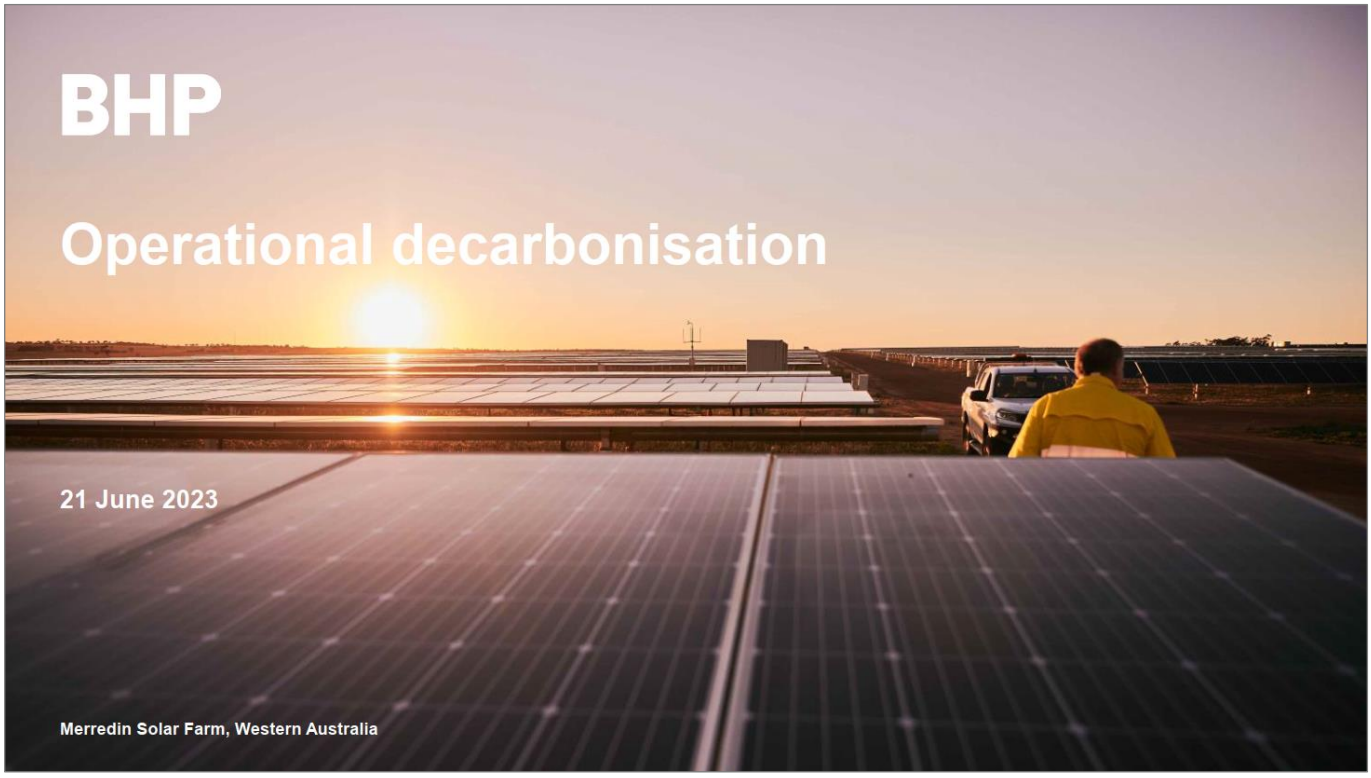
BHP

Operational decarbonisation investor briefing

Presentation & speech

21 June 2023



Introduction: Tristan Lovegrove, Group Investor Relations Officer

Welcome everyone, and thank you for joining us today.

I am joined by Graham Winkelman, Head of Carbon Management; Alejandro Tapia and Anna Wiley, who are the Vice Presidents of our Planning and Technical functions in the Americas and Australia respectively; as well as our Head of Decision Evaluation, Patrick Collins.

They have deep expertise in these areas.

- Graham has been with BHP for nine years and leads our decarbonisation strategy and positioning across both operational and value chain emissions, leveraging the effort and dedication of so many across BHP in the pursuit of emissions abatement.
- Alejandro has been with BHP for 19 years and has held various leadership roles including Head of Projects Pampa Norte, Project Director Integrated Operations and General Manager Concentrator Escondida. And for those that don't know, Alejandro will soon move into the role of Asset President of our Escondida copper mine in Chile.
- Anna has been working in the mining industry for over two decades in senior operational leadership and functional roles. She joined BHP six years ago as the Head of Asset Management in the global Maintenance function, before transitioning to her current role where she has, amongst other things, led the decarbonisation strategy for our Australian operations for the past 18 months.
- And Patrick has been with BHP for 12 years providing evaluation support to our Assets on their most material investment decisions. He has held leadership roles as Head of Decision Evaluation for Minerals Americas and now Minerals Australia. As part of his current role, he is responsible for embedding decarbonisation and social value pillars into our decision-making processes.

So we're in good hands.

After the presentation, you'll have an opportunity to ask questions.

Disclaimer

Forward-looking statements

This presentation contains forward-looking statements, which may include, without limitation, statements regarding: (i) our strategy, our values and how we define success; (ii) our commitment to generating social value; (iii) our commitments under sustainability frameworks, standards and initiatives; (iv) our expectations, commitments and objectives with respect to sustainability, decarbonisation, natural resource management, climate change and portfolio resilience and timelines and plans to seek to achieve or implement such objectives, including our strategies, goals, targets, milestones and metrics to seek to reduce or support the reduction of greenhouse gas emissions, and related perceived costs, benefits and opportunities for BHP; (v) the assumptions, beliefs and conclusions in our climate change related statements and strategies, for example, in respect of future temperatures, energy consumption and greenhouse gas emissions, and climate-related impacts; (vi) trends in commodity prices and currency exchange rates; (vii) demand for commodities and our expectations of a competitive advantage for our business or certain products; (viii) reserves and resources and production forecasts; (ix) expectations, plans, strategies and objectives of management; (x) climate scenarios; (xi) assumed long-term scenarios; (xii) potential global responses to climate change; (xiii) the potential effect of possible future events on the value of the BHP portfolio; (xiv) approval of certain projects and consummation of certain transactions; (xv) closure or divestment of certain assets, operations or facilities (including associated costs); (xvi) anticipated production or construction commencement dates; (xvii) capital costs and scheduling; (xviii) operating costs and supply (including shortages) of materials and skilled employees; (xix) anticipated productive lives of projects, mines and facilities; (xx) provisions and contingent liabilities; and (xxi) tax and regulatory developments.

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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 presentation. BHP cautions against reliance on any forward-looking statements or guidance, including in light of the current economic climate and the significant volatility, uncertainty and disruption arising in connection with the Ukrainian conflict and COVID-19.

For example, our future revenues from our assets, projects or mines which may be described in this presentation will be based, in part, upon the market price of the minerals or metals produced, which may vary significantly from current levels. These variations, if materially adverse, may affect the timing or the feasibility of the development of a particular project, the expansion of certain facilities or mines, or the continuation of existing assets.

Other factors that may affect the actual construction or production commencement dates, revenues, costs or production output and anticipated lives of assets, mines or facilities include (i) our ability to profitably produce and transport the minerals and/or metals extracted to applicable markets; (ii) the impact of foreign currency exchange rates on the market prices of the minerals and/or metals we produce; (iii) activities of government authorities in the countries where we sell our products and in the countries where we are exploring or developing projects, facilities or mines, including increases in taxes and the imposition of or increase in carbon pricing; (iv) changes in environmental and other regulations; (v) the duration and severity of the Ukrainian conflict and any resurgence of the COVID-19 pandemic and their impact on our business; (iv) political or geopolitical uncertainty; (viii) labour unrest; and (viii) other factors identified in the risk factors discussed in section 9.1 of BHP's Annual Report for the year ended 30 June 2022.

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Numbers presented may not add up precisely to the totals provided due to rounding.

Due to the inherent uncertainty and limitations in measuring greenhouse gas (GHG) emissions and operational energy consumption under the calculation methodologies used in the preparation of such data, all GHG emissions and operational energy consumption data or references to GHG emissions and operational energy consumption volumes (including ratios or percentages) in this presentation are estimates. Emissions calculation and reporting methodologies may change or be progressively refined over time resulting in the need to restate previously reported data.

There may also be differences in the manner that third parties calculate or report GHG emissions or operational energy consumption data compared to BHP, which means that third-party data may not be comparable to our data. For information on how we calculate our GHG emissions and operational energy consumption data, see our Methodology tab in our ESG Standards and Databook (for the applicable year), available at bhp.com.

Unless expressly stated, information and data in this presentation does not reflect BHP's acquisition of OZ Minerals Limited on 2 May 2023.

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In this presentation, the terms 'BHP', the 'Company', the 'Group', 'BHP Group', 'our business', 'organisation', 'we', 'us' and 'our' refer to BHP Group Limited and, except where the context otherwise requires, our subsidiaries. Refer to note 28 'Subsidiaries' of the Financial Statements in BHP's Annual Report for the year ended 30 June 2022 for a list of our significant subsidiaries. Those terms do not include non-operated assets. Notwithstanding that this presentation may include production, financial and other information from non-operated assets, non-operated assets are not included in the Group and, as a result, statements regarding our operations, assets and values apply only to our operated assets unless otherwise stated.

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But before we get into the detail, here's a traditional disclaimer slide.

I'd like to highlight that the nature of this presentation is inherently forward looking – and in an area that is rapidly changing – so it's not a guarantee or prediction of future performance.

Our plans include reliance on technological developments – and the relative economics of these; regional and global policy developments; and a myriad of other uncertainties and risks.

The only thing that is certain, is that our plans will change, but we want to highlight in this briefing our current thinking on how we hope to achieve our target and goal. As well as some of the risks and opportunities that we may see along the way.

With that, I'll hand over to Graham.

Overview: Graham Winkelman, Head of Carbon Management, Sustainability & Climate Change

Thanks, Tristan, and thanks to all of you for the opportunity to present on this topic.

The world faces a critical challenge to respond effectively to the risks of climate change. Every segment of society has a role to play.

And BHP recognises our vital role – both in supplying commodities the world needs to decarbonise, and in making sure we do so as sustainably as possible.

Our focus on operational decarbonisation

Working with global partners and other stakeholders in the value chain

On track to reduce our operational emissions by at least 30% by FY30 from FY20 levels

We have an aspirational goal to achieve net zero operational emissions by 2050

To succeed:

- technology must advance quickly from where it is now
- we must collaborate with our vendors and industry
- we must effectively integrate decarbonisation into all aspects of our business

The pathway to **net zero will be non-linear** as we grow the business

Working hard to find the **most capital efficient carbon abatement solutions**

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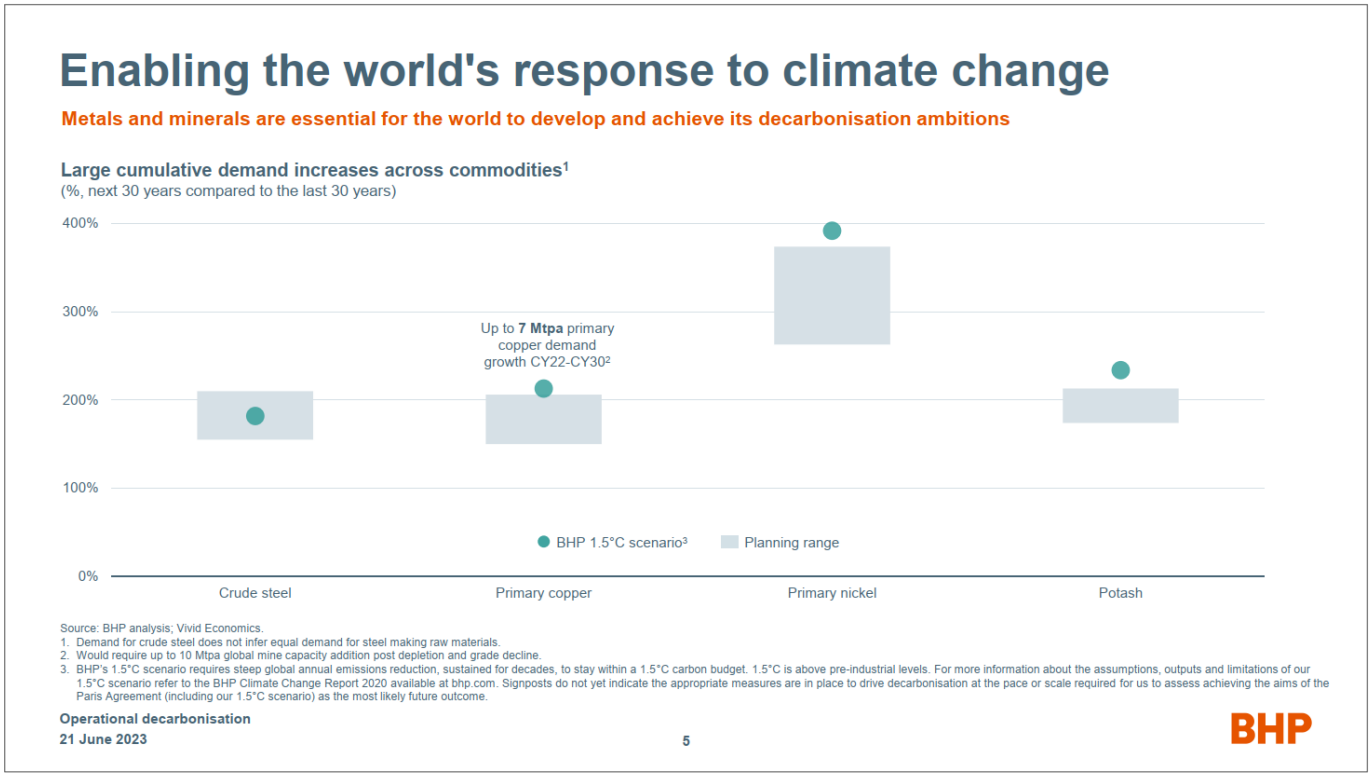
Let's start with a few key messages that we hope will resonate throughout the presentation today.

