



# BHP

## Decarbonisation: Strategy and progress

Investor Presentation

26 June 2024

Enel Green Power's hybrid renewable energy park that provides renewable electricity to our Escondido and Spence assets

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## Decarbonisation: Strategy and progress

26 June 2024



# Decarbonisation overview

Dr Graham Winkelman  
Vice President Climate

Jimblebar in Western Australia will be the site of our first planned battery electric haul truck trial in CY2024

# Decarbonisation in our operations and value chain

BHP is working with global partners and other stakeholders in the value chain

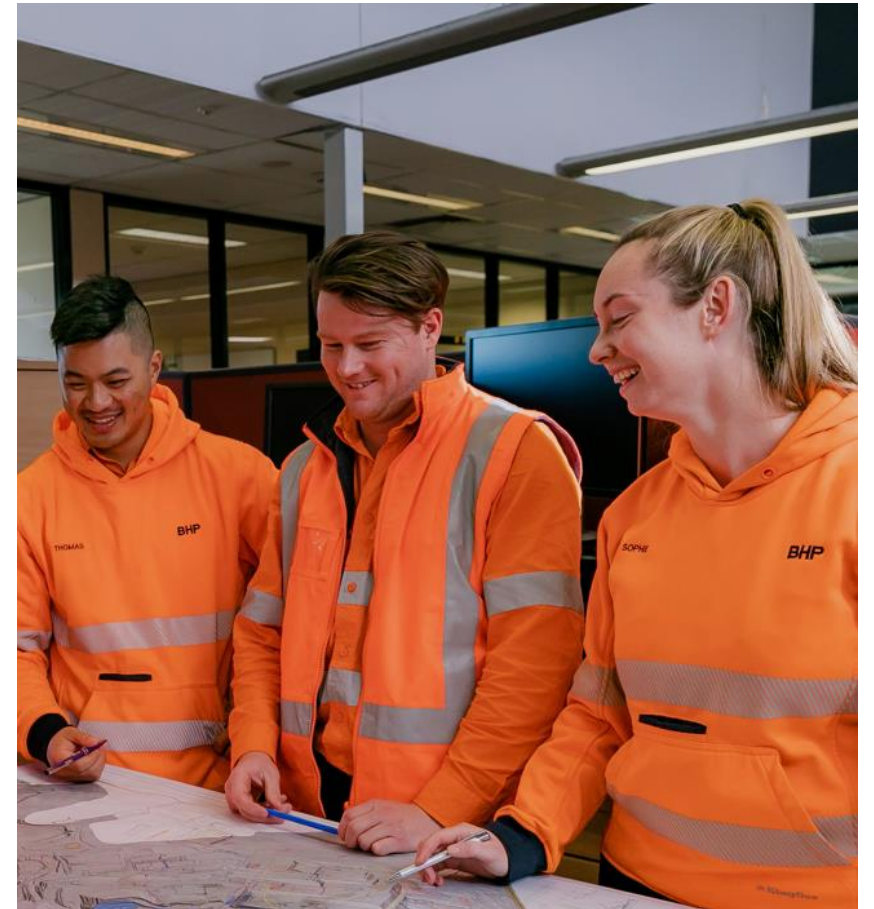
**On track** to reduce our operational GHG emissions (Scopes 1 and 2 from our operated assets) by at least 30% by FY2030 from FY2020 levels

We have a goal to achieve net zero operational GHG emissions by CY2050

- To succeed, we know that **technology must advance** rapidly
- The pathway to **net zero will be non-linear** as we organically grow our business
- We are using our **Capital Allocation Framework to maximise the returns** on our GHG emissions abatement

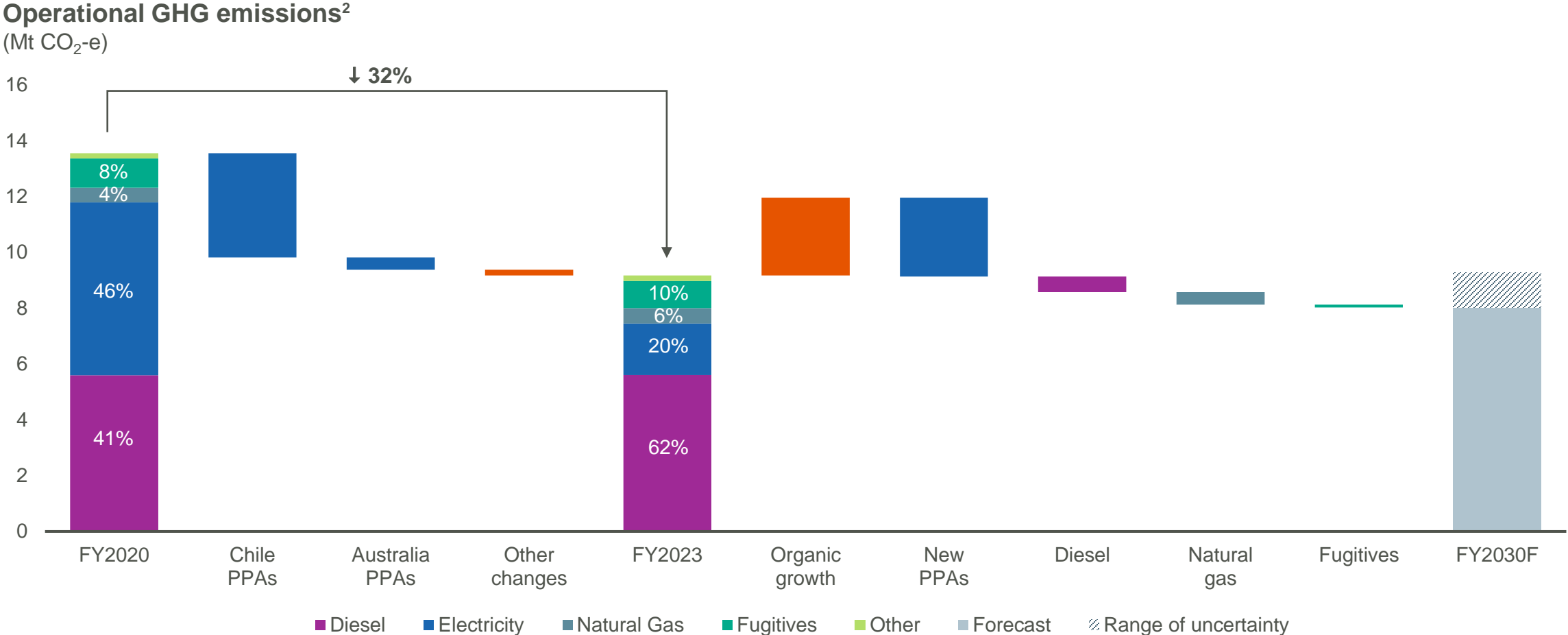
We are pursuing **the long-term goal of net zero Scope 3 emissions by CY2050<sup>1</sup>**

