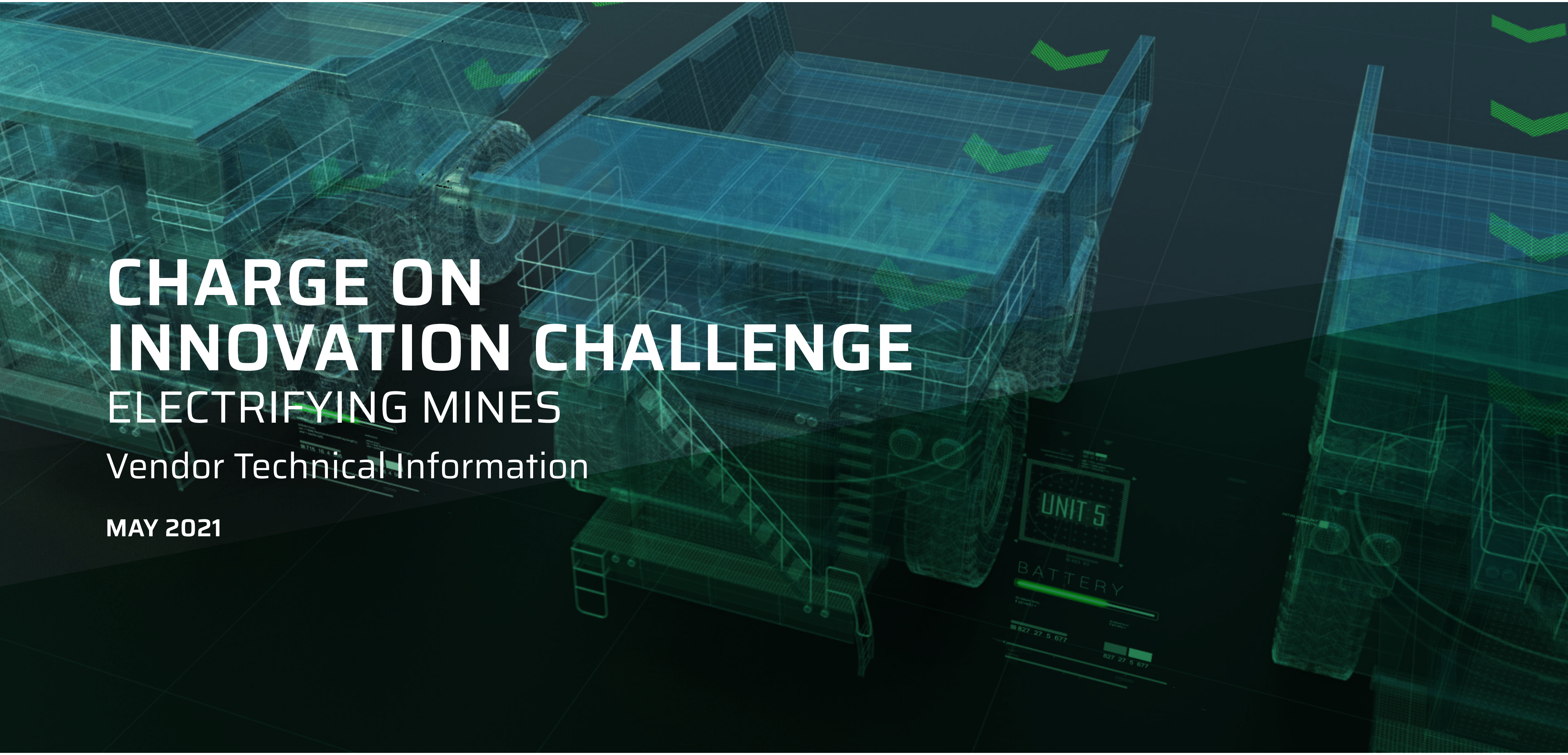
CHARGE ON INNOVATION CHALLENGE

ELECTRIFYING MINES

Vendor Technical Information

MAY 2021



DISCLAIMER

Forward-looking statements

This presentation contains forward looking statements of Vale S.A., Rio Tinto, and BHP Group Operations – collectively referred to as “Patrons”, which may include statements regarding plans, strategies and objectives of management, future performance and future opportunities relating to achieving zero greenhouse gas emissions for haul trucks. This information is disclosed on condition that it will only be used for the purpose outlined in this presentation. The forward looking statements in this presentation 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.

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EXECUTIVE SUMMARY

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INTRODUCTION

BHP, RioTinto and Vale are the founding partners of an exciting new collaboration - The Charge On innovation challenge.

To develop innovative ways to safely charge our mining truck fleets without losing productivity

But we cannot solve the decarbonization challenge alone.

And we are looking beyond mining for help.

The Charge On innovation challenge will be a vital step in achieving zero emissions mining.

We encourage other mining companies to join us in this challenge, take another step toward zero emissions mining, and to create operations we are proud to pass to the next generation.