We are on track to deliver our credible FY30 target and we have an aspirational goal to achieve net zero emissions in 2050. This target and goal are both related to our Scopes 1 and 2, or 'operational' greenhouse gas emissions.

To be successful, step change technology solutions driven by collaboration in the value chain will be necessary.

And as we grow our business to meet increasing demand, the pathway will not be a straight line, nor will it be smooth.

But by integrating decarbonisation into how we plan, we can find the most cost-effective way to achieve these outcomes.



Demand for commodities we produce is underpinned by the intensifying global trends shaping our society and our economy.

By 2050, global population is expected to increase to almost 10 billion people, while the urban population is expected to grow by 50 per cent to almost seven billion.

More people, and more urbanisation, means a greater need for commodities.

And over and above this, it is expected that demand for our products will be driven by the strengthening push across the world to decarbonise.

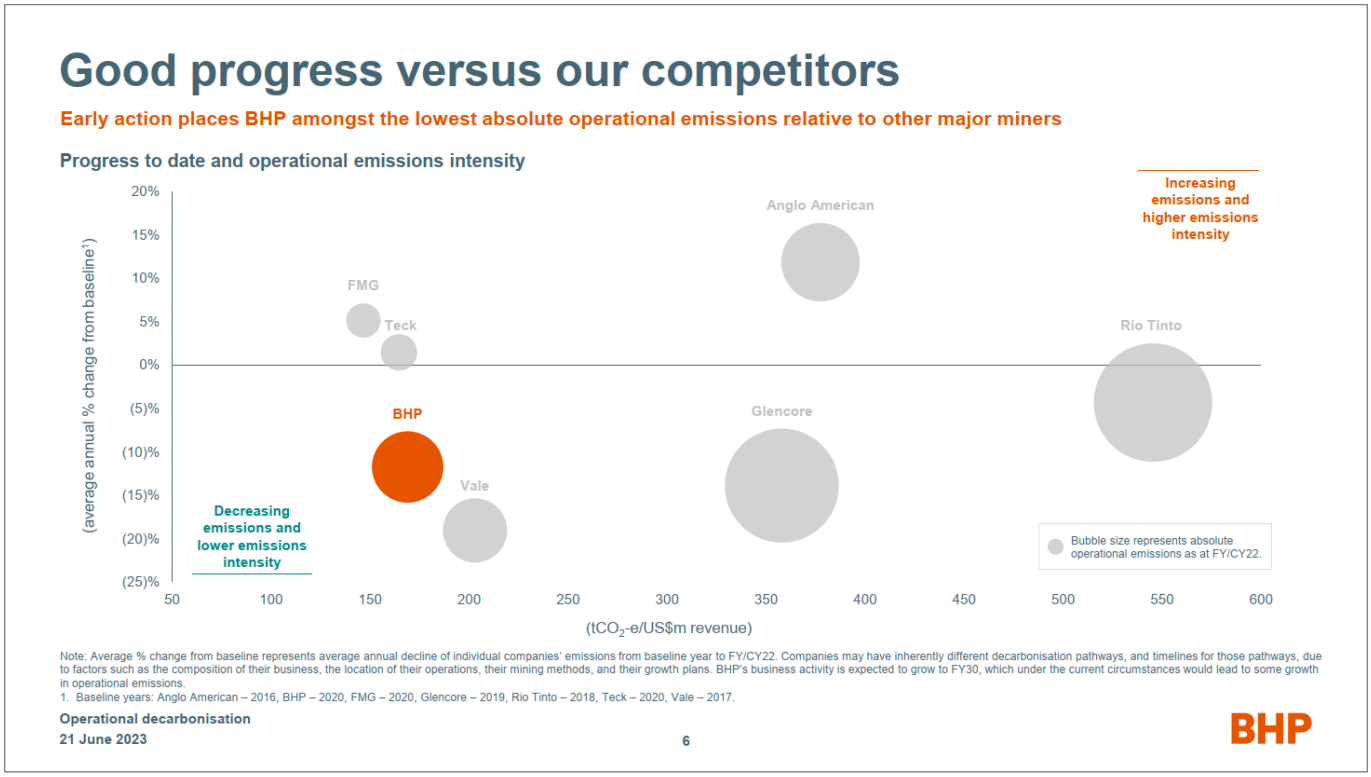
BHP's key products are expected to play a vital part in enabling the world's response to climate change, and we plan to grow our production to meet this demand while simultaneously working to decarbonise our operations.

Investment in such things as the copper-intensive shift to electrification, and nickel-intensive batteries, both required under our 1.5°C scenario, would contribute to significant increases in demand in the next 30 years compared to the last 30 years.

This scenario also sees amplified demand for crude steel for such things as wind turbines.

The world clearly needs more mining to meet this demand – but we must continue to produce more with less.

Today we're going to talk about the credible target and goal we have in place for operational emissions, and the approach we are taking to reach them – not a path founded only in optimism, but a realistic acknowledgement that the roadmap for such a journey will be neither linear nor easy, but achievable.



BHP has a history of taking action and we have been setting and achieving targets for operational emissions since the 1990s.

And today:

- we have among the lowest absolute emissions of the diversified mining majors (as represented by the size of the bubble on the chart);
- among the lowest emissions intensity on a revenue basis (as shown by our position towards the left of the chart);
- and we continue to make significant progress in reducing our emissions against our FY20 baseline (indicated by our position towards the bottom of the chart).

On the latter point, the displayed chart shows an average of 12 per cent annual emissions reduction across BHP since our baseline year, representing our 24 per cent reduction over the past two years.

Now, we know that different companies will have very different decarbonisation pathways that are influenced at different times by a range of factors, including the composition of their business, the location of their operations, their mining methods and of course, growth plans. But the key point here is that BHP is well positioned among peers and has a strong foundation for further progress towards our target and goal.

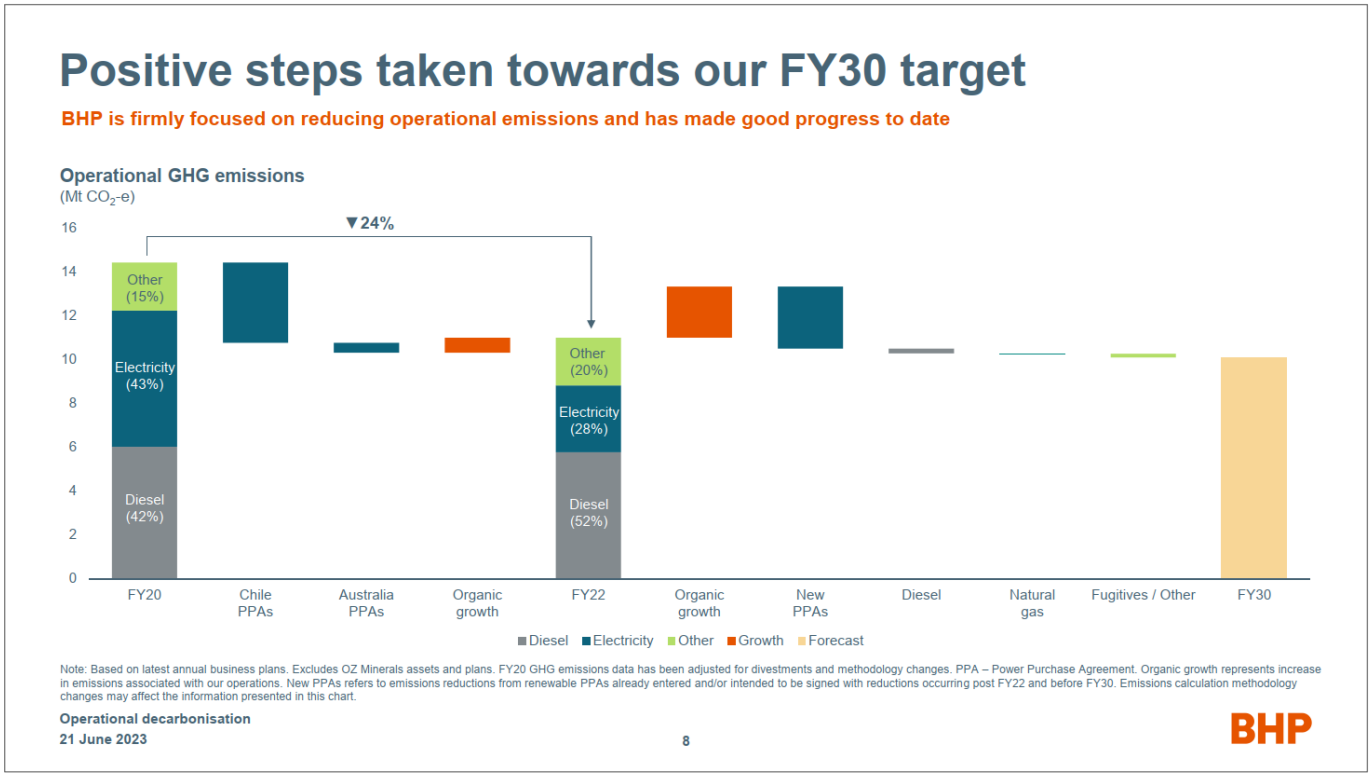
At BHP, we are very deliberate in how we set targets. We work with BHP's asset teams to determine what's possible. Our targets are set on the basis of seeing a credible pathway.

Our FY30 target of at least a 30 per cent reduction gives us focus, and our long-term goal of net zero operational GHG emissions by 2050 orients us towards the future.

And let me be clear, we are not planning to change our 2030 reduction target. Rather, we're focused on action to deliver our plan.

Taking action means working with others to identify solutions through studies, undertaking proof-of-concept trials and executing outcomes. Anna and Alejandro are here today to further explain the actions that we are taking across our global operations.

And, as Patrick will speak to later, we have integrated our decarbonisation response into our corporate planning, capital allocation framework and decision-making.



In FY22, our operational GHG emissions were 11 million tonnes of CO_2-equivalent, adjusted for divestments and methodology changes.

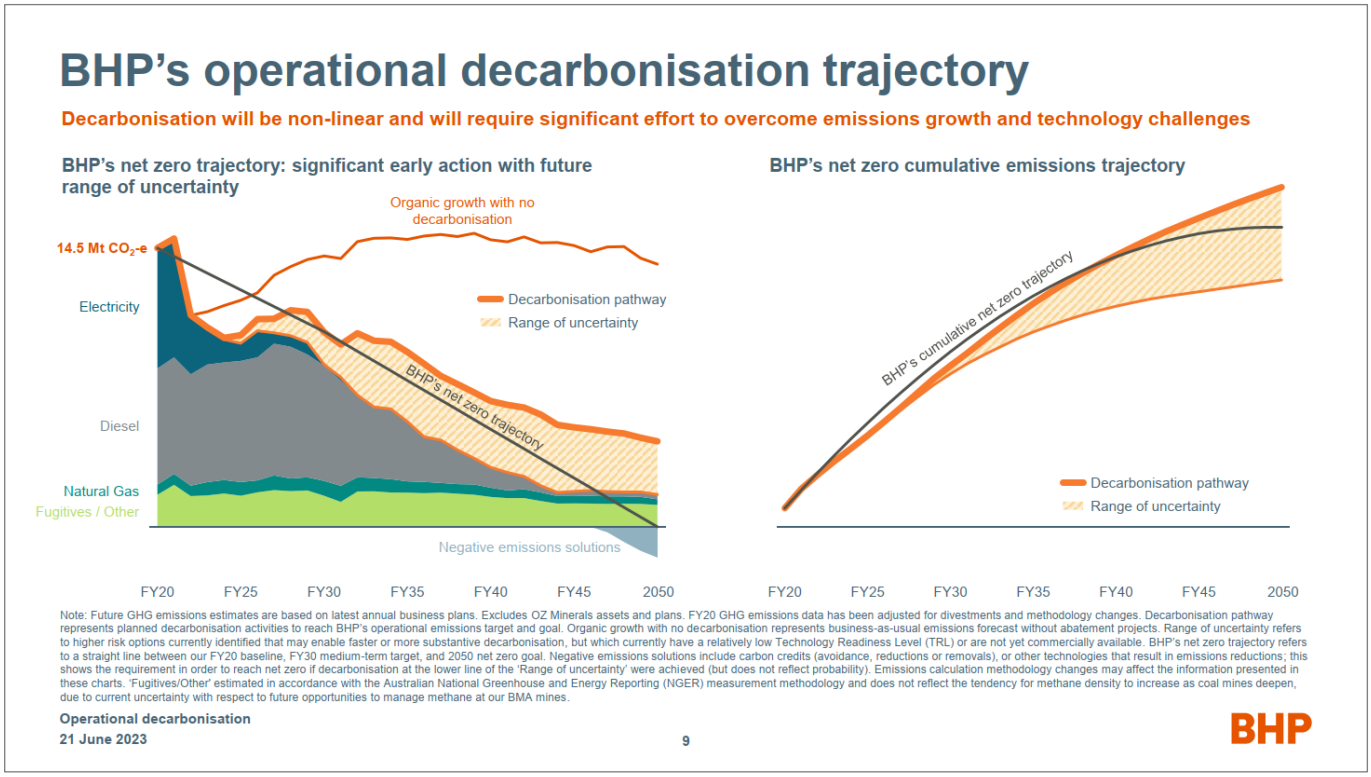
It's a good start from our FY20 baseline and has been achieved primarily through introducing renewable electricity at many of our operated assets – notably in Chile.