- To support this goal, we have made strong progress on our strategy in the areas of **steelmaking and maritime decarbonisation** via partnerships, trials and pilots



# Progress towards our FY2030 operational GHG emissions target

We are firmly focused on reducing operational GHG emissions and have made good progress to date



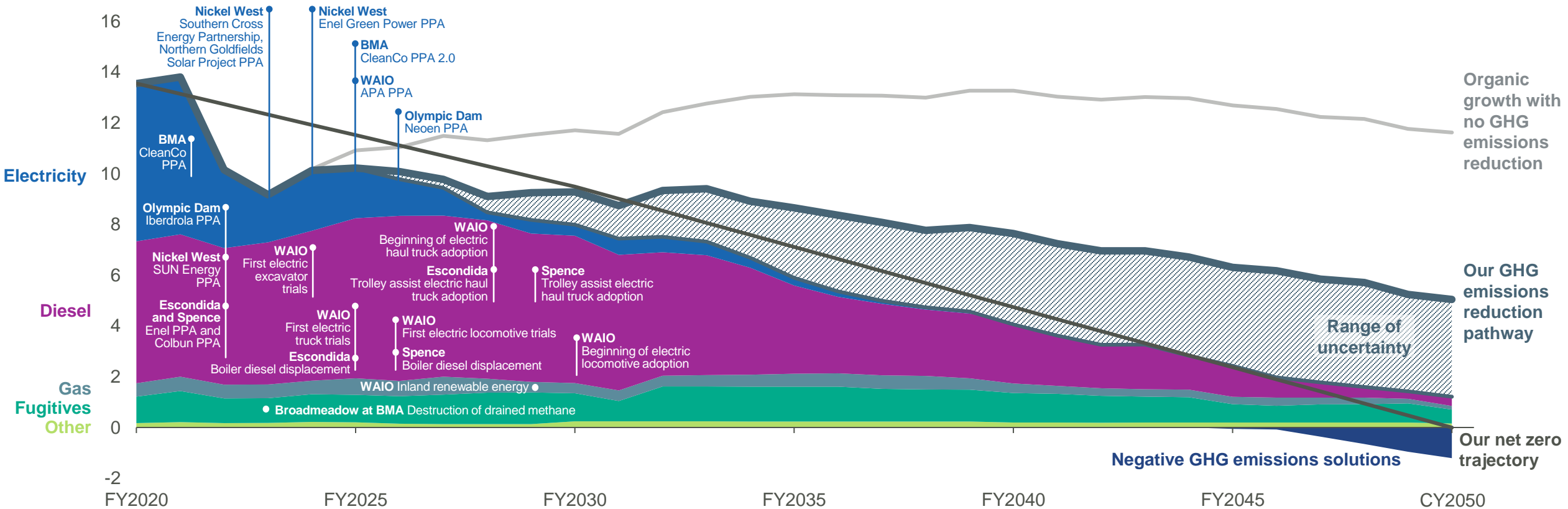
Note: PPAs – Power Purchase Agreements.

# BHP's operational decarbonisation trajectory

The pathway will be non-linear and requires significant effort to overcome organic growth and technology challenges<sup>3</sup>

## Operational GHG emissions

(Mt CO<sub>2</sub>-e)