ELECTRIFICATION IS AN IMPORTANT STRATEGY

Mining companies are exploring multiple ways of decarbonising material movement, including:

- Electrifying equipment
- Exploring use of different size and types of equipment

A priority stream of work is to understand how to electrify our current way of operating

- This includes electrifying large trucks (220 tonne – 360 tonne payload)

Current battery technology constrains how much energy can be carried on board a truck

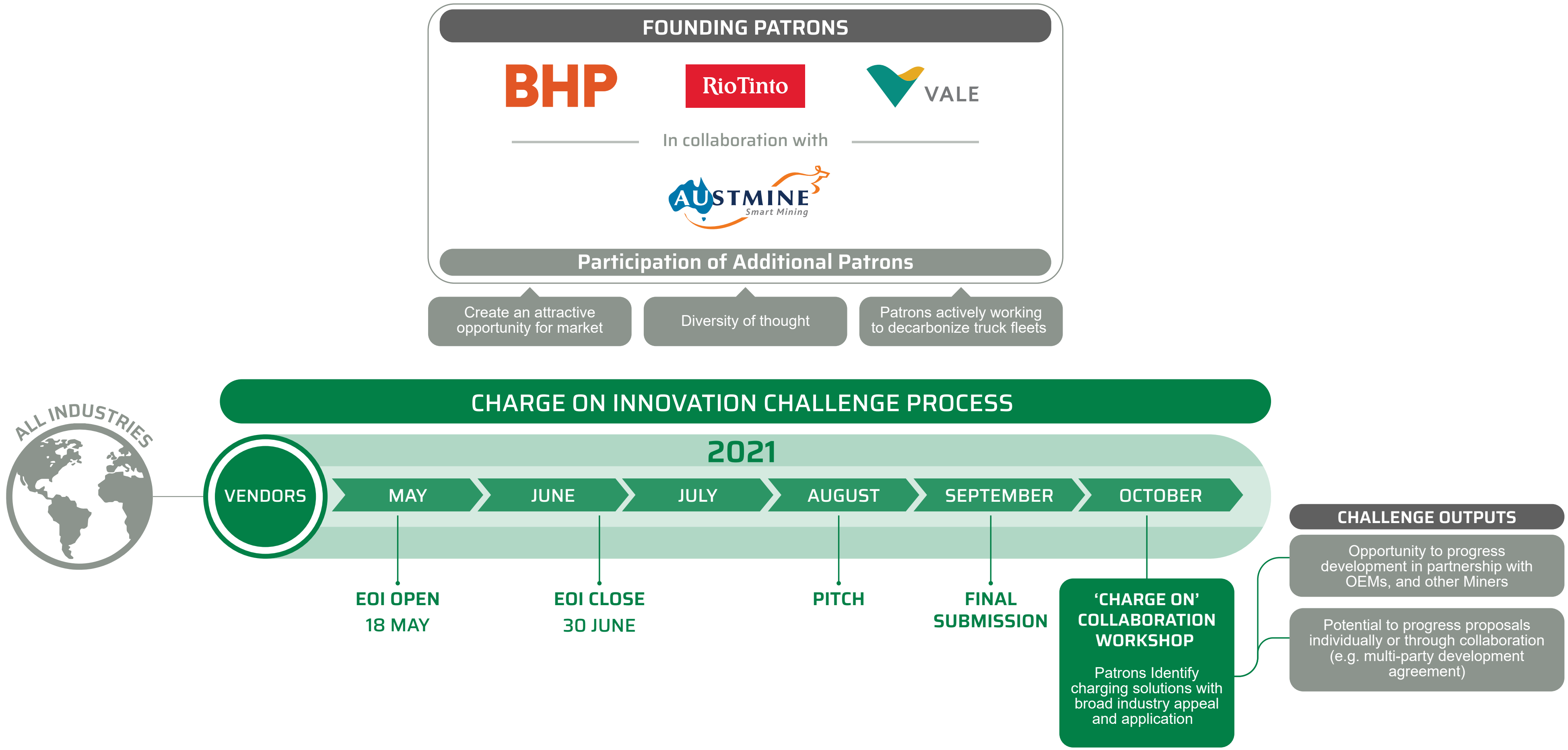
- It is important not to sacrifice truck payload as this is a large driver of productivity

A key opportunity is to charge trucks in-cycle (i.e. while being loaded, dumping or hauling)

- This has the potential to reduce the size of the battery required on the truck – **Maximise payload**
- Reduces the number of trucks in the fleet because the trucks don't have to stop to recharge – **Optimise truck numbers**
- Potential for trucks to travel faster by providing charging and propulsion simultaneously – **Maximise productivity**

The scope of the Charge On Innovation Challenge is focussed on scalable, interoperable solutions for delivering electricity to 220 tonne haul trucks, without adding time to the haul cycle.

CHARGE ON INNOVATION CHALLENGE PROCESS



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SCOPE DEFINITION

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CHARGE ON INNOVATION CHALLENGE

WHAT IS IT?

The Charge On Innovation Challenge asks Vendors to present scalable, interoperable solutions that can safely deliver in the order of 400 kWh electricity to 220 tonne battery-electric trucks in a way that maintains or improves current productivity levels (without adding time to haul cycle).

WHY ARE WE DOING IT? WHAT HAPPENS IF WE DON'T DO IT?

Current stationary charging systems would require substantial time to charge a truck out-of-cycle and current dynamic trolley systems are limited in where they can be deployed.

The Founding patrons - BHP, Rio Tinto and Vale - aim to engage the mining sector and adjacent sectors for solutions. We will do this with other miners to demonstrate that in-cycle charging for mining equipment is an attractive market worth pursuing.

WHEN?

The Challenge will run from May to October with commercial discussions thereafter to tie into timelines in relation to a Battery Electric (BEV) truck being available for testing from as early as 2023.

We expect some solutions identified in the Challenge could provide propulsion to existing diesel-electric trucks. This may present a pathway to early implementation for dynamic charging solutions.