But the path to 2030 is more challenging.

Our emissions profile is now weighted towards diesel. And while technology solutions for diesel displacement are emerging, many are not yet available at scale.

In addition, our business activity is expected to grow to FY30, which under the current circumstances would lead to some growth in emissions. This is shown as the orange box labelled 'organic growth'.

Countering this growth, we plan additional deployment of renewable energy before FY30, and further effort to deliver abatement across other emissions sources – including diesel, fugitive methane and natural gas.



Our potential future emissions pathways are summarised in these two charts. Let's start on the left.

First, we maintain visibility of our 'do-nothing' emissions pathway, shown in the chart as 'organic growth with no decarbonisation'. This represents the expected emissions pathway associated with our increasing production were we not to implement decarbonisation projects.

Beneath that line is our 'decarbonisation pathway', the thicker orange line. You will see that we're currently well ahead of a straight-line contraction to FY30.

This decarbonisation pathway aggregates all planned structural abatement projects and incorporates planned business growth, excluding Oz Minerals assets for now.

So while we've seen further emissions reduction progress in the current financial year, we do expect some near-term increase in emissions from production growth.

To move faster than our decarbonisation pathway, we will be reliant on the availability of technology still under development, and related factors.

On the chart, we have labelled this potential abatement the "range of uncertainty".

And we can see a conceptual pathway to our goal of net zero in 2050.

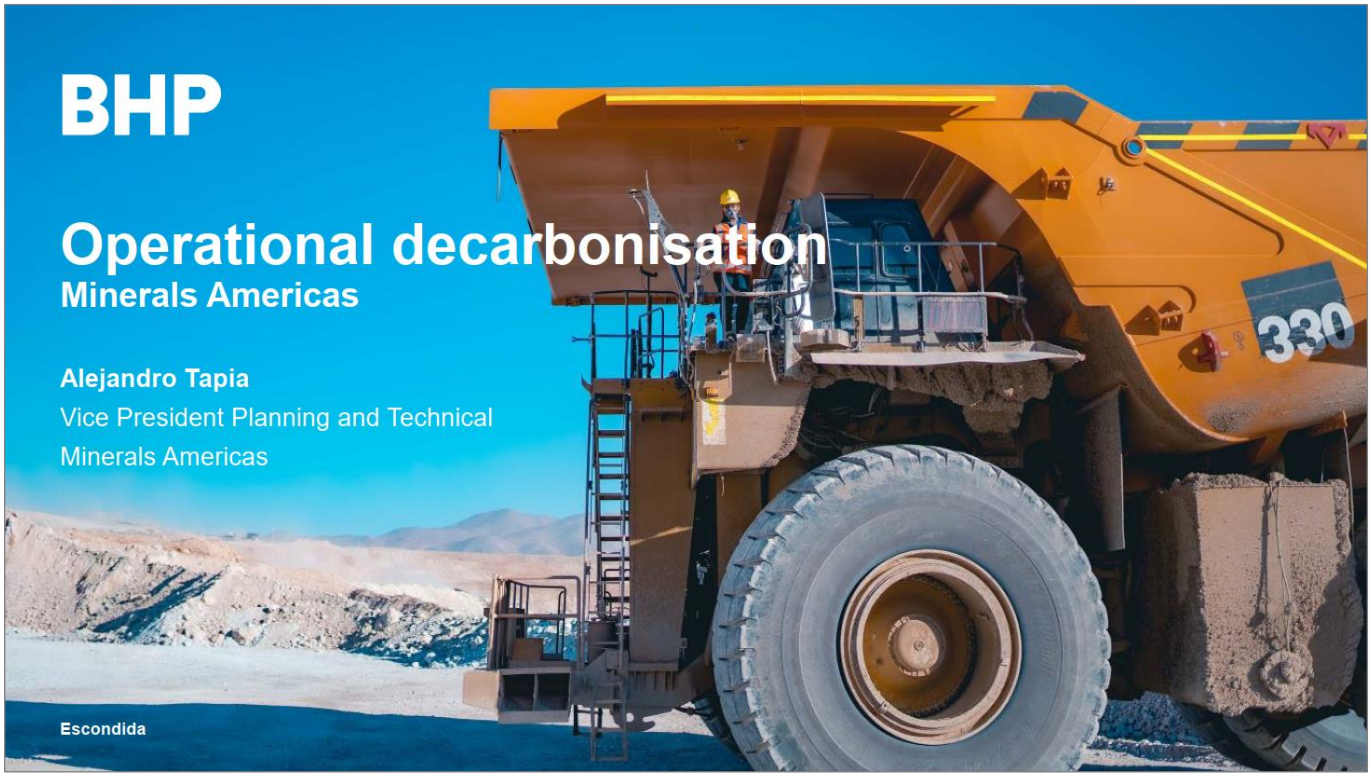
Despite effort to date and our plans going forward, the challenge of eliminating natural gas and removing fugitive methane emissions, in addition to the viable advances needed in diesel displacement technology, continue to shape BHP's future emissions pathway.

However, on a cumulative basis (as shown on the right), we remain ahead of a net zero trajectory until around 2035.

We maintain the option to use high-integrity carbon credits for GHG emissions that cannot reasonably be entirely avoided. And while unlikely to be necessary for our FY30 target, we can anticipate the need for some carbon credits to deliver on our net zero goal.

And we may be required to source and relinquish carbon credits in coming years to meet compliance obligations under Australia's safeguard mechanism.

So, I'd like to reiterate, the path ahead of us is not linear but remains consistent with our target and goal. Our clear 'focus' drives our ambition, we are taking 'action' where it matters, and we continue to 'integrate' decarbonisation into the core of BHP's plans. Over to you, Alejandro.

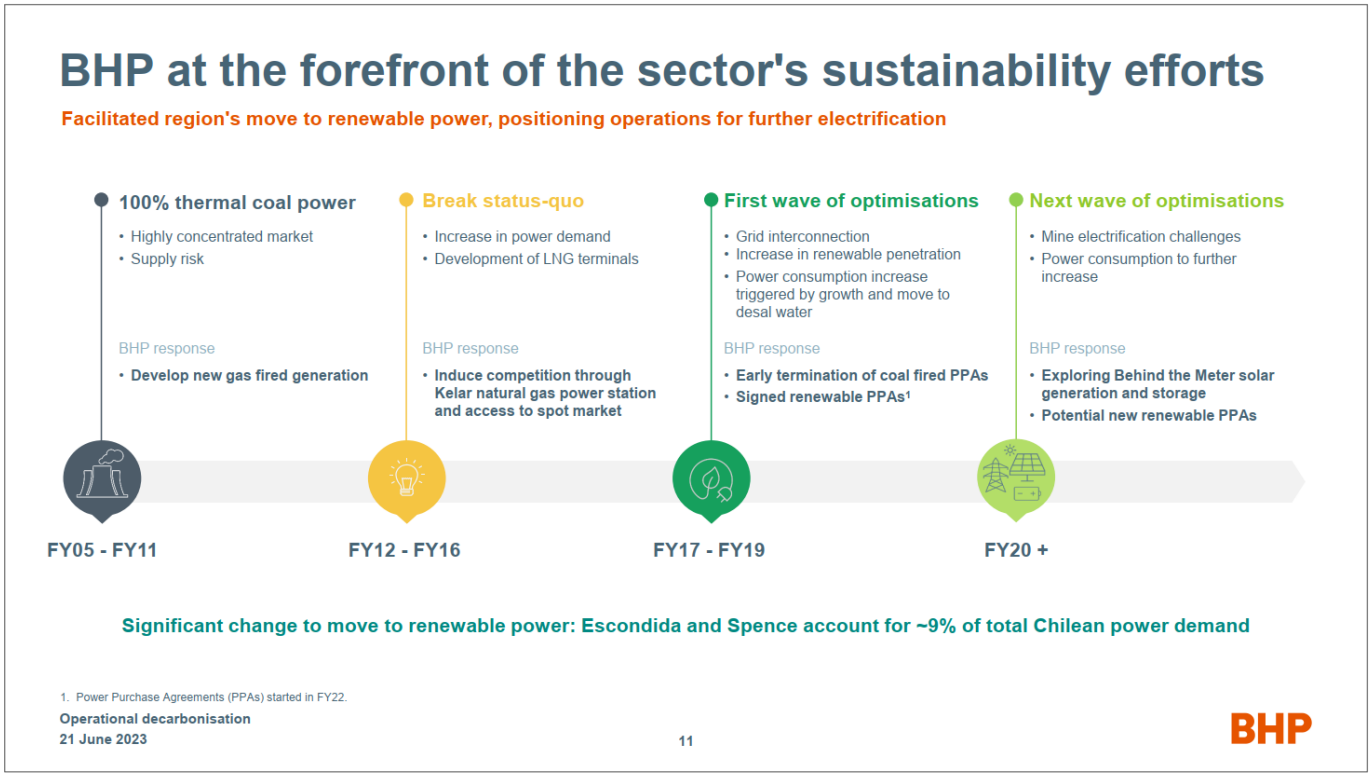


Minerals Americas: Alejandro Tapia, Vice President Planning & Technical Minerals Americas

Thanks Graham.

I'm going to focus on local action – at least locally for me – by talking about our Minerals Americas operations.

I will start with Chile, where I have spent most of my career, and then we'll look at our newest project, Jansen, in Canada.



BHP is at the forefront of more sustainable mining in Chile. By always having the future in mind, we've been an early mover in each step we've taken.

On this slide, you can see the decarbonisation transition we have made. Prior to 2011, the northern Chilean power market was highly concentrated, and assets were thermal coal powered.

In 2013, BHP started the development of the gas-fired Kelar power plant through an outsourcing model, allowing us to take control of our power costs and supply by entering the power generation market.

From 2017, Chile had its first wave of optimisations as renewable penetration was increasing materially and the interconnection between the northern and central power systems came online.

BHP was one of the first movers in capturing these benefits at scale by securing renewable PPAs for Escondida and Spence which commenced in 2021. This meant we could terminate our coal-fired generation PPAs early – reducing unit energy costs at both sites by around 20 per cent, and displacing an average of 3 million tonnes of CO_2 per year, or around 70 per cent of our Chilean assets' operational GHG emissions.