# Value chain strategy and long-term Scope 3 net zero goal

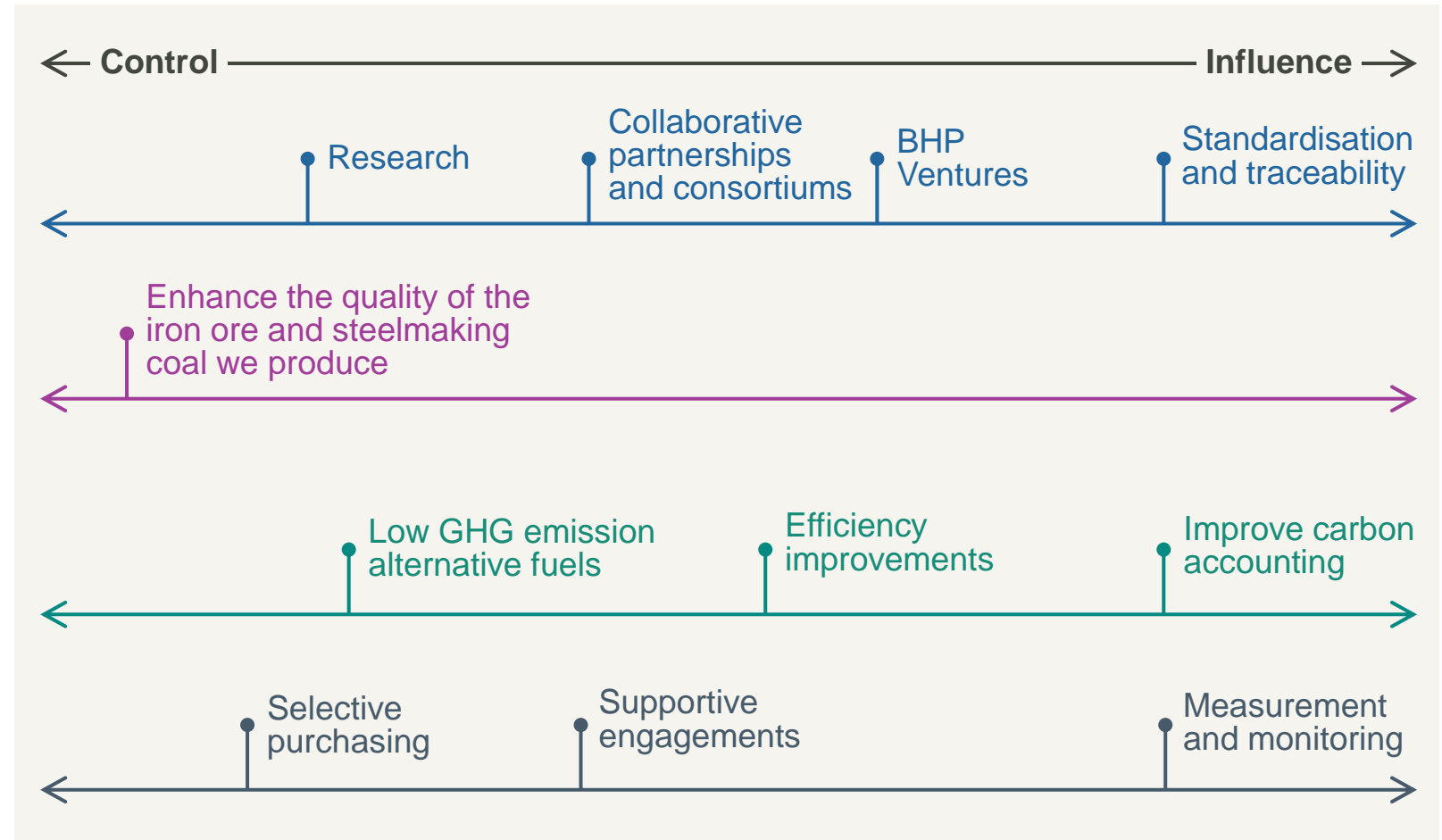
Our focus areas are defined by materiality, ability to impact and alignment to our commodity and asset portfolio

Support the development and adoption of GHG emission reduction technologies in steelmaking

Enhance the quality of the iron ore and steelmaking coal we produce

Support the development and adoption of GHG emission reduction technologies in shipping

Encourage suppliers to pursue net zero GHG emissions



# BHP

## Operational decarbonisation

Dan Heal

Vice President Operational Decarbonisation

Minerals Australia



BHP is collaborating with equipment manufacturers and others across the industry to accelerate development of the technology required

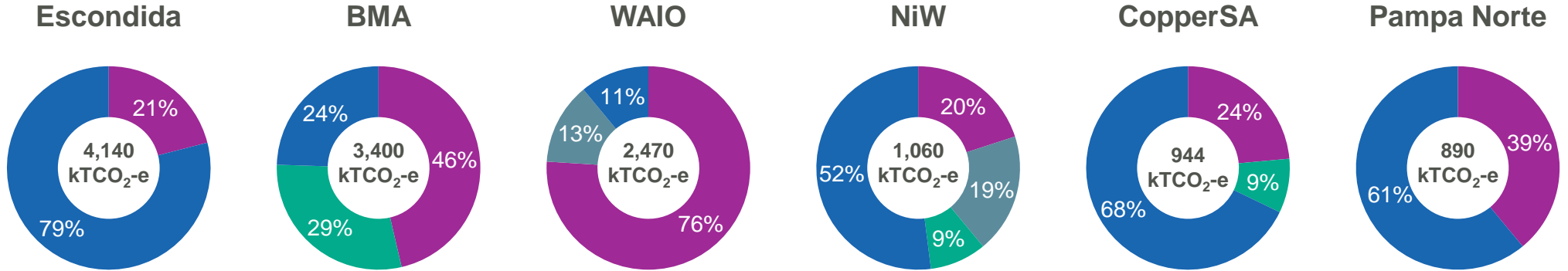


# Global operational GHG emissions snapshot

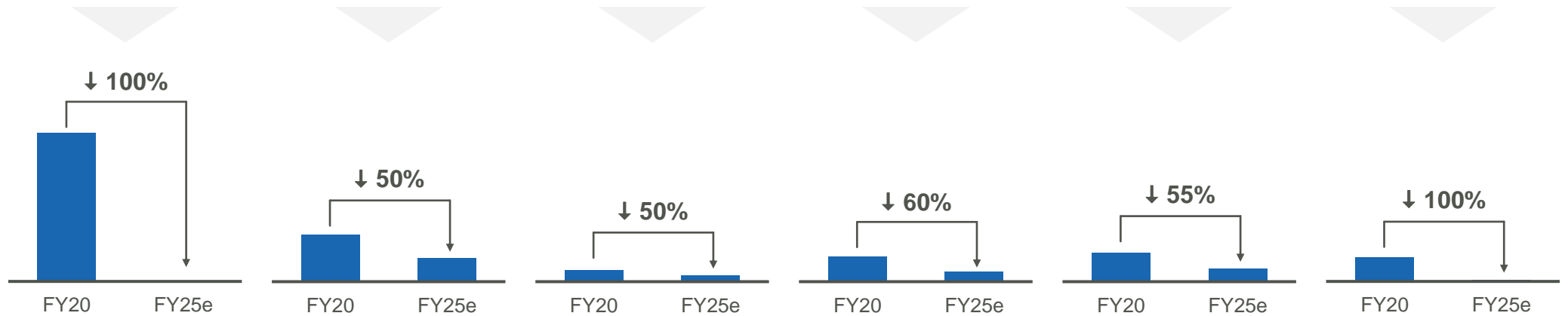
Strong progress made in reduction of Scope 2 emissions by signing multiple low GHG emissions PPAs at many of our operated assets

■ Scope 1: Natural gas    
 ■ Scope 1: Diesel    
 ■ Scope 1: Fugitives / Other    
 ■ Scope 2: Purchased electricity

FY2020 asset emissions split by source<sup>4</sup> (%)



Scope 2 purchased electricity emissions<sup>5</sup> (CO<sub>2</sub>-e)