There is no contractual obligation to procure any products or services at the end of challenge

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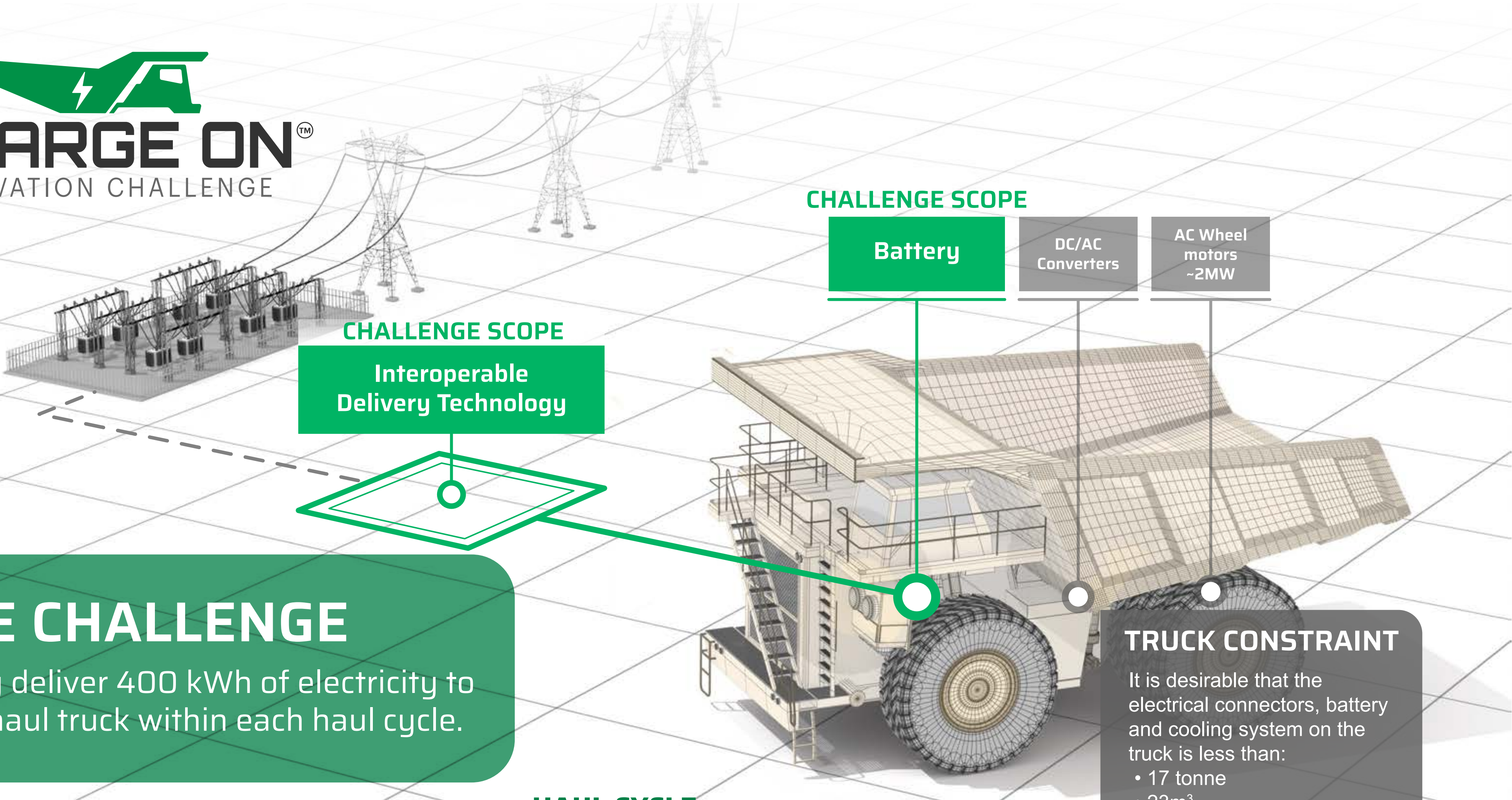

THE CHALLENGE

Safely deliver 400 kWh of electricity to each haul truck within each haul cycle.

TRUCK CONSTRAINT

It is desirable that the electrical connectors, battery and cooling system on the truck is less than:

- 17 tonne
- 23m^3

HAUL CYCLE

PARAMETER	QUEUE	LOAD	TRAVEL	DUMP
Indicative Times	Median 15 sec Q1-Q3 Range 0-180 sec	Median 180 sec Q1-Q3 Range 160-210 sec	Refer to the standard haul profiles provided.	Median 45 sec Q1-Q3 Range 40-55 sec

CURRENT TECHNOLOGY IS UNSUITABLE FOR ZERO EMISSIONS MINE

Challenges with traditional overhead trolley systems:

Existing technology is commercially available and can deliver electricity for propulsion to electric-drive haul trucks. These systems represent semi-permanent fixed assets placed onto pit ramps, in highly dynamic mining environments. Application is limited due to several factors:

- Expensive to install and difficult/slow to deploy/relocate/extend
- Require extra road width and a large turning radius
- Even with a fully autonomous trolley-ready fleet, it may require an extra lane because of other equipment using the road
- Require a very high standard of road maintenance
- Extra care has to be taken to avoid overfilling the truck body as to avoid collision between material and overhead lines, such as height detecting sensors
- Tight vertical tolerance, requiring a very high standard of road maintenance
- Tight horizontal tolerance making it difficult to manoeuvre around obstacles such as a rock on the roadway
- Requires attention from the driver to maintain connection to the overhead lines, reducing awareness of immediate environment
- Manual activation of pantograph decreases the time on the system reducing energy transfer. The manual process is also a source of damage to the overhead lines, either by activating it to soon or too late
- Increased operational complexity with potential impact on productivity
- Potential to get damaged during mine blasts, with fly rock damaging overhead lines and other infrastructure, e.g. damage to insulators