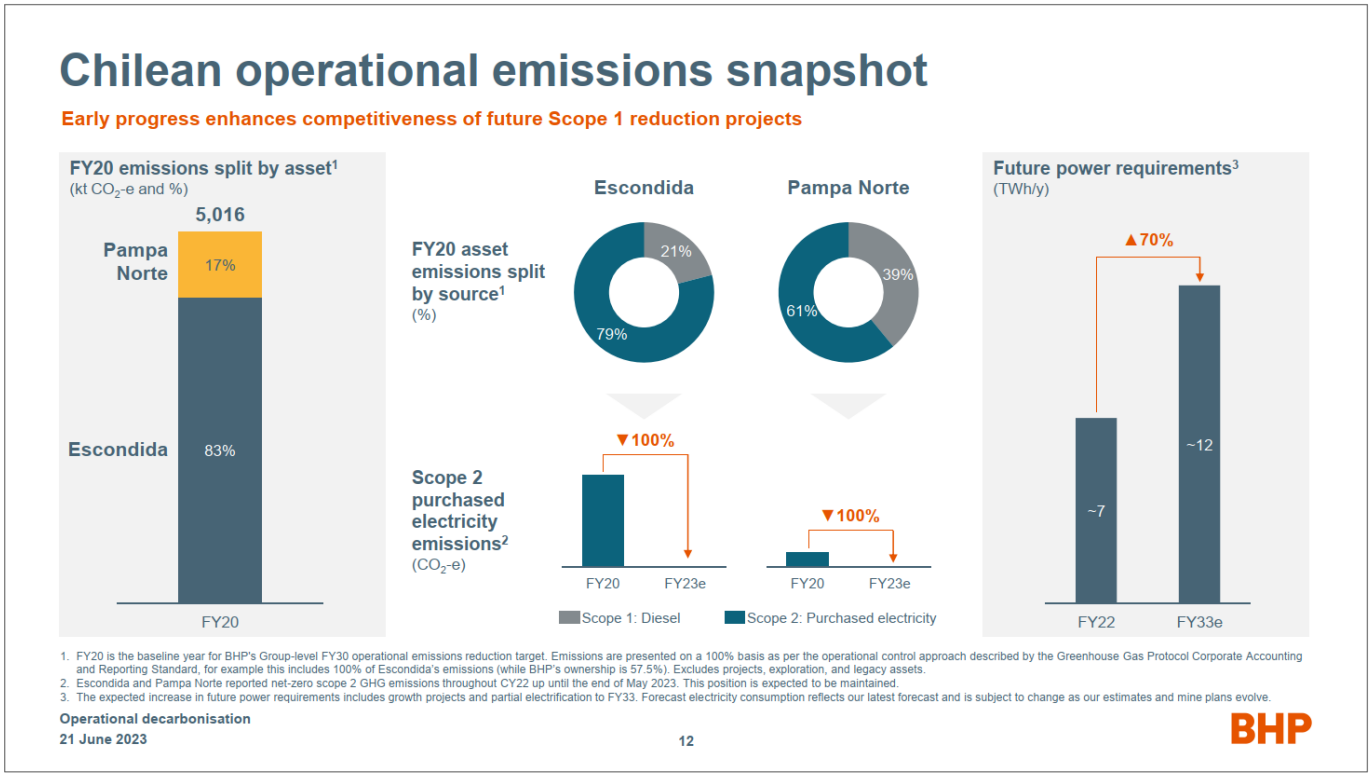
Even after the costs of cancelling the coal-fired PPAs early, this move was NPV positive. And with Escondida and Spence representing about nine per cent of Chilean power demand – so a massive amount of electricity – this change to renewables has been a significant step forward.

This move also helped cover the power requirements, and stabilise power costs, associated with the shift to 100 per cent desalinated water at Escondida in 2019. And then the desalination plant for the Spence Growth Option that came online in 2020.

I would highlight that desalinated water at Escondida requires around 10 times more power than water drawn from the aquifer as we have to pump it from sea to site. This accounts for around 25 per cent of Escondida's total power requirements.

As we look forward, while renewable penetration is expected to continue to increase gradually, back-up generation is not being developed at the pace required, which is creating transmission bottlenecks and intermittency issues, and increasing system costs associated with reliability. Even with these challenges, we aim to maintain fully renewable energy supply at competitive costs for an expected increase in our required power demand at site.

I'll go into how we expect to do this shortly.



As you know, our Chilean operations are focused on copper production – an energy intensive process.

Therefore, in FY20, prior to the commencement of our renewable PPAs, most of our operational GHG emissions came from electricity consumption. They then accounted for around 80 per cent and 60 per cent of total emissions in Escondida and in Pampa Norte, respectively – as you can see in the pie charts.

I am pleased to be able to share that Escondida and Spence have transitioned to 100 per cent renewable energy - three years ahead of schedule – reporting for the first time, net zero Scope 2 emissions throughout calendar year 2022 up until the end of May this year.

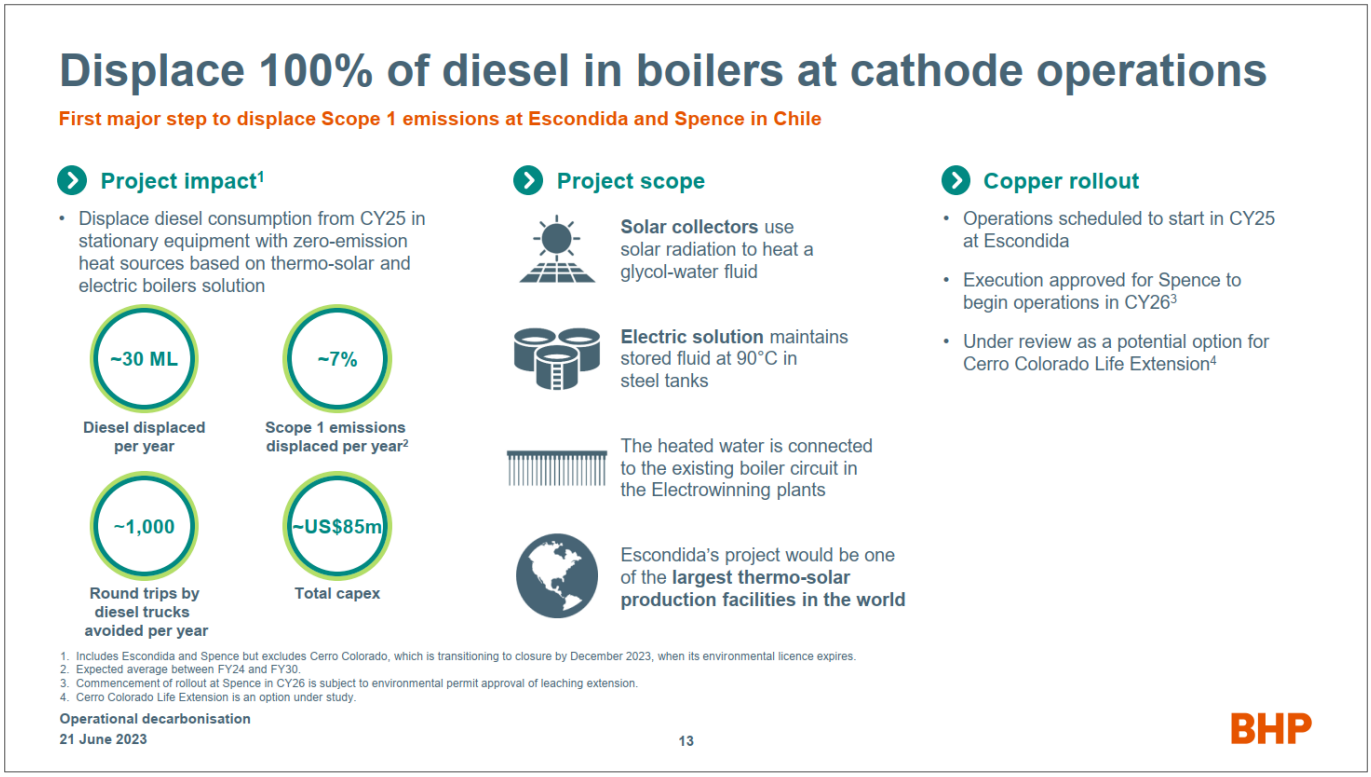
The focus for us now will be maintaining 100 per cent renewable energy with expected increased power demand. While much smaller in terms of overall operational emissions from our Chilean assets, our next challenge is to displace Scope 1 emissions from diesel consumption at our operations.

This will require further electrification.

Along with projects needed to enable growth, we expect an increase of up to 70 per cent in our power demand in Chile (as shown on the right of the slide) as we get to the first stage of trolley assist (which I'll talk about later). Of course, we are aiming to meet this using fully renewable power.

Initiatives are already in place to work towards electrifying all our operations, which would reduce these emissions in the near term.

I will now give you a couple of great examples of what we are doing on the ground.



Of the Scope 1 emissions from diesel consumption at Escondida and Spence – 80 per cent is from haul trucks, 13 per cent from ancillary equipment, and 7 per cent from water boilers used in the electrowinning process in the cathode area.

The first project I would like to highlight is our intention to displace 100 per cent of our diesel consumption in the water boilers.

For reference, the boilers are used to increase the temperature of the mineral-rich solution where the electrowinning process takes place to produce cathodes…and cathode production in FY22 for Escondida and Spence represented ~29% of total copper production.

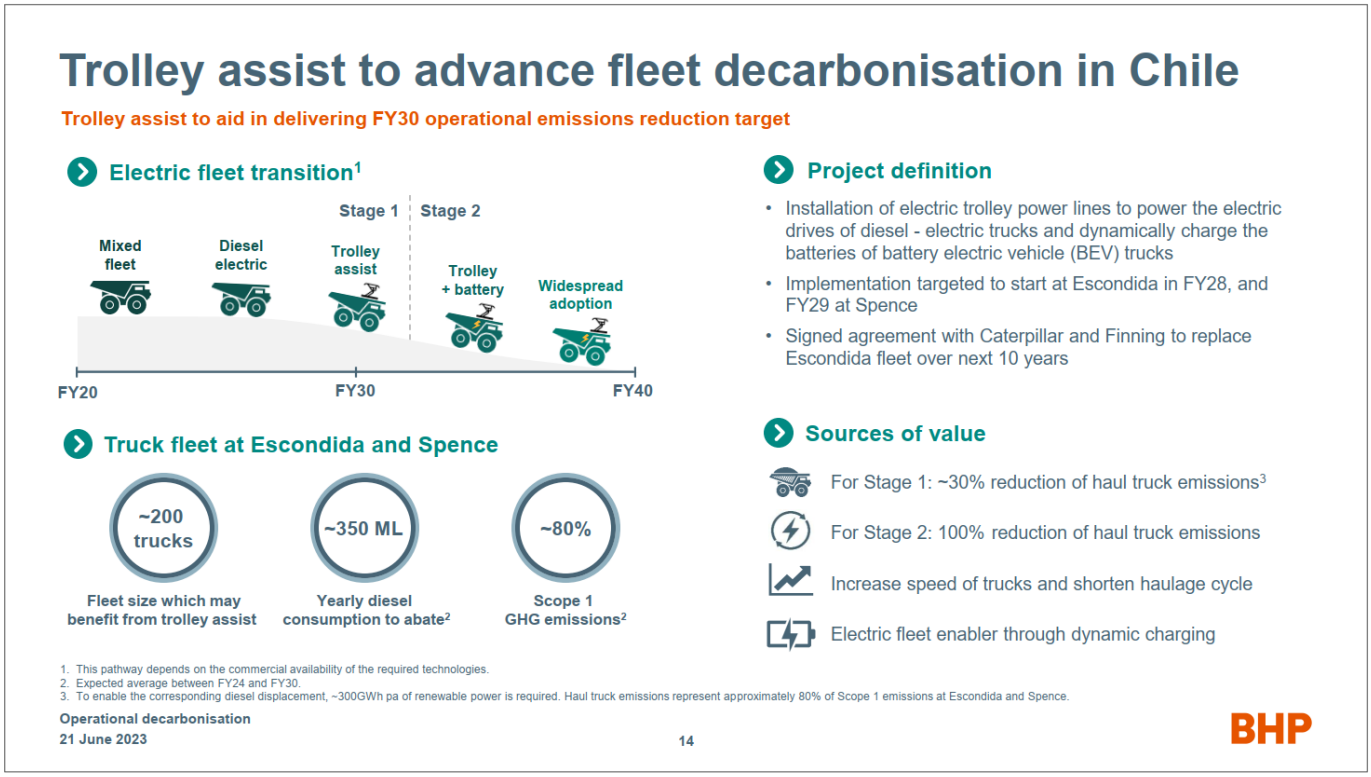
We expect to replace these diesel-fired boilers with zero emissions heat sources through combining a thermo-solar and electric boiler solution. This would:

- leverage the efficiency associated with Escondida's location in a region with one of the highest levels of UV radiation globally;
- save about 30 million litres of diesel per year, and reduce our Scope 1 emissions for our Chilean assets by about seven per cent; and
- it would avoid about 1,000 round trips for diesel truck to and from our mine site – improving both our diesel supply chain dependency, and safety on-site.

Escondida's project would be one of the largest thermo-solar energy production facilities in the world.

The project involves investment of US$85 million for Escondida and Spence, and is expected to deliver results in Escondida by 2025, becoming the first major step in safely reducing Scope 1 emissions in our Chilean operations.

So that's the first major initiative.



Secondly, we're studying trolley assisted haul trucks to 'drive' those Scope 1 emissions further down.

The figure on the bottom left shows the electric fleet transition we hope to achieve.

For those unfamiliar, our diesel-mechanical haul trucks are progressively being replaced by diesel-electric trucks over coming years, which means they use diesel engines to drive electric wheel motors, so called "diesel-electric" trucks. We will approach trolley assist in two stages.

First, we will implement trolley assist with diesel-electric trucks.

And second, next decade, we will expand the trolley infrastructure to assist a transition from diesel-electric to the next generation of battery electric haul trucks.

Trolley assist works like an electric tram or train network – electric infrastructure that haulage trucks can connect to, while moving, to receive electricity to power their electric drives and therefore displacing diesel use.

We will soon begin testing diesel-electric trolley assist at Escondida, followed by Spence, with implementation of the first stage expected to start in FY28 and FY29, respectively. This timing is mostly driven by permitting, component lead times and retrofitting.

Once diesel-electric trolley assist is fully deployed, we expect to reduce Scope 1 haul truck emissions by around 30 per cent. Before we implement trolley assist, we will roll out autonomous haulage at both mines. This made the most sense as it means we can optimise routes, battery charging cycles and avoid the costs of refitting ramps.