# Globally, haul trucks are the largest user of diesel at BHP

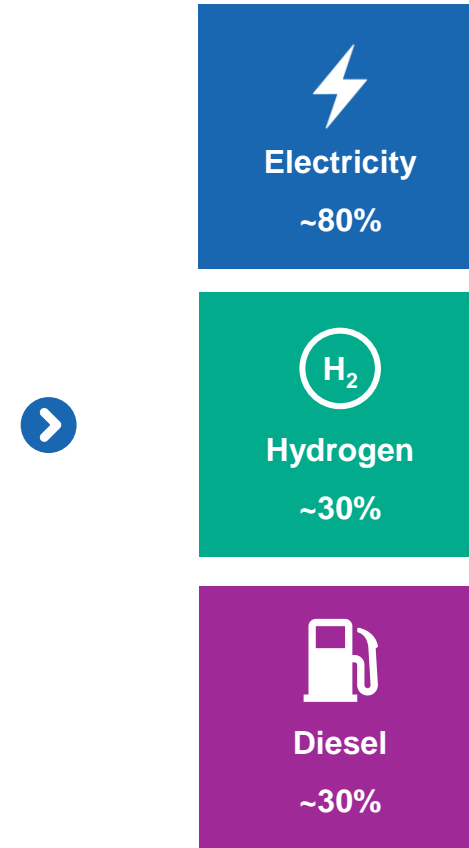
Our preferred pathway to eliminate diesel is via electrification

Diesel use by type of equipment<sup>6</sup>  
(%)



	Trucks	Ancillary & others	Locomotives	Excavators / Loaders	Drills	Electric Rope Shovels	Draglines
<b>Equipment count<sup>6</sup></b>	~800	~670	~180	~110	~150	~30	~20
<b>Technology readiness</b>	Under development	No current pathway	Under development	Available	Available	Available	Available

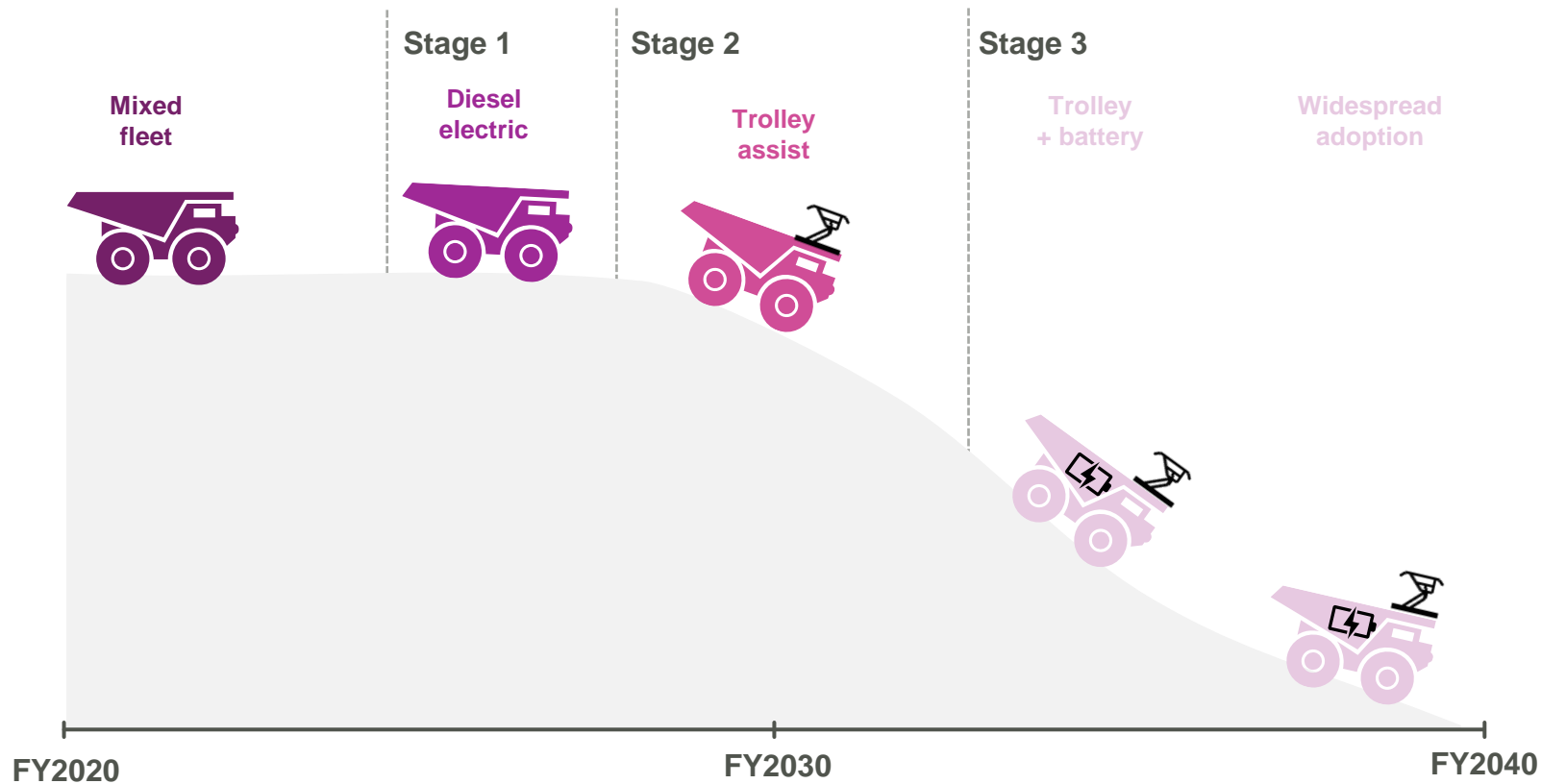
Fuel-to-wheel efficiency of alternative fuel sources<sup>7</sup>



# Diesel displacement in Chilean copper assets

Trolley assist to aid in delivering FY2030 target for operational GHG emissions

## ➤ Electric fleet transition<sup>8</sup>



## ➤ Truck fleet at Escondida and Spence

**~200 trucks**

fleet size which may benefit from trolley assist

**~350 ML**






yearly diesel consumption to abate<sup>9</sup>

**~80%**

Scope 1 emissions<sup>9</sup>

# Diesel displacement in Minerals Australia

Operational trials and collaboration to accelerate development are critical to success

Partners	Operating prototype	BHP operating trial	BHP target deployment <sup>10</sup>
 <b>CATERPILLAR®</b>	2022 <sup>11</sup>	2024	From 2028 <sup>12</sup>
	<b>KOMATSU</b>	2021	
  <b>Progress Rail</b> <small>A Caterpillar Company</small>	2022	2025	From 2029
	 <b>Wabtec</b> <small>CORPORATION</small>	2021	
 <b>LIEBHERR</b>	-	2024	From 2027



9400E electric excavator on site at Yandi mine in February 2024

Note: Years shown are calendar years. All dates are approximate and subject to change.

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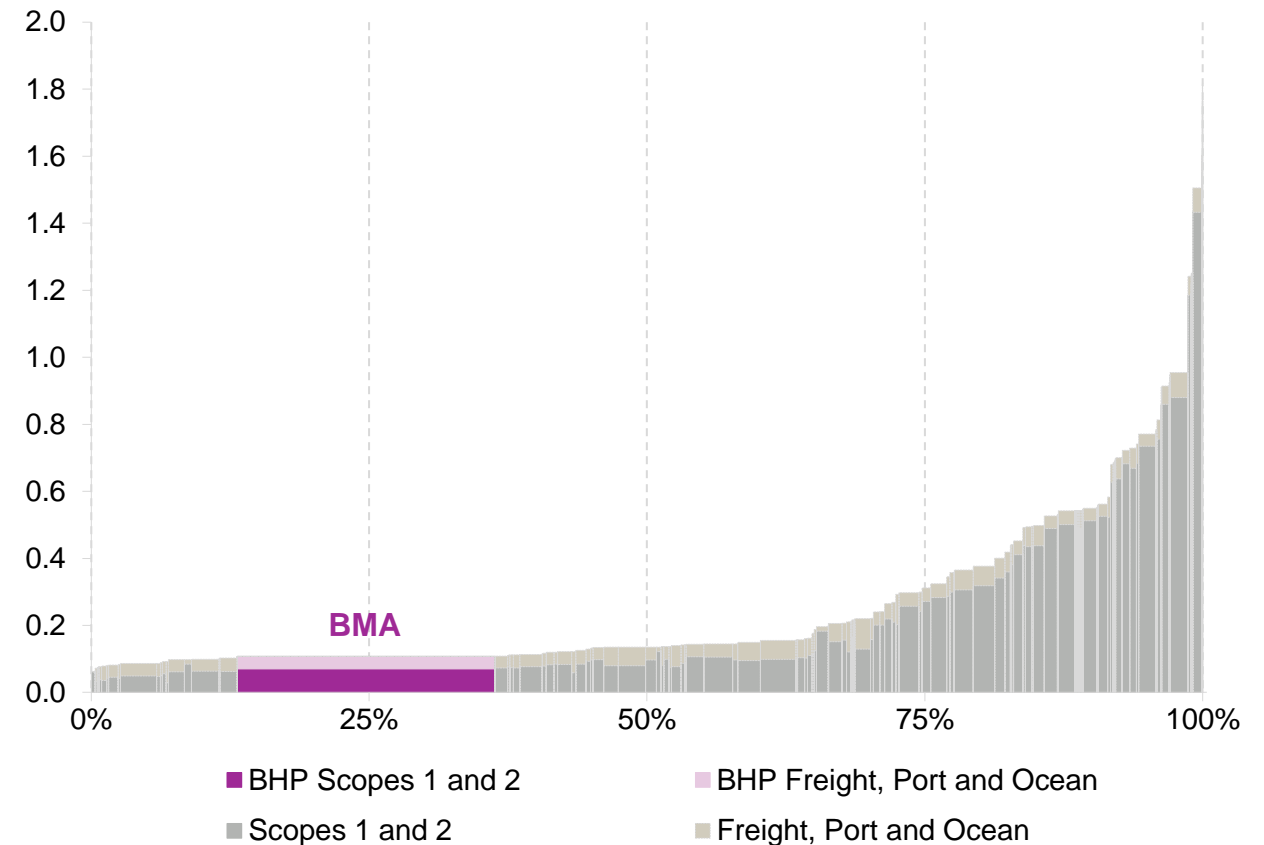
# Approach to methane emissions

## BMA's higher quality metallurgical coal can help steel mills reduce their own GHG emissions intensity

- BMA had one of the lowest GHG emissions intensity footprints among our global coal competition in CY2022.
- Our current open-cut mines now employ direct, site-specific industry best practice measurement of their fugitive emissions.
- Our aim is to identify the potential for emerging technologies to improve measurement.
- At our only underground steelmaking coal mine, Broadmeadow, drainage methane is captured and flared.
- For open cut mines, we are working to determine the optimal use of the gas as well as any operational challenges pre-drainage may create.
- Proven solutions will not address 100 per cent of fugitive methane emissions, so it is likely that a residual amount will remain untreated if there is no significant technological progress.

### CY2022 GHG emissions intensity of export metallurgical coal mines<sup>13</sup>

(Tonnes CO<sub>2</sub>-e per tonne of exported coal)



Source: Skarn Associates and BHP.