Challenges with current stationary charging systems:

- Likely to require the truck to be taken out of cycle
- Unacceptably low charge rates
- Slow time to connect/disconnect
- Difficult/slow to relocate
- No flexibility to match mining flexibility

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CHALLENGE OPPORTUNITY STATEMENT

TO PROPOSE ELECTRICITY DELIVERY CONCEPTS:

1. Designed with safety as the number one priority, using inherent defensive design and fail-safe principles
2. To supply a 220 tonne payload battery-electric haul truck (scalable to 360 tonne ultra class)
3. Capable to transfer 400 kWh[1] of electricity into each truck within each haul cycle
4. To provide battery charging, or both propulsion and battery charging
5. To be cost effective, minimize complexity, and not reduce productivity
6. That promotes inter-operability allowing different OEM trucks to utilize the same electricity delivery system

[1] Vendor concept proposals will ideally be capable of providing a total of 400 kWh over the representative haul cycle, but this may be provided via multiple interactions with the haul truck over the haul cycle. Vendors may submit a solution that provides less than 400 kWh. Also, where possible, Austmine will provide assistance to match Vendors together, so that they may submit joint proposals that meet the 400 kWh target.

IN / OUT OF SCOPE

In-Scope

1. Electricity delivery between the mine electricity grid and the haul truck (i.e. assume AC mine power is reticulated adjacent to the load and haul network)
2. Haul truck onboard battery and battery management technology
3. Haul truck onboard electrical hardware for charge receival
4. Interaction with the truck whilst stationary or moving
5. Battery charging (including AC/DC, DC/DC conversion whether onboard or off board) and direct propulsion
6. Site energy management, dispatch optimisation software and integration of concept into mine grid (optional inclusion)

Out of Scope

1. On-site electricity reticulation
2. Electricity supply to mine site
3. Loading and ancillary equipment
4. Haul trucks less than 220 tonnes payload
5. Haul truck components (apart from onboard battery and electrical connection to delivery infrastructure)
6. Regeneration of power into the battery

Other Considerations/Constraints

1. Proposals may have different Technology Readiness Levels (TRL). All vendors to refer to TRL Framework supplied in Technical Information Pack
2. Desirable that the concept can be trialled on a mine-site as early as 2023
3. Vendors may assume trucks have precision guidance via autonomous solutions
4. Vendors to note if precision guidance is not required for concept
5. Haul trucks available 7000 hours per annum
6. Assume no constraining limitations on electricity supply
7. Environmental conditions will vary due to global application
8. Planned redundancy should be considered to ensure a reliable charging service
9. Haul profiles will be provided in x, y, z format
10. Assume concept will be on a mine site with controlled access and therefore some hazards may be managed that would be unacceptable in a public space
11. Trolley Assist systems available today operate in the 1000-3000 direct current voltage range

Broadly speaking, the "Charge On" Innovation Challenge's Battery Limits are from the AC output terminals of a mine substation to aggregated DC output of the onboard battery system

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HAUL CYCLE INFORMATION

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HAUL CYCLE OUTLINE





Parameter	Queue	Load	Travel Assumptions	Dump	Refuelling
Indicative Times	Median 15 sec Q1-Q3 Range 0-180 sec	Median 180 sec Q1-Q3 Range 160-210 sec	Refer to the four standard haul profiles and indicate where a mobile charging system would be located.	Median 45 sec Q1-Q3 Range 40-55 sec	15 min/day
Speed	0	0	10-60 kph	0	0
Comment	Queueing could occur away from the loading area with smart dispatch and autonomous trucks	Infrastructure located near loading area needs to be flexible and relocatable to allow for different digger/truck interactions, moving to new dig locations and removal for blasting etc.	**In-Pit Haul Roads** Opportunity to provide propulsion and charging on in-pit ramps where truck speed is low, but ramp length & life often short (6-12 months) or has operational restrictions (e.g. variable height between pavement and a trolley line, road has tight radius of curvature) **Dynamic Charging in-Pit** Aspirational goal for dynamic charging concepts is to achieve a turn radius of 15-20 metres and ability to cheaply & quickly extend/relocate. **Ex-Pit Haul Roads** Opportunity for more 'permanent' infrastructure ex-pit on long life, high utilization roads that service multiple pits. Ex-pit roads have significantly less operational restrictions. For dynamic charging, we aspire to maintain the current 'higher' speed of trucks.	Primary crusher locations offer a significant volume of truck interaction albeit short duration. Waste dumps have volumes of truck interaction that vary depending on the number of dumps and mine strip ratio. Interaction duration is similar to the crusher, however waste dumps move over time and the surface settles as material is compacted over time. The layout of the dump can potentially be varied within the boundary constraints to more readily accommodate charging infrastructure.	Whilst there is an opportunity to gain productivity by 'refuelling' within cycle, trucks currently stop for 15 mins/day which could also be available for charging.