We have thought deeply about the approach here in terms of timing and scale to maximise value and our plans are based on how to maximise NPV – i.e. we will only install trolley in ramps where it makes sense to do so for value.

At the second stage, the trolley will not only power the electric drive, but it will also charge the batteries while the trucks are operating, so reducing the need to stop for static charging.

Once the autonomous, trolley and battery electric trucks are proven, we're planning a widespread adoption across our assets, which would enable an efficient, low-risk, zero emissions material handling solution by 2040.

And as I mentioned earlier, haul truck emissions account for about 80 per cent of our Scope 1 emissions across Escondida and Spence – so this would have a huge impact.

So that was some detail on a couple of our priorities. But let's have a look at how all of our infrastructure initiatives could come together to maximise sustainability at Escondida and Spence.

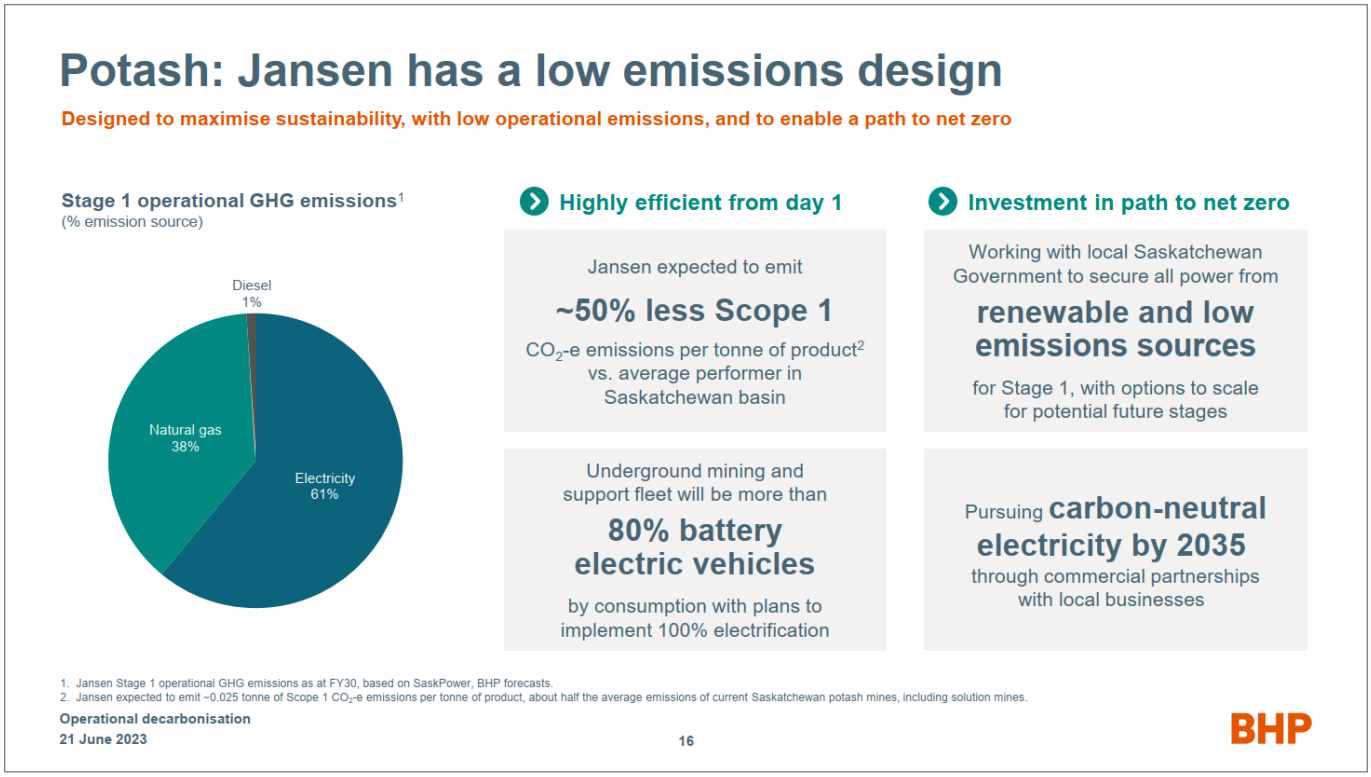
Our vision for the electric mine of the future is one that uses entirely renewable power to create a fully electrified operation, including fleet, and no use of continental water.

To maintain 100 per cent renewables for all the new power needed for this electric mine of the future we are looking to combine two approaches:

- additional renewable PPAs and
- power generation at site – so 'Behind the Meter' – with a focus on solar generation and storage.

We will also maintain optionality through the study of less mature technologies that may possibly accelerate this transition or leverage value creation if they can be fully scaled up. For example, technologies like synthetic fuels, or long duration storage solutions.

Now, before I hand over to Anna to go through our plans for the other side of the Pacific, I'll touch briefly on what we're doing further north.



Development of our Jansen project in Canada is very exciting.

As a new operation, we have been able to design it to be one of the world's most sustainable potash mines from the start.

We expect Jansen to have carbon emissions about 50 per cent lower per tonne of product produced, compared to similar operations in the region. As you can see in the pie chart, approximately 60 per cent of Jansen's Stage 1 operational emissions will come from electricity.

Our electricity is sourced from SaskPower, the local government electricity utility which holds the sole right to generate and transmit electricity in the province.

Most of SaskPower's generation is from coal and natural gas, but the good news is that they share similar goals to BHP to reduce emissions.

We are working with them on options to lower emissions from electricity, following from our strategy in Chile and success in incentivising investments in low carbon emissions power in the province. Jansen's second highest source of emissions, at almost 40 per cent is associated with use of natural gas in the processing plant.

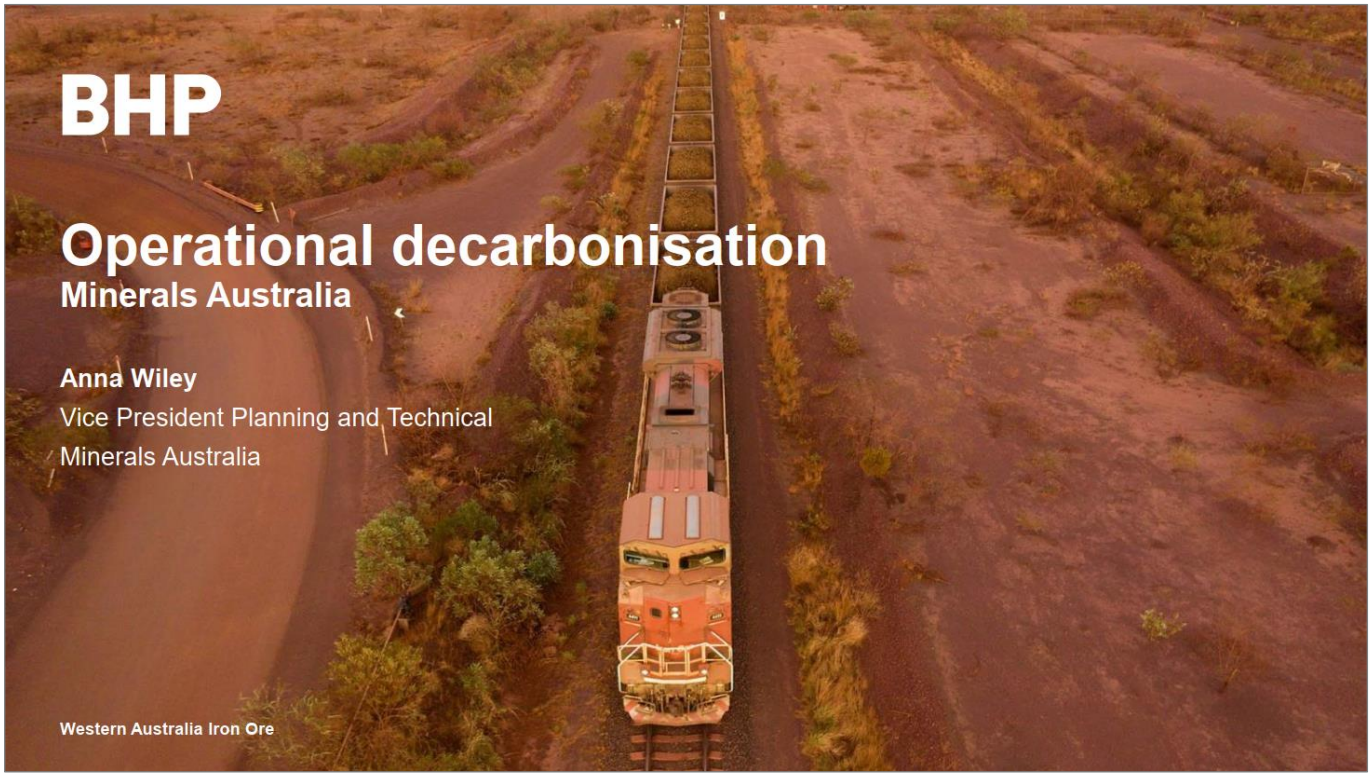
Here, we are exploring a range of potential technologies to mitigate or reduce reliance on natural gas, including carbon capture and storage, hydrogen, and even nuclear technology opportunities

By design, diesel will make up only a very small proportion of Jansen's operational emissions.

More than 80 per cent of the underground fleet will be battery-electric when Stage 1 comes online. And our plan is to have this fully electrified by the next decade.

So, in summary, we believe it is clear, from our plans underway to improve our operations in Chile, and the exceptional opportunity we are leveraging in Canada, that our plans for emissions reduction and maximising sustainability in our Minerals Americas operations are real, achievable, and genuine.

I'll now hand over to Anna Wiley, my counterpart in our Minerals Australia business, to talk further about the work BHP is doing across Australia.



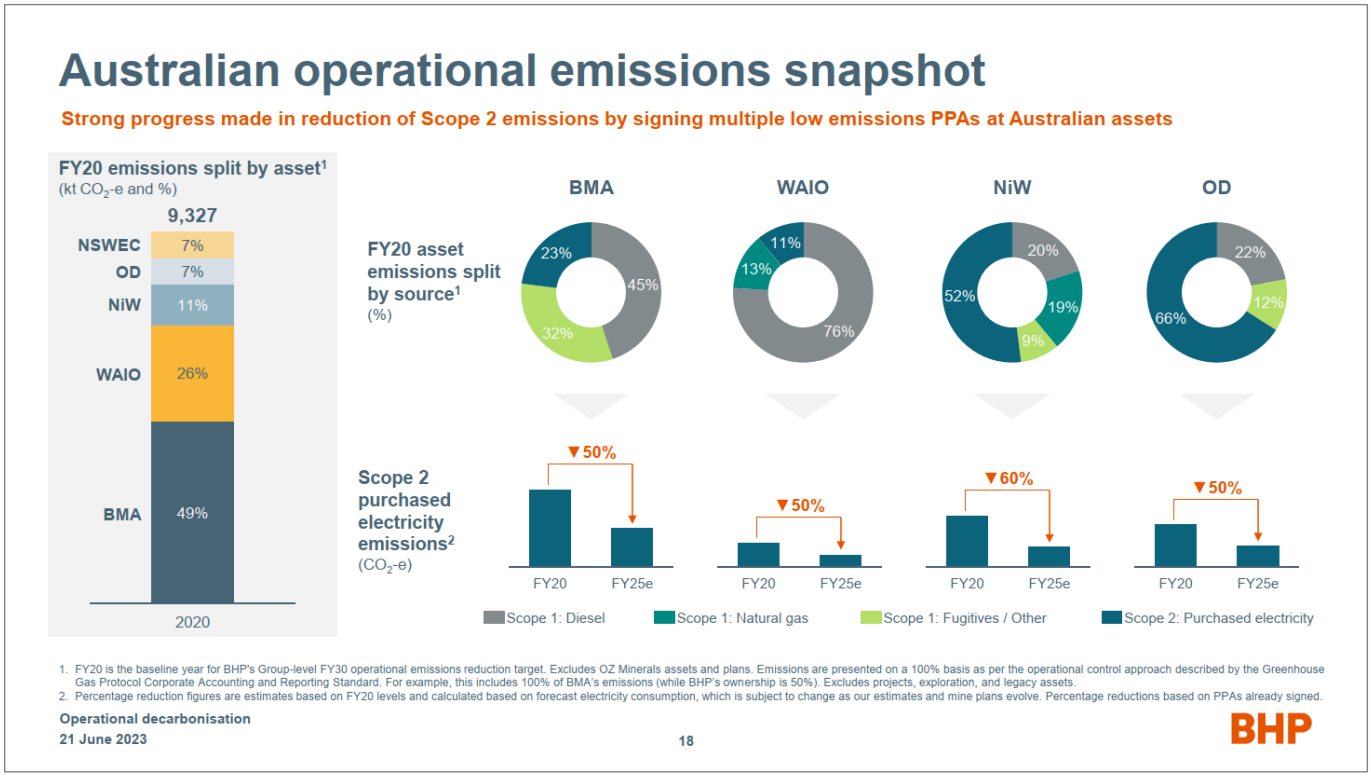
Minerals Australia: Anna Wiley, Vice President Planning & Technical, Minerals Australia

Thanks, Alejandro. And hello everyone.

