, combined with improved energy efficiency.

Depending on the speed of transition and the energy choices made, we will have opportunities to mitigate the impacts on the value of our portfolio through selectively investing in the commodities that will benefit from structural market changes.

Over our long history, we have continually demonstrated our ability to reposition ourselves for future growth, by divesting those parts of our business that do not align with our strategy, like the recent demerger, or by investing in new commodities where we see a strong long-term growth story, like potash.

We believe our analysis demonstrates that BHP Billiton will continue to create substantial value for shareholders under both an orderly and a more rapid transition to a 2°C world.

As a leading global resources company, we also have a broader role to play in supporting this transition, including the development of low-emissions technology, and sharing our market experience to support governments in delivering the changes in policy and regulation required to successfully address climate change.

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## Accessing information on BHP Billiton

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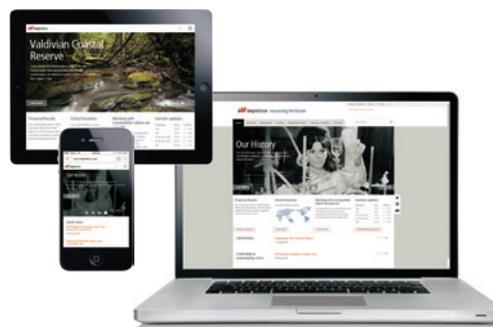
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### BHP Billiton Centre

171 Collins Street

Melbourne VIC 3000

Telephone 1300 554 757 (within Australia)

+61 3 9609 3333 (outside Australia)

Facsimile +61 3 9609 3015

Email for Investor enquiries: [investor.relations@bhpbilliton.com](mailto:investor.relations@bhpbilliton.com)



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