THE HAUL CYCLE LANDSCAPE


ELECTRIC SHOVEL (trailing cable)


LOADING (backhoe configuration)


ELECTRIC SHOVEL (trailing cable)


QUEUEING & LOADING


IN-PIT TEMPORARY RAMP


MINE LOADING AREA


WASTE DUMP RAMP


EX-PIT HAUL ROAD (high utilization)


DUMP AT WASTE DUMP


DUMP AT CRUSHER

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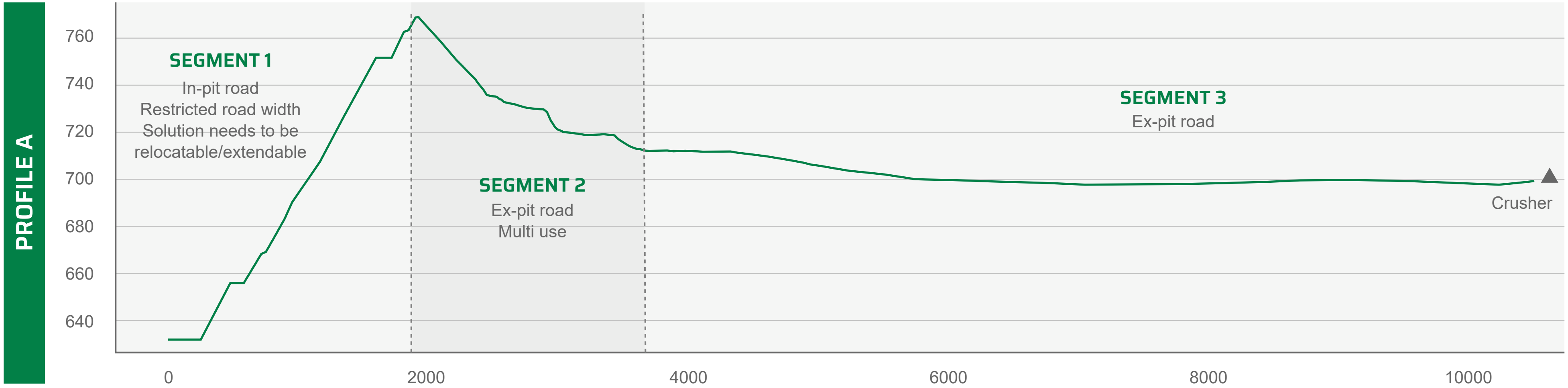
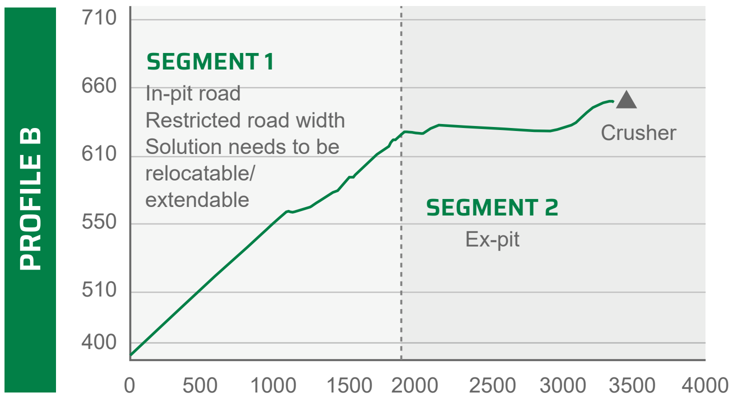
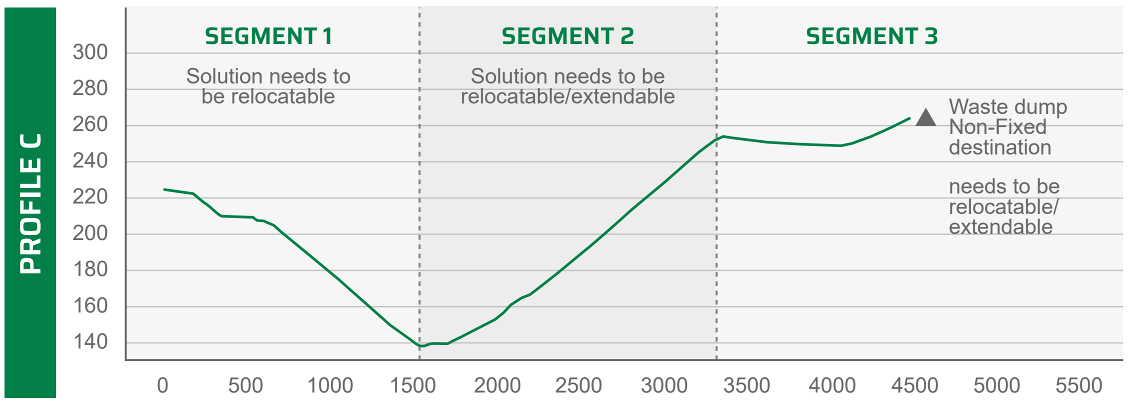
EXAMPLE HAUL PROFILES

Proposals to demonstrate how/where 400 kWh can be supplied to each truck over one cycle for each of the following haul profiles