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# Value chain decarbonisation: Steelmaking

Dr Nigel Tame

Head of Steel Decarbonisation Partnerships

Tapping molten iron produced in an electrolysis test cell from BHP ores, as part of our partnership with Boston Metal

# Collaborating to reduce GHG emissions in steelmaking

Nine partnerships with steel-makers representing ~20% of global steel production<sup>14</sup> to help tackle long-term steel transition through the decades to come



# Supporting decarbonisation in steelmaking

We are progressing a diverse project portfolio to larger scale; covering routes we believe have greatest potential to support decarbonisation from use of our products

## BHP's steelmaking decarbonisation program

Invests in and supports:

- Collaborative partnerships and consortiums
- Research
- Ventures (i.e. early-stage start-ups)
- Standardisation and transparency

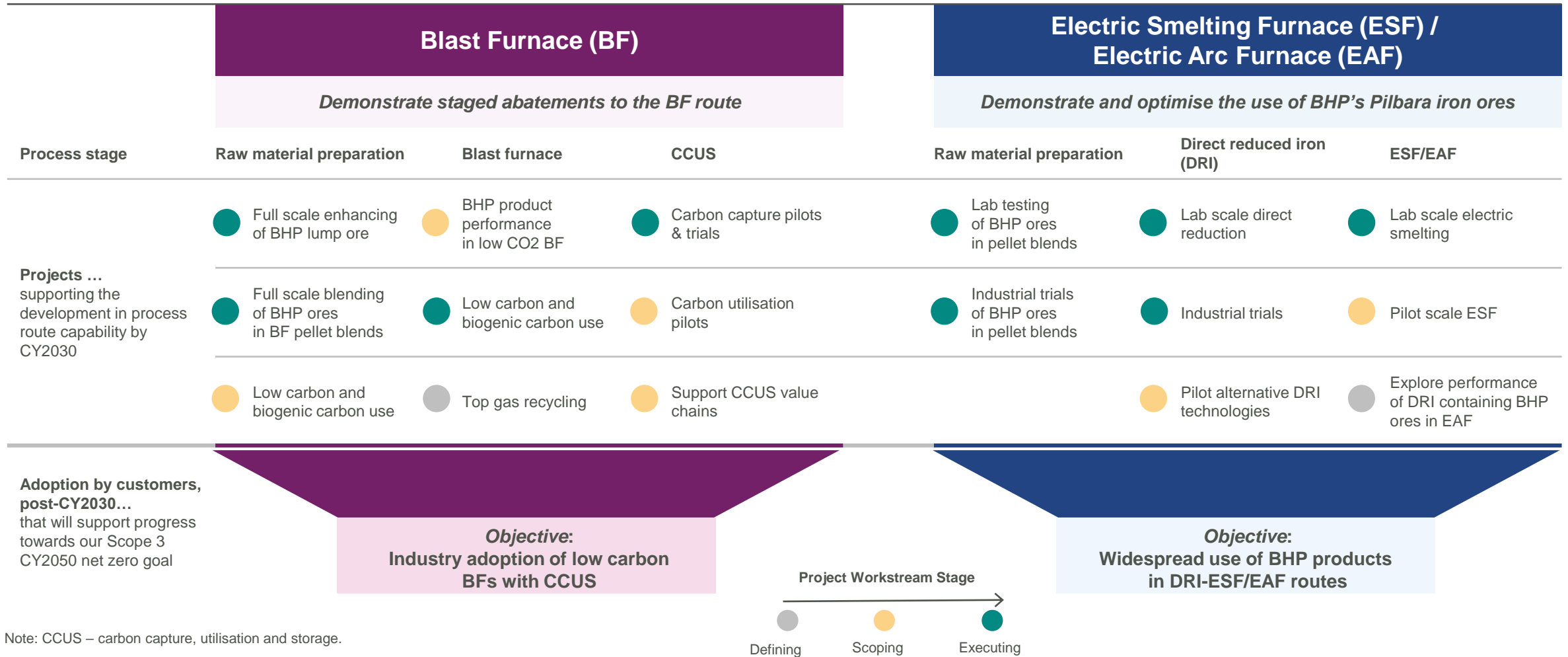
...to advance the readiness of steel decarbonisation technologies





# Pathway scorecard: progress of projects in our program

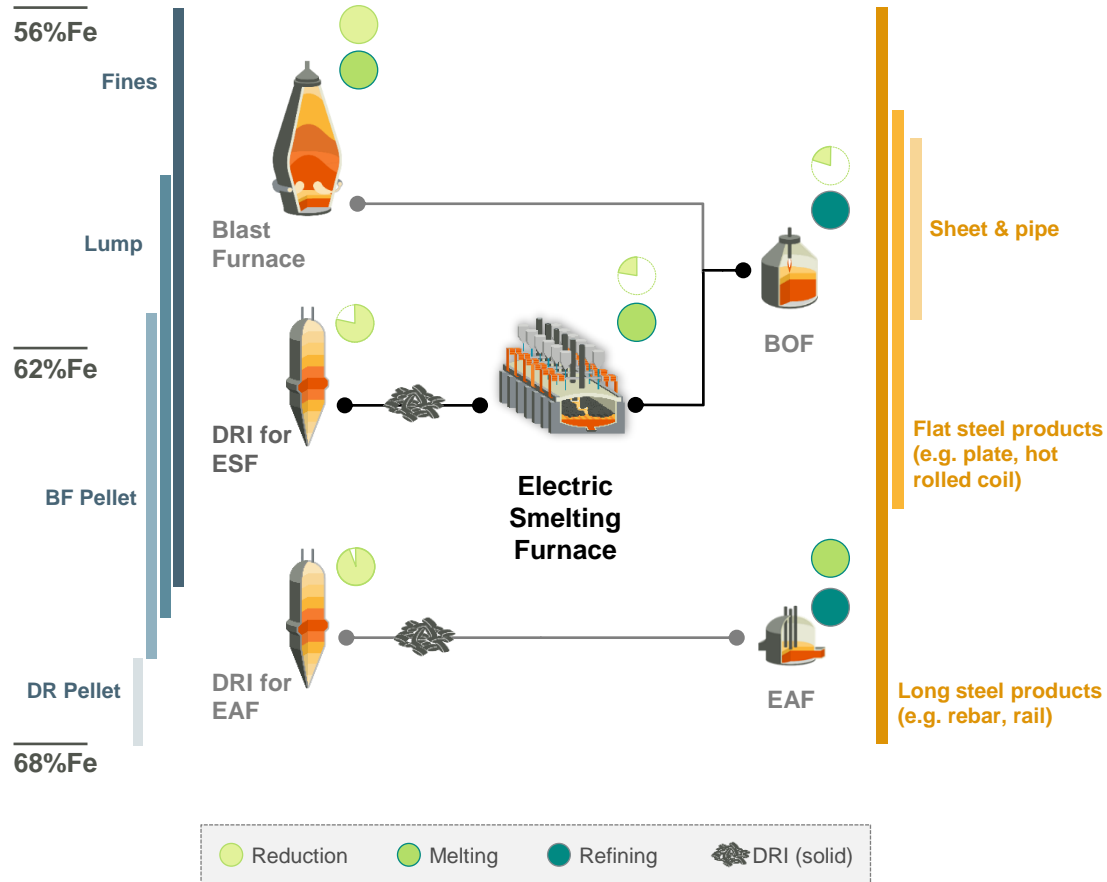
New abatement technology capabilities we are helping to develop to support our customers to decarbonise their processes



Note: CCUS – carbon capture, utilisation and storage.

# Advancing readiness for an electric smelting pilot facility

We have been progressing development in this route since CY2022



CY2022



Laboratory research at University of Newcastle (New South Wales, Australia)

Mar 2023



Partnership with Hatch: Pilot Design Study

Feb 2024



Consortium with Rio Tinto and BlueScope: Pre-feasibility Study

CY2027



Target for pilot plant facility commissioning

Post-CY2030



Widespread commercial deployment

# BHP

## Value chain decarbonisation: Shipping

Ashima Taneja

Head of Maritime Safety, Sustainability & Technical



The world-first trial of sustainably-certified biofuel supplied in Singapore, conducted by BHP in collaboration with Oldendorff and GoodFuels

# BHP is a leading organisation in maritime decarbonisation

Achieved a GHG emissions intensity reduction of 41% in BHP-chartered shipping of our products in FY2023 against a CY2008 baseline

## ▶ We are supporting decarbonisation

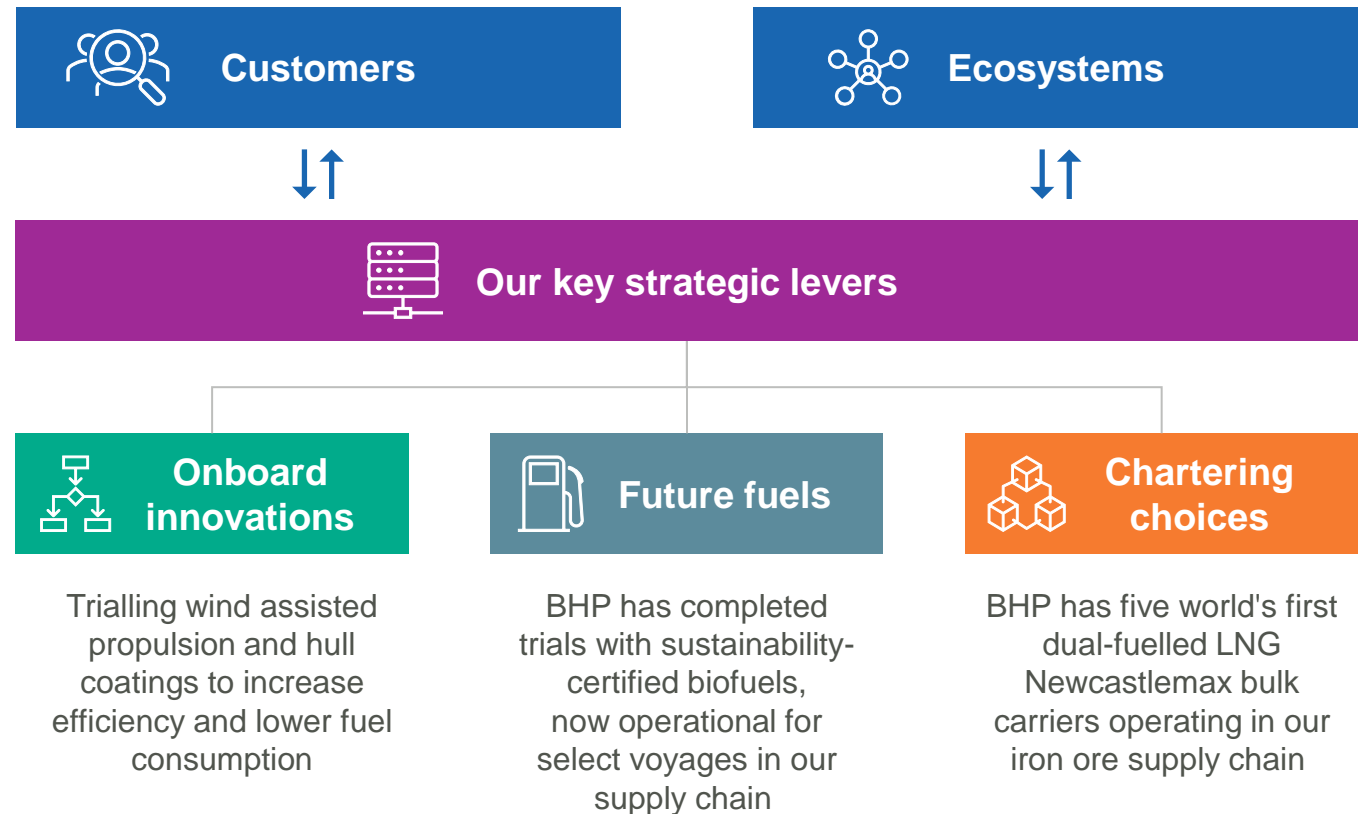
### CY2030 goal

Support 40 per cent emission intensity reduction of BHP-chartered shipping of BHP products from a CY2008 baseline

### CY2050 target

Net zero for the GHG emissions from all shipping of BHP products<sup>16</sup>

## ▶ We are progressing delivery of our strategy



# Future fuels: developing the ammonia value chain

We see significant potential in the trial and adoption of low to zero-emissions alternatives such as ammonia

## ➤ A promising future fuel

with potential to drive a step change reduction in GHG emissions on a per voyage basis compared to conventional fuel

## ➤ Intent to deploy on our iron ore trade route before CY2030

subject to reasonable thresholds for price premiums, supply and safety standards



Launching the Ammonia EOI

BHP successfully launched an expression of interest (EOI) to establish the world's first ammonia value chain for shipping



Establishing demand signals

First mover advantage to seek to increase zero GHG emission vessel and fuel availability at commercially viable prices



Collaborating on safety

- Addressing toxicity challenges through ammonia bunkering pilots
- Crew training framework in collaboration with International Maritime Organization (IMO)

# Footnotes

## Decarbonisation overview

1. Slide 4: Achievement of this goal is uncertain, particularly given the challenges of a net zero pathway for our customers in steelmaking, and we cannot ensure the outcome alone.
2. Slide 5: Future GHG emission estimates are based on latest annual business plans. Includes former OZ Minerals Australian assets and plans. Excludes Blackwater and Daunia (divested on 2 April 2024). FY2020 GHG emissions data has been adjusted for acquisitions, divestments and methodology changes. 'Organic growth' represents increase in GHG emissions associated with planned activity and growth at our operations. 'New PPAs' refers to GHG emission reductions from renewable/low to zero emission PPAs already entered and/or intended to be signed with reductions occurring post FY2023 and before FY2030. 'Other changes' refers to reductions in GHG emissions not covered by PPAs. 'Other' refers to GHG emissions from coal & coke, fuel oil, LPG or other sources. 'Range of uncertainty' refers to higher risk options currently identified that may enable faster or more substantive decarbonisation, but which currently have a relatively low Technology Readiness Level (TRL) or are not yet commercially available. Emissions calculation methodology changes may affect the information presented in this chart.
3. Slide 6: Future GHG emissions estimates are based on latest annual business plans. Includes former OZ Minerals Australian assets and plans. Excludes Blackwater and Daunia (divested on 2 April 2024). FY2020 GHG emissions data has been adjusted for acquisitions, divestments and methodology changes. 'Organic growth with no GHG emission reduction' represents business-as-usual emissions forecast without abatement projects. 'Our GHG emission reduction pathway' represents planned decarbonisation activities to reach BHP's operational GHG emissions FY2030 target and CY2050 goal. 'Range of uncertainty' refers to higher risk options currently identified that may enable faster or more substantive decarbonisation, but which currently have a relatively low Technology Readiness Level (TRL) or are not yet commercially available. 'Our net zero trajectory' refers to a straight line between our FY2020 baseline, FY2030 medium-term target, and CY2050 net zero goal. 'Negative GHG emissions solutions' include carbon credits (avoidance, reductions or removals), or other technologies that result in emissions reductions; this shows the requirement in order to reach net zero if decarbonisation at the lower line of the 'Range of uncertainty' were achieved (but does not reflect probability). Emissions calculation methodology changes may affect the information presented in these charts. 'Fugitives' (methane emissions) estimated in accordance with the Australian National Greenhouse and Energy Reporting (NGER) measurement methodology and does not reflect the tendency for methane density to increase as coal mines deepen, due to current uncertainty with respect to future opportunities to manage methane at our BMA mines.

## Operational decarbonisation

4. Slide 9: FY2020 is the baseline year for BHP's Group-level FY2030 operational emissions reduction target. Emissions are presented 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%). Excludes projects, exploration, and legacy assets.
5. Slide 9: Percentage reduction figures are estimates based on FY2020 levels and calculated based on forecast electricity consumption, which is subject to change as our estimates and mine plans evolve. Percentage reductions based on PPAs already signed.
6. Slide 10: Global operations. Excludes former OZ Minerals assets. Excludes Blackwater and Daunia (divested on 2 April 2024).
7. Slide 10: BHP analysis (based on modelling and initial studies). Percentages shown are estimated comparative efficiency.
8. Slide 11: This pathway depends on the commercial availability of the required technologies. Visual is illustrative and not to scale.
9. Slide 11: Expected average between FY2024 and FY2030
10. Slide 12: Upon completion of successful trials.
11. Slide 12: At Caterpillar's Tucson, Arizona Proving Ground.
12. Slide 12: Smaller pilot fleets may be deployed earlier, subject to technology readiness.
13. Slide 13: The metallurgical coal GHG emissions intensity curve is based on CY2022 data estimates from Skarn Associates. The GHG emissions intensity basis is tonnes of CO<sub>2</sub>-equivalent per tonne of exported coal produced per mine. BHP operations have been aggregated to BHP Mitsubishi Alliance (BMA) level. BMA has been overlaid with reported BHP data points for CY2022 for: i) metallurgical coal production; ii) Scope 1 emissions; and iii) Scope 2 emissions incorporating BHP operated integrated rail and port GHG emissions. GHG emissions intensity estimates for freight, port and ocean logistics of metallurgical coal products were calculated using Skarn Associates average intensities for CY2022. As BMA utilises both integrated (included in Scopes 1 and 2 emissions) and third-party rail and port services, this may result in partial double counting of GHG emissions. The data set applies IPCC AR5 CH<sub>4</sub> global warming potential factors to all mines.

## Value chain decarbonisation: Steelmaking

14. Slide 15: Based on reported steelmaking production based on World Steel Association data.
15. Slide 15: 0.40 tonnes of CO<sub>2</sub>-e per tonne of crude steel for 100% ore-based production (no scrap), as defined by the International Energy Agency (IEA) and implemented in ResponsibleSteel International Standard V2.0 ('near zero' performance level 4 threshold). IEA (2022), Achieving Net Zero Heavy Industry Sectors in G7 Members, IEA, Paris, License: CC BY 4.0, which also describes the boundary for the emission intensity calculation (including in relation to upstream emissions). Abatement potentials have been calculated relative to a baseline reference of 2.0 tonnes of CO<sub>2</sub>-e per tonne of crude steel.

## Value chain decarbonisation: Shipping

16. Slide 20: Ability to achieve the target is subject to the widespread availability of carbon neutral solutions to meet our requirements, including low/zero GHG emission technologies, fuels, goods and services.

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