Today I am going to share some of the decarbonisation work we have underway across our operations in Minerals Australia, and I will cover some of the biggest technical challenges we need to solve including:

- our ambitious plans for diesel elimination;
- how to reduce emissions from natural gas in our Pilbara operations; and
- how we are managing our fugitive emissions at BMA.

But before I talk about these specifics, let's take a moment to touch on where our emissions come from and the work we have done so far.



On this slide you can see a breakdown of our emissions in Minerals Australia, which are all reported on a 100 per cent basis.

The chart on the left shows the contribution of each asset to the total, and the charts across the top show the source.

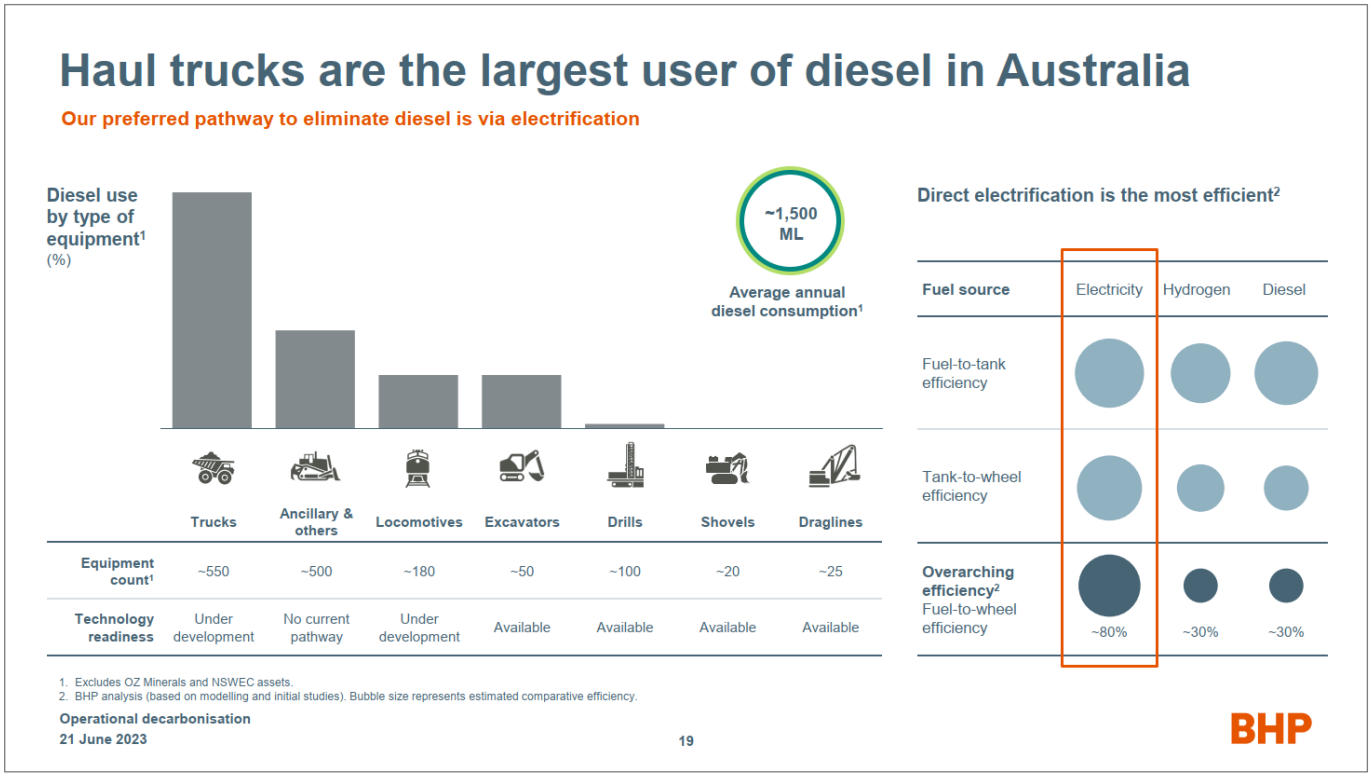
It is not surprising that these pie charts look different when you consider each of the four assets produces a different commodity, uses different mining methods, moves different volumes of material, and requires different amounts of energy.

So, the way we decarbonise will be different at each, and different from our path in Minerals America that Alejandro has shared.

I will start with purchased electricity, which as you can see, is something common to all our assets.

Like in Minerals Americas, we have made good progress in this area through leveraging PPAs to do so in a capital efficient manner. As the charts along the bottom show, these agreements have us on our way to reducing emissions by at least 50 per cent by 2025, and our aim is to eliminate them entirely by 2030.

Not only have these PPAs reduced our emissions, but they have supported over 1.2GW of new wind and solar generation and battery storage assets around Australia. As Alejandro mentioned, we also expect to see power demand increase – in our case, by three to four times – as we move onto eliminating emissions from diesel.



Each year, our Australian operations use roughly 1,500 mega litres of diesel in over 1,000 pieces of equipment. As the chart here shows, over half of this is used in our truck fleets. Electrification is our preferred pathway to eliminate this diesel. One of the reasons for this is energy efficiency, which is shown on the table on the right for three fuels – electricity, hydrogen and diesel.

Let me take a moment to expand on this.

The first row represents the fuel movement from source to the equipment.

Using hydrogen as an example, we see the greatest losses at this phase due to generation, storage and transportation compared to minimal losses in electricity generation and transmission.

Once on board, the fuel needs to be transferred to energy. In both todays' diesel-electric technology, and in a hydrogen system, the fuel is used to generate electricity to drive the electric wheel motors which has additional losses compared to direct feed

Putting this together, in the bottom row we can see around an eighty per cent overall efficiency from an 'electrified' pathway, compared with less than half of this for hydrogen.

There would be some downside offsets to this comparable efficiency advantage from electrification, such as how we resolve long-term storage and constraints to mining operations due to power infrastructure.

However, our view is that an electrified mining fleet is more economic and more achievable than the alternative fuel sources.

We are helped on this journey when we consider that some of our core mining equipment is already available in an electrical configuration.

For example, both BMA and Alejandro's asset, Escondida, operate electric shovels, and Escondida also has electric drills and has done so for many years.

But it's not just about buying new equipment. Replacing diesel requires us to develop a whole new operational ecosystem to surround the fleet and every part of the mine will be touched by this change.

Partnering widely and building our knowledge base

Operational trials and collaboration with our vendors and industry to accelerate development are critical to success

Partners	Operating prototype	BHP operating trial	BHP target deployment[1]
Caterpillar	2022[2]	2024	From 2028[3]
Komatsu	2021	~2025	
Progress Rail	2022	2024	From 2029
Wabtec	2021	2024	
Liebherr	-	2024	~2027

Note: Years shown are calendar years. All dates are approximate and subject to change.
1. Upon completion of successful trials.
2. At Caterpillar's Tucson, Arizona Proving Ground.
3. Smaller pilot fleets may be deployed earlier, subject to technology readiness.
4. Modelling is indicative, based on current assumptions and subject to change.

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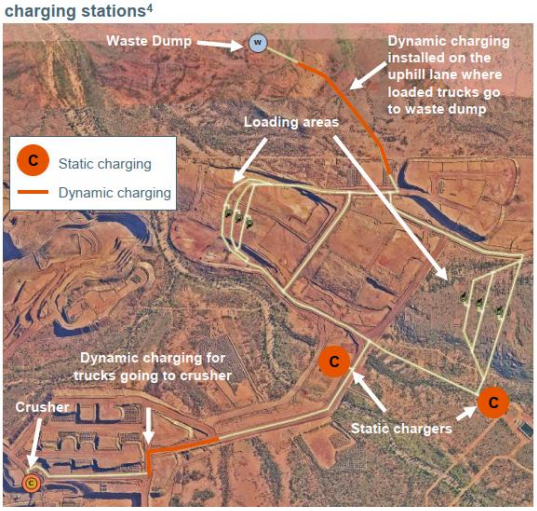
Concept of Operations modelling showing potential locations of charging stations[4]



BHP

There are still a lot of unknowns in our future concept of operations that we need to consider:

- the way we plan our mines;
- how we charge our equipment;
- how we manage power demand;
- the skills we will need; and
- most importantly, the additional safety considerations these changes will bring.

To build our knowledge and firm up our plans, our approach is to collaborate with equipment manufacturers and others across industry to accelerate development.

And then, when available, trial equipment at our sites, to validate our assumptions and learn how the equipment will operate in practice. As can be seen in the table, this approach is reflected in the comprehensive program of trials we are planning.

The development of equipment will move through multiple phases as it matures.

Recently I visited the Tucson proving grounds and witnessed both Caterpillar and Komatsu prototype trucks in operation in battery mode. We expect to have our first Caterpillar truck for trial at BHP in 2024 and will move to trial Komatsu soon after.

In rail, we have seen prototypes operating, and will be receiving four locomotives, two each from Wabtec and Progress Rail also for trial in 2024.

After completion of successful trials, we anticipate our first battery-electric truck sites and loco consists will be in operation from the late 2020s.

We are applying this same approach across other equipment where development is more advanced but there is learning to be done in the application.

Later this year, our Western Australia Iron Ore operations will receive a Liebherr 9400 electric excavator, one of the first in Australia, and we have trials underway underground at Olympic Dam where we are testing a fully electric jumbo drill with Epiroc.

Partnering widely and building our knowledge base (continued)

Excitingly our new partners at OZ Minerals also bring their own trials including one underway for battery-electric road trains.

As part of this ecosystem, we also need to consider how our trucks will charge.

The exact design will depend on the mine itself, but we anticipate having both static and dynamic charging systems in place.

For static charging, we are working through the Charging Interface Initiative Mining Taskforce, with over 60 other mining companies and vendors, to develop a standard so equipment will charge with the same connectors.

For dynamic charging, as Alejandro called out earlier, conventional trolley assist is available today and we are encouraged by the innovation we see to lower cost and improve mobility.

However, implementation is difficult, because as the areas we mine change the infrastructure will need to be moved

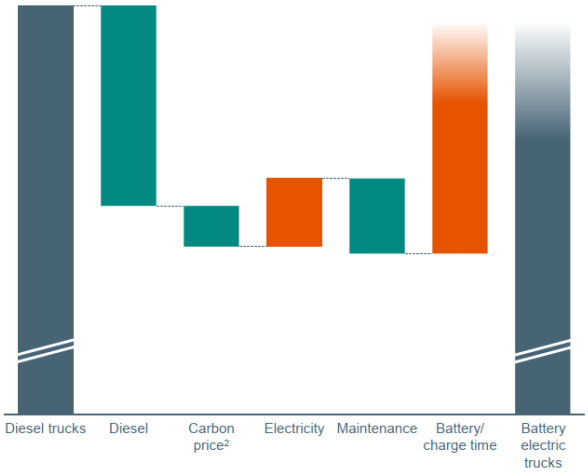
So we are looking towards innovation. We are supporting one of the Charge on Innovation Challenge participants – BluVein – who are developing side mount dynamic charging systems to improve both mobility and cost effectiveness.

To better understand how these systems will interact, we have completed extensive modelling of our operations – the example on the right is for one of our iron ore pits with dynamic charging in two locations and several static charging points. This modelling has been completed in hundreds of configurations across our coal and iron ore mines over multiple decades of mine plans - the insights are helping us better understand the economics, trade-offs and limitations of the technologies as we design our future operations.

Battery truck opex expected to be comparable to diesel

Understanding of battery electric truck operating costs are developing and we will learn more through operational trials

Opex changes between diesel and electric truck fleet[1]



1. Representative of an open cut mine site.
2. Representative carbon price of ~US$50/t.

Fuel source

- Removes the need to purchase diesel and any associated carbon price
- Electric trucks are expected to have ~2x engine efficiency versus diesel trucks

Maintenance

- Reduced spend on maintenance as battery trucks have fewer moving parts

Unknowns

- Battery electric trucks may require charging more frequently, which could require more truck hours to produce same volumes
- Battery life will potentially be shorter than truck life, in which case batteries will need to be replaced
- Operational trials will help us learn more about battery management and battery truck operation

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BHP

Staying on economics, we are asked often whether we believe we will see operating cost savings with battery electric trucks.

Our initial modelling suggests they will cost the same or less to operate compared to a diesel.

We have illustrated some of the variances in the chart. Let me speak to a couple of points

Starting with fuel. As we transition from diesel to electricity we will spend less on carbon exposure.

We will need to spend more on electricity but we expect the cost would be less overall, given the efficiency of the battery-electric trucks, and expected energy price differential.

We also expect to see overall savings in truck maintenance as without a diesel engine or mechanical drivetrain, there are significantly fewer moving parts, making the trucks simpler to maintain.

Finally, and by far the most uncertain area, are some of the costs associated with operating these new technologies.

For example, we don't expect that the battery will last as long as the truck itself, so it may need to be replaced over the truck's lifetime.

The method of charging will also have an impact as will the number of times we need to re-locate our charging system and trolley lines.

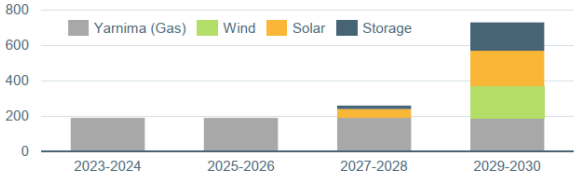
As technology evolves, and we learn from our trials, we will continue to refine our modelling–optimising our concept of operations, per site for battery size and specification, the number and size of trucks, and the location and configurations of static and dynamic charging systems.

Before I move on from diesel, I wanted to summarise that we are stepping up to the challenge and seeking to learn as much as we can, as fast as we can. We're focused on providing the best technical and emissions reduction solutions while making sure we achieve competitive economic outcomes.

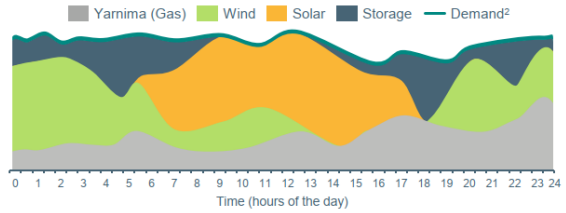
Powering our mines in the Pilbara

We are working on technical solutions to meet the growing demand for power due to fleet electrification

Indicative future Pilbara installed generation[1]
(MW)



Indicative power sources over a typical day in 2030[2]
(MW)



1. Subject to renewable resource assessments and approvals.
2. Based on forecast electricity consumption, which is subject to change.
3. North West Interconnected System.

- Our inland Pilbara operations are not connected to an electricity grid
- Power is currently supplied by our highly efficient 190MW Yarnima gas fired power station, which emits over 35% less CO_2/MWh than the Australian average
- Planning for up to 500MW additional renewable generation and storage capacity installed by the end of the decade
- Yarnima will be required to provide power during periods of lower renewable generation
- Exploring options for interconnection to the NWIS[3] electricity grid in the future

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BHP

One of the things we do know for certain about the transformation is that we are going to need a lot more power. I spoke earlier about how we manage this when we purchase power, but how do we manage this when our mines are remote, and we are not connected to a grid?

Our iron ore operations in the Pilbara are an islanded network and as such power cannot be purchased through the market.

As you can see on the chart at the top, electricity is currently supplied by our highly efficient Yarnima gas fired power station which produces power at 35 per cent lower emissions per megawatt hour than the Australian average.

Over the decade we will increase the volume of renewables and anticipate having up to 200 megawatts each of wind and solar and 150 megawatts of battery energy storage installed capacity by 2030. We have already completed solar resource assessments to understand its potential and are undertaking wind assessments and surveys right now.

In terms of whether we will buy it or build it, we are open to all options, and we are engaging with the market to determine the best solution for BHP.

As the volume of renewables increases, the way we will use Yarnima will evolve. The second chart shows an example 24 hours for a typical day in the future. Here we can see solar in the daytime, more wind generation at night, energy provided from batteries and Yarnima providing a firm baseload of power and filling the gaps when required. Longer term, as more options for carbon neutral firm power become available, we expect Yarnima's use will taper off.

We want to ensure the ongoing supply of reliable and affordable energy to our mining operations and our local communities. To support this, we will continue to collaborate with partners and review options including interconnection to the electricity grid into the future.

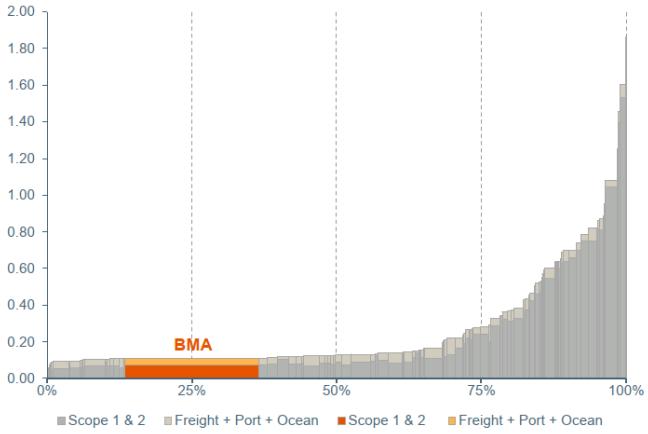
Addressing methane emissions

BMA's higher quality metallurgical coal helps steel mills reduce their own emissions intensity

- Methane accounted for 32% of BMA's and 15% of Minerals Australia's reported operational emissions for FY20[1]
- BMA is one of the lowest carbon intensity emitters among our global coal competition
- With currently available technology, we anticipate that up to 50% of BMA's total forecast methane emissions could be extracted and actively managed
- We are accelerating work to understand the characteristics of this gas and determine its optimal use, including:
  - using it for safe, reliable and relatively low emission power generation
  - selling it for use in other industrial processes
- We are exploring new and innovative technology options to allow us to extract and manage the remaining forecast methane emissions

2021 carbon intensity – metallurgical coal

(Tonnes CO_2-e per tonne of saleable metallurgical coal)



Source: Skarn Associates; 2022 BHP Annual Report.

1. FY20 is the baseline year for BHP's Group-level FY30 operational emissions reduction target. Excludes OZ Minerals assets and plans. Emissions are calculated on a 100% basis as per the operational control approach described by the Greenhouse Gas Protocol Corporate Accounting and Reporting Standard. For example, this includes 100% of BMA's emissions (while BHP's ownership is 50%).

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BHP

To close out on the third challenge I wanted to speak to coal.

We saw in the charts earlier that methane accounts for around one third of all BMA's operational emissions. Methane is released as part of the coal mining process and has a higher global warming potential than carbon dioxide.

BMA is one of the lowest carbon intensity emitters among our competition, that's how much carbon we emit per unit of production. We are around the lower quartile as you can see in the chart here. This is in part due to our active management of methane at our underground mine, Broadmeadow, where today methane is captured and flared to reduce its overall emissions impact.

In open cut mines, it's not quite as straightforward. Methane is currently released as the coal seams are broken up so in the future we will need to pre-drain and extract this before we mine. This can be done, although it is not common practice across the industry.

With current technologies we estimate around 50% of BMA's methane can be pre-drained and used.

Over time, we hope to increase this percentage and are looking to innovation and new technologies to advance this.

Once extracted, methane can be used for relatively low emission power generation or be sold for other industrial processes, both options that we are investigating today. Any residual methane that we cannot extract will need to be offset to reach our goals

In wrapping up, I hope you can see, that while the challenges are formidable, we don't think they are insurmountable. We are working at pace, investing in creating solutions, and collaborating with others to set ourselves up for a lower emissions future.

I will now hand over to Patrick Collins, Head of Decision Evaluation, who will take you through how we think about our decarbonisation program overall in terms of capital allocation.

Decision Evaluation: Patrick Collins, Head of Decision Evaluation, Transformation Portfolio & Performance

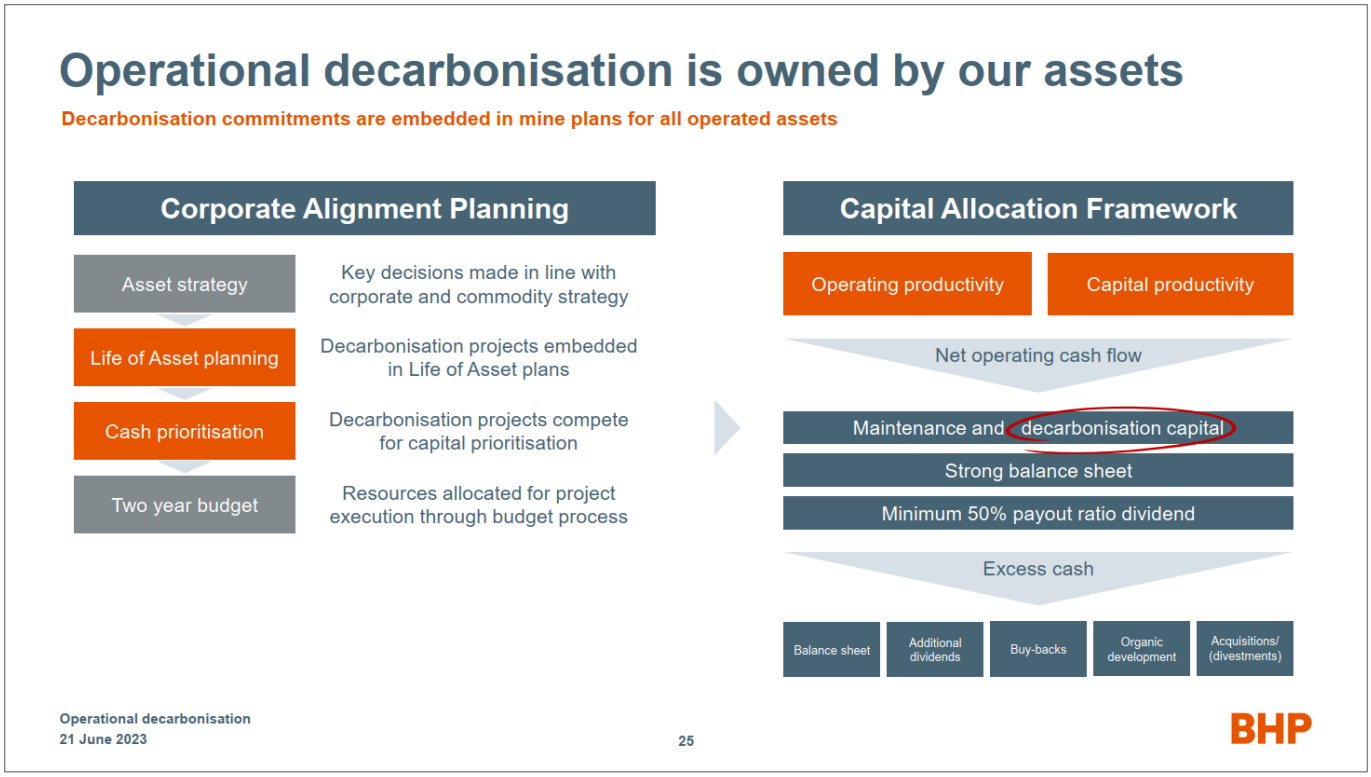
Thanks Anna, and thanks everyone.

We've heard a lot so far about the work going into finding the best solutions for operational emissions reduction.

Part of my role is to make sure that the solutions we choose are also the best fit for us in terms of capital allocation.

After all, this is a balancing act. We need the best solutions that allow us to both;

- supply the metals and minerals the world needs, and
- optimise value and returns for all our stakeholders – including our shareholders.



Decarbonisation projects are incorporated into our annual corporate planning process, which is critical to creating alignment across BHP.

This process, which you can see on the left of slide, guides the development of plans, targets and budgets to help us decide where to deploy our capital and resources.

I cannot stress enough how important it is, that the assets own these commitments. They plan the work and deliver on the execution with support from Alejandro and Anna's teams.

As many of you know, BHP's Capital Allocation Framework (shown on the right of the slide) is our overarching hierarchy for the potential uses of operating cash. And this is used for short, medium and long-term decision making and planning processes.

Capital is prioritised to ensure maximum value and returns.

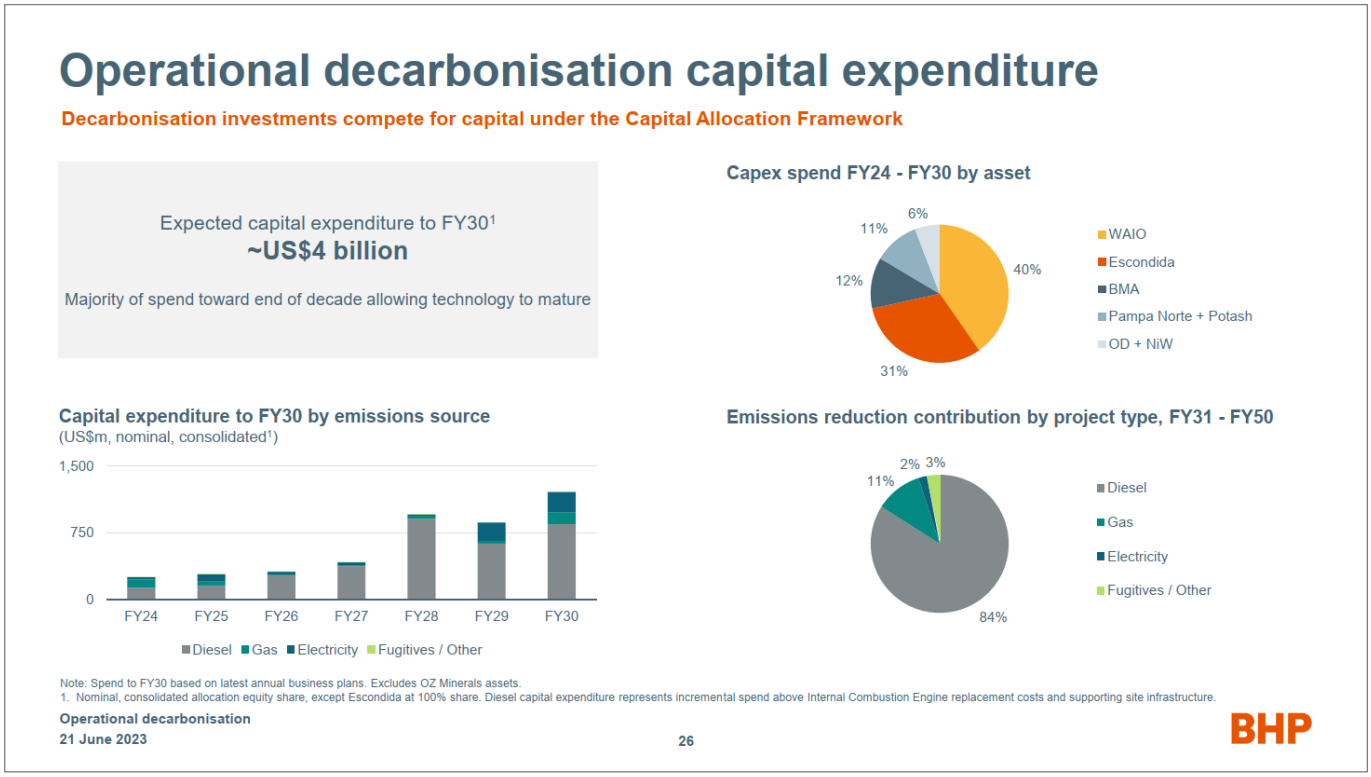
A couple of years ago, we formally added operational decarbonisation projects into our 'maintenance capital' category within this framework. So they are prioritised – along with risk reduction and asset integrity projects.

Like other projects, individual decarbonisation projects must justify and compete for capital based on a number of metrics – such as abatement efficiency, technology readiness and operational impact.

After all, a tonne of carbon is essentially a tonne of carbon. Whichever project demonstrates the best 'risk-return' metrics will win.

Embedding this asset-owned bottom-up approach that feeds into a top-down group strategy process is critical.

It not only creates alignment but strengthens commitment and delivery across the organisation.



Here you can see the outcome of this latest prioritisation process.

The chart on the left shows the profile of spend by emission source, and top right shows the allocation of capital across assets.

We still expect to spend around US$4 billion on decarbonisation capital until FY30.

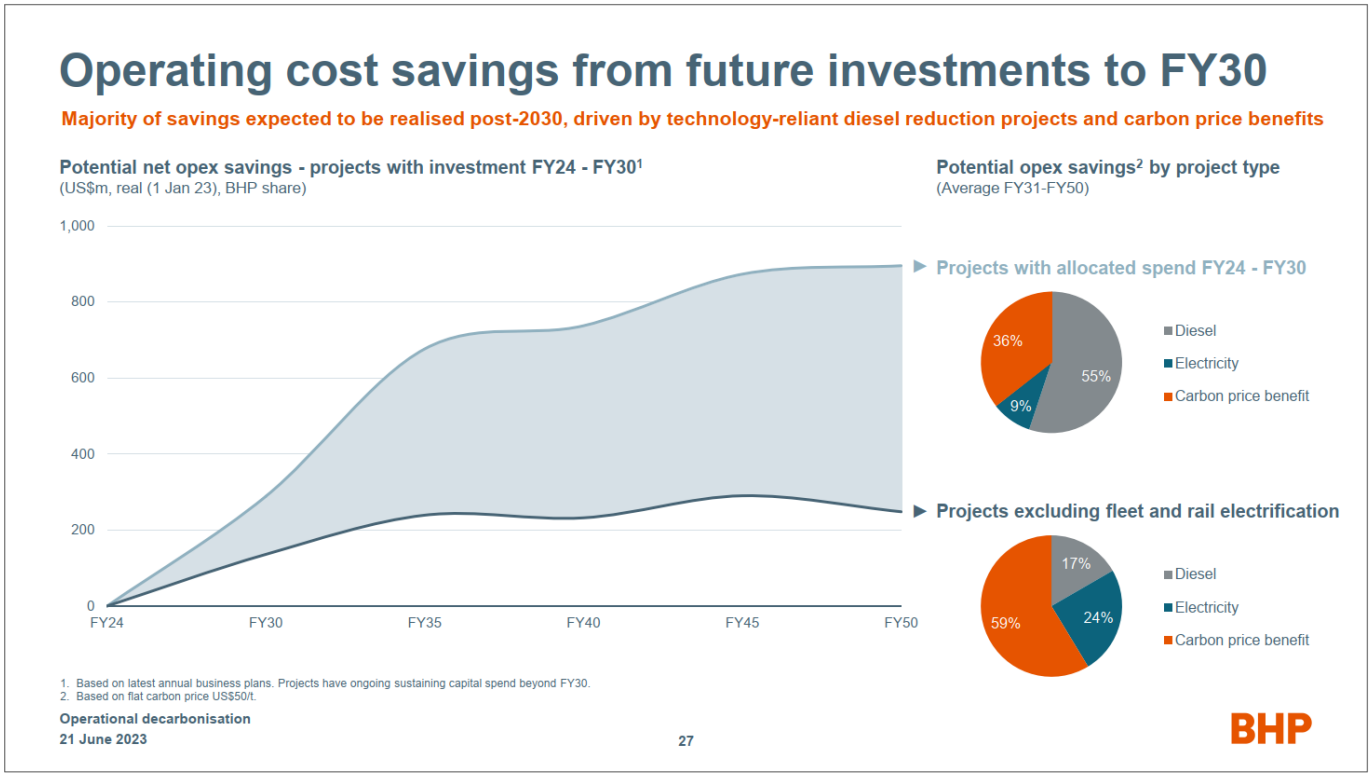
The majority of this spend is allocated to our most diesel intensive assets and will be weighted to the back end of this decade, allowing technology to mature.

Also, just to be clear, the capital we've shown here only includes the incremental cost of decarbonisation. For example, that which is over and above fleet replacement for internal combustion vehicles, but includes the associated infrastructure requirements.

As you heard from the team, most of our emissions reductions in FY30 are expected from electricity, mainly through PPAs. PPAs, however, are captured within our operating cost cash flows, not in this capital profile.

Around 75 per cent of decarbonisation capital over this period will be on diesel-displacement projects. And while this spend delivers some emissions reductions towards the end of this decade (through initial deployments), it is critical to advance tech readiness, equipment trials, and [begin installation of supporting infrastructure] in order to accelerate the emission reductions in the following decades. As you can see on the bottom right slide.

If we don't do this, we can still achieve our 2030 target, but we'll be facing a significant headwind to achieving our 2050 ambition.



So that's the capital expenditure picture. Now onto operating costs.

The top line of this chart shows the potential operating cost savings from the projects with investment from FY24-FY30, so including diesel-displacement projects and renewable electricity. It also includes savings from reduced carbon price costs.

The pie chart on the top right shows the proportion of savings from each of these.

Graham spoke to the range of uncertainty in our decarbonisation pathway due to technology readiness, and you heard from both Anna and Alejandro about the uncertainty around operational cost impacts and benefits at this early stage of fleet electrification development.

This is driving the range of forecast operating cost savings from our prioritised capital spend, and is shown by the bottom line, which excludes any benefits from fleet or rail electrification projects.

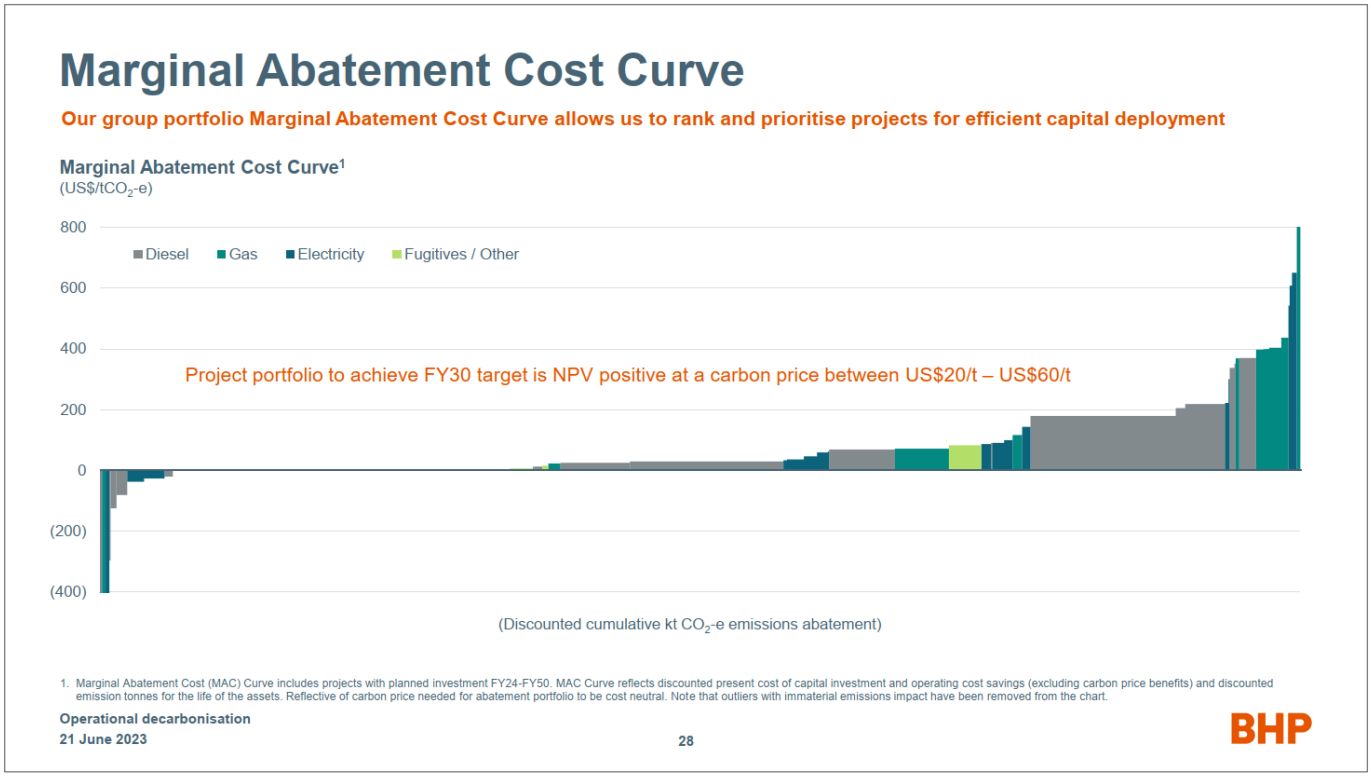
Out to 2030, we expect relatively minor operating cost savings. And this is because much of the emissions reduction is driven by the replacement of existing power contracts with renewable PPAs (as Anna and Alejandro showed earlier).

Notably, this chart excludes ongoing savings from projects already executed – for example, from the move to renewable PPAs in Chile and Australia.

Longer term, we expect cost savings to be driven by displacing diesel and the differential in power costs between renewables and non-renewables.

And, of course, depending on your view on carbon prices, the savings could increase substantially.

However, just to reiterate, developments and advancements in this space are moving rapidly, and as such, these numbers will also move around continually.



Lastly, I'd like to touch on our Marginal Abatement Cost Curve, or MAC Curve, which brings together the cost benefit proposition for projects.

The MAC Curve reflects the present cost of capital investment and operating cost savings (excluding carbon price benefits) against discounted emission tonnes.

It is one of the tools we use to support the allocation of capital towards the most economically efficient and effective decarbonisation projects at the portfolio level.

This curve includes projects additional to those in the US$4 billion spend to 2030. However, it does not include all projects within the range of uncertainty you saw in Graham's pathway chart.

The curve is also reflective of the carbon price needed for abatement portfolio to be cost neutral, or NPV breakeven.

Projects required to achieve our 2030 emission reduction target are predominately on the left side of curve.

And that portfolio of projects is expected to generate positive NPV at a carbon price as low as US$20/t through to US$60/t, based on the technology readiness of the projects in the upper and lower bounds of our decarbonisation pathway Graham spoke about earlier on.

Projects on the right hand side, or the higher end, of the curve largely reflect diesel displacement projects. While they currently require carbon price support to be economic, they also have the greatest cost uncertainty.

While they are not required to achieve our 2030 target, as I mentioned before, it is prudent to progress with studies, trials and initial deployments so we can remain on the trajectory to achieve our 2050 ambition. And we expect that as technology matures, costs will come down over time.

With that, I'll hand back to Tristan for some closing comments, before we turn to Q&A.

Summary: Tristan Lovegrove, Group Investor Relations Officer

Thanks Patrick, and thanks Alejandro, Anna and Graham as well.

We hope we've been able to convey to you the positive reality of BHP's commitment to operational emissions reduction.

Our progress compares well to our competitors; and that we expect our path to be real but also lumpy.

We are committed to our target and goal. We're planning and spending this decade for abatement beyond 2030.

We do face challenges, but those challenges are familiar to many in the sector, and the pace of innovation and technological advancement is encouraging.

Overall, we want to be clear that we expect that our plan will achieve the aims of reducing emissions and remaining productive and financially responsible, while supporting BHP to continue to produce the commodities the world needs to decarbonise and provide a higher standard of living to a growing population.


BHP