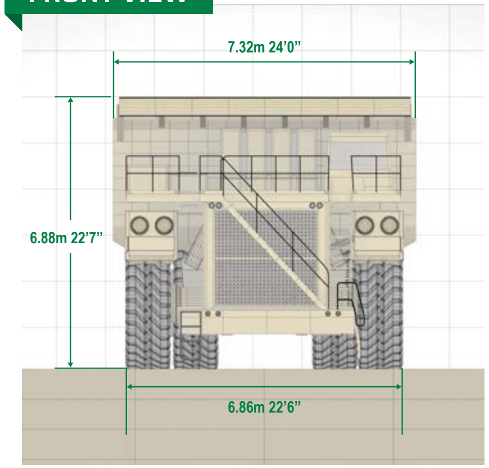




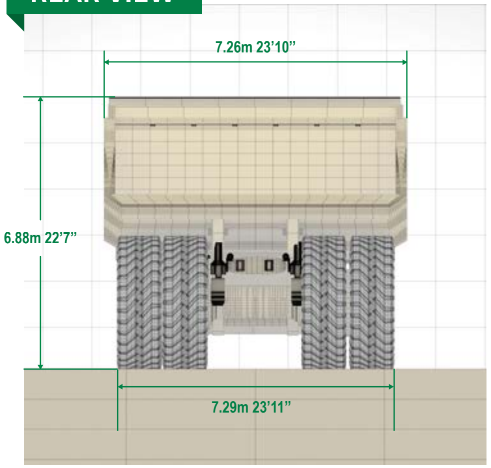


EXAMPLE 220 TONNE HAUL TRUCKS

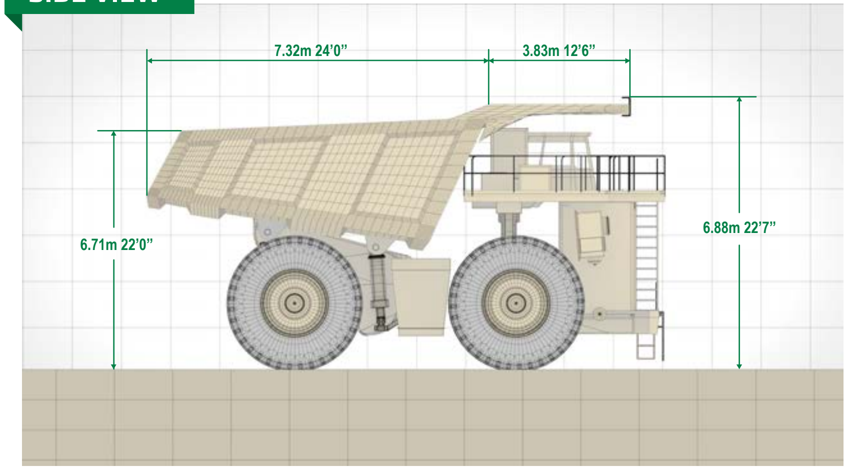
FRONT VIEW



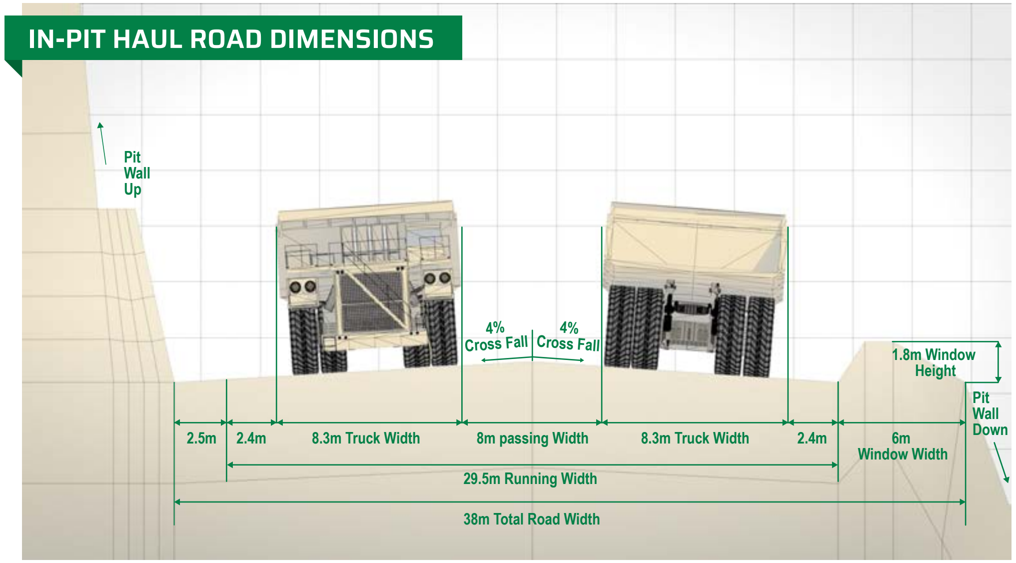
REAR VIEW



SIDE VIEW



IN-PIT HAUL ROAD DIMENSIONS

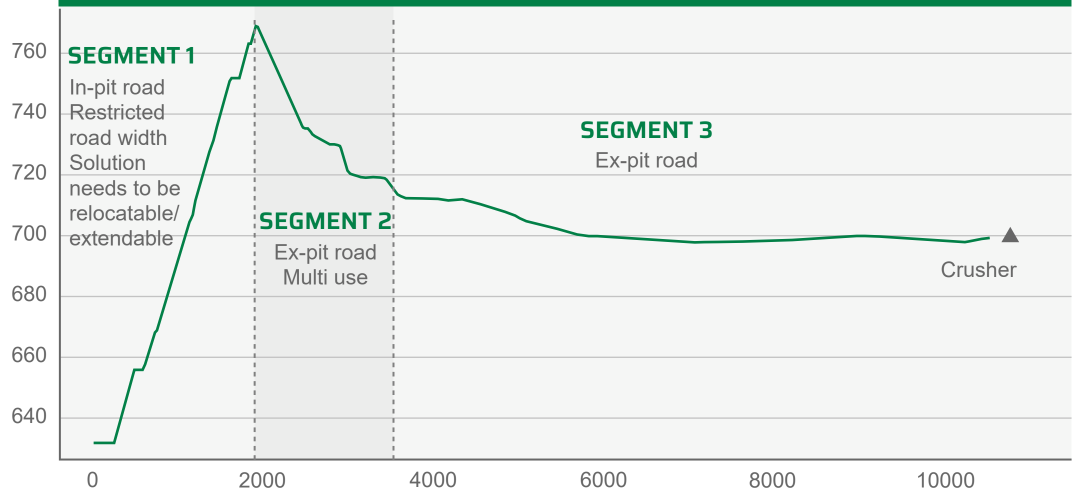


- Battery replaces diesel engine & fuel tank.
- Battery, cooling system and electrical connection interface are desirable to weight less than 17 tonnes, and fit in a volume of 23 cubic meters.
- Battery innovations may be proposed in the challenge.
- Solutions should be focussed on servicing the 220 tonne payload truck size, but be scalable up to ultra class truck sizes (360 tonne).

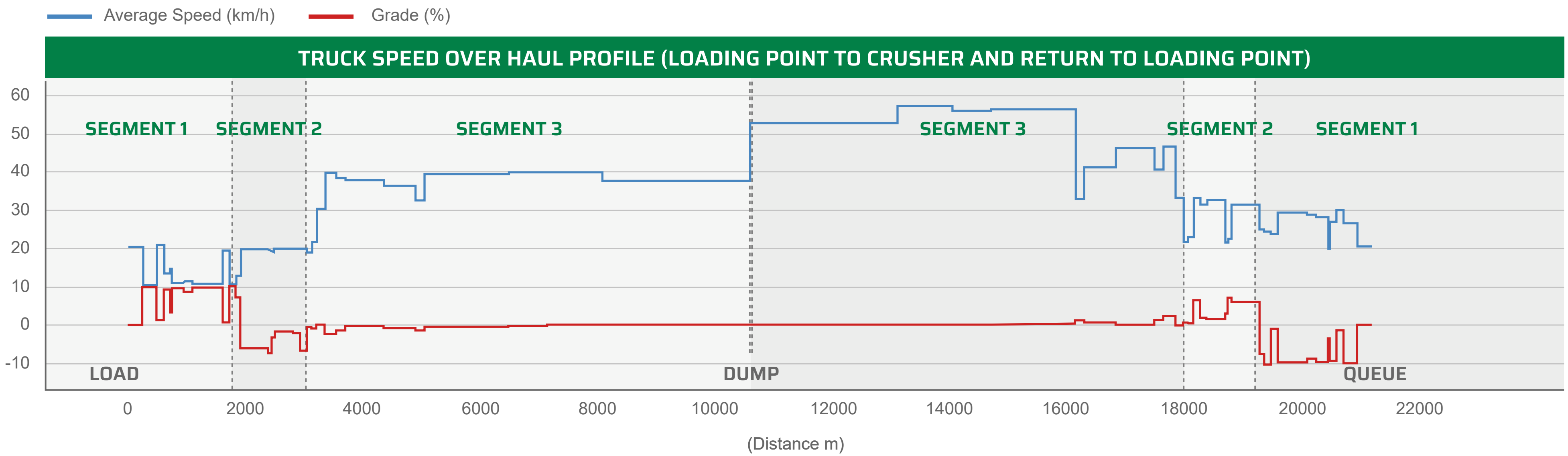
PROFILE A

	TONNAGE	LIFE	COMMENT
SEGMENT 1	1.5 Mtpa	3 years	Ore and waste traveling up in-pit haul ramp. Restricted road width. Must allow for ancillary equipment to utilise road.
SEGMENT 2	20 Mtpa	30 years	Ex-pit road ore and waste from multiple pits. Flexible road width.
SEGMENT 3	7 Mtpa	30 years	Ex-pit road dedicated to haul ore to primary crusher. Flexible road width.

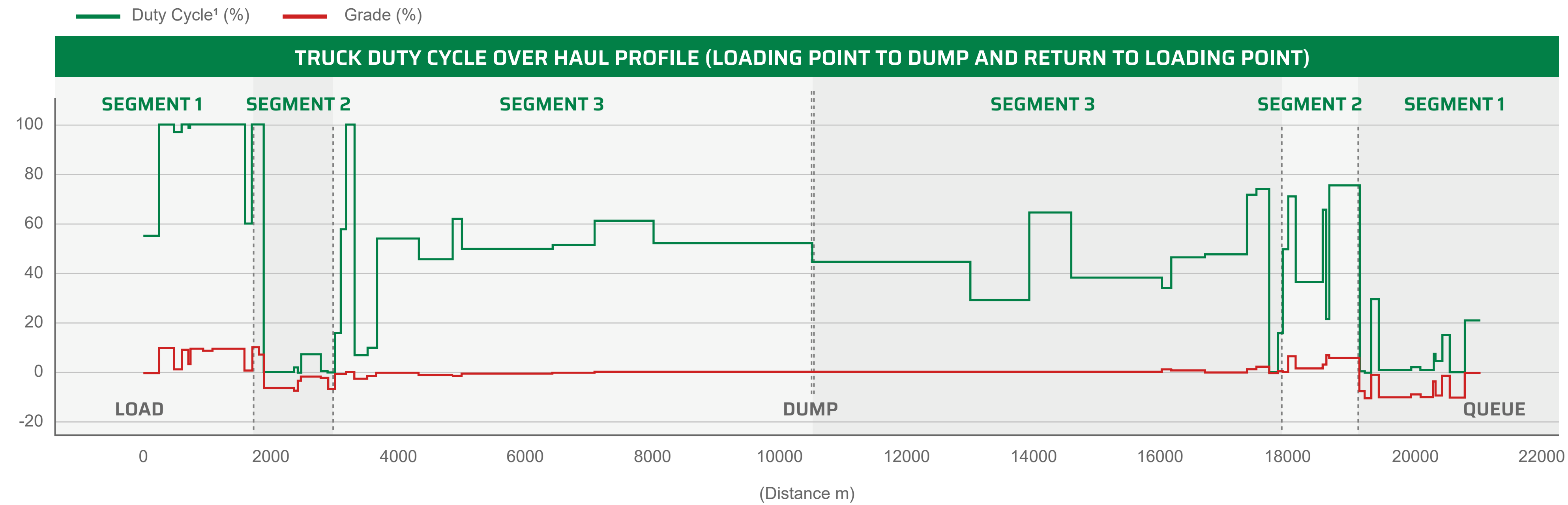
HAUL PROFILE CROSS-SECTION (ONE-WAY)



TRUCK SPEED OVER HAUL PROFILE (LOADING POINT TO CRUSHER AND RETURN TO LOADING POINT)



PROFILE A

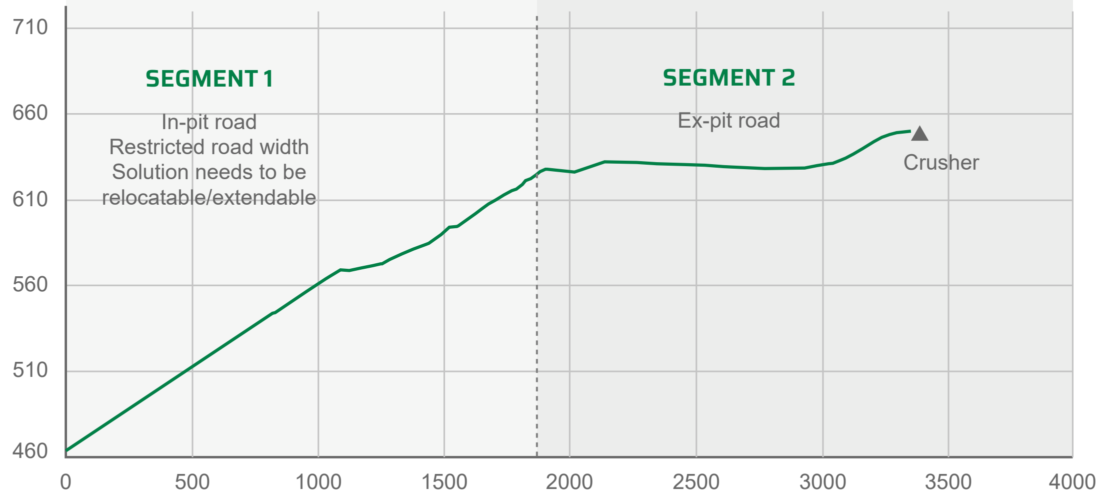


[1]*Duty Cycle - the percentage of maximum engine load*

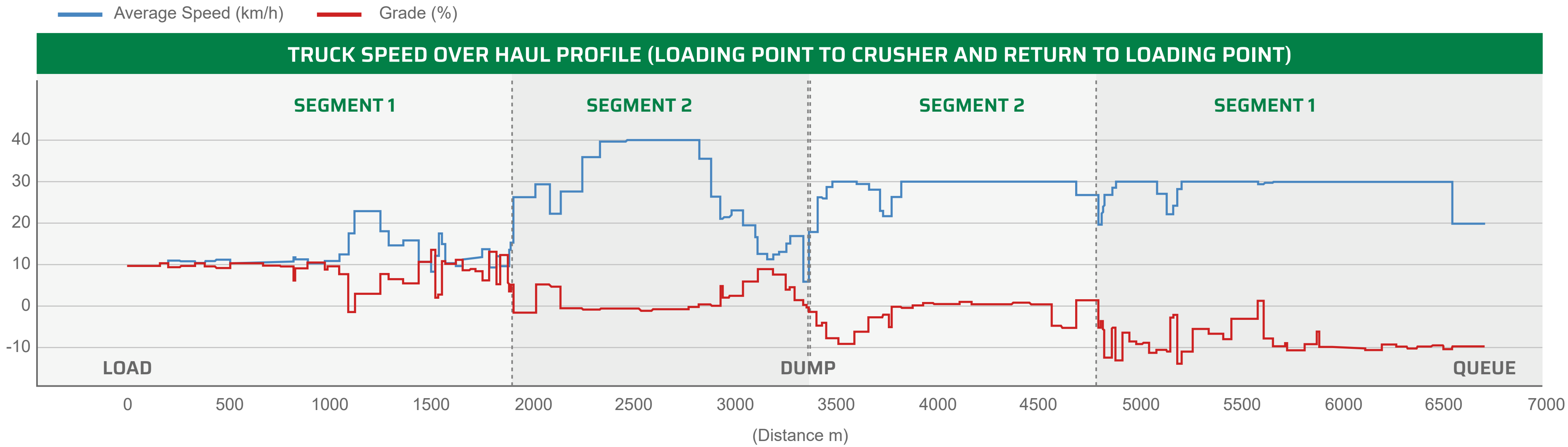
PROFILE B

	TONNAGE	LIFE	COMMENT
SEGMENT 1	16.5 Mtpa	11 years	Ore and waste traveling up in-pit haul ramp. Restricted road width. Must allow for ancