

# Capture and re-use energy from our rail wagon fleet



## Introduction and Business Challenge

We recognise that we have significant scope 1 and 2 emissions and know we must address this with urgency to be part of the solution the world is looking for.

We have committed to a 50% reduction in Scope 1 and 2 CO<sub>2</sub> emissions by 2030, and net zero carbon emissions by 2050.

Our rail fleet is extensive, with 220 locomotives, and each train of three locomotives (typically 9 MW tractive power) hauls an average of 240 wagons. Diesel fuel usage by our rail fleet contributes almost 30% of current Scope 1 and 2 emissions. The strategy to achieve our 2050 goal of net zero emissions includes transitioning to battery electric locomotives.

Our loaded trains (locomotives plus wagons) travel mostly downhill (maximum elevation ~800 m above sea level) from our 17 mines to 4 ports over 1,900 km of total track and at temperatures that may exceed 50°C. Battery electric locomotives allow for energy recovery via regenerative braking over portions of this journey and onboard storage via battery packs. However, regenerative braking by the locomotives alone does not provide sufficient energy to drive the trains as we have:

- A high train mass (typically 34,000 tonnes) with small number of locomotives
- A low power to weight ratio and falling gradients of up to 2% that require frequent use of friction brakes on loaded trains
- Long operating cycles (400–1000 km round trips in 25–40 h)
- Minimal regenerative opportunity on empty trains (typically 5,500 tonnes) on the mostly uphill journey
- Constraints on train length by infrastructure design

Current braking technology on wagons (electronically controlled pneumatic brakes) does not allow for energy capture, however, the ability to capture braking energy from our wagon fleet could eliminate charging infrastructure and deliver significant capital savings opportunities.

We seek opportunities to innovate and implement emerging technologies that will allow for energy capture from the wagons and its storage and re-use to support efforts to decarbonise our rail network. Compatibility and integration with AutoHaul®, our autonomous, driverless operation would be required.

By crowdsourcing solutions to this complex challenge, we hope to identify and support projects that will help deliver breakthrough positive outcomes for our rail network.

## Solutions we seek

We seek ideas and solutions from the global research, technology, and innovation industry to achieve our goals for this business challenge. We aim to:

- Identify and support the development of options to capture and re-use energy from our rail wagon fleet. We will prioritise options at the prototype stage or more advanced, but concept options will also be considered
- Stimulate the market to potentially transfer solutions from other industries
- Understand the options for energy system management and control
- Understand the options for onboard (locomotives and/or wagons) and wayside energy storage
- Understand the options for energy transfer from wagons to locomotives and/or wayside energy storage
- Capture key lessons for future developments or opportunities.

Solutions may include projects such as (but not limited to) energy capture by the wagons with isolated control at the wagon or integrated control with the locomotives; options for wagon/locomotive energy storage, integration and control; and will also consider alternative proposals to heavy haul freight rail operation (such as autonomous, self-propelled, automated, independent, flexible or modular concepts).

## Timeline

This initial phase will close for submissions on 30 November 2022. A shortlist of selected submissions will be contacted during the week of 5 December 2022 to discuss further.

## About your submission

We encourage you to include as much evidence as possible to support your submission's claims. This will boost our confidence in the feasibility and effectiveness of your solution or concept.

We may elect to proceed with any, all, or none of the submissions. Similarly, there could be aspects of your solution that could work with other solutions, so consider whether you would be willing to partner with other third parties. This will be discussed on an individual basis.

You should include an assessment of your solution's readiness, ideally for proof-of-concept testing in 2023.

We will consider a mix of quantitative and qualitative criteria in determining whether to discuss submissions further. Should we wish to proceed further, a non-disclosure agreement

will be entered into to ensure the intellectual property and information rights of both parties are maintained.

### How to lodge your submission

Please submit via the form on the [Pioneer Portal](#) and ensure that you agree to the Terms and Conditions.

For further clarification email [pioneerportal@riotinto.com](mailto:pioneerportal@riotinto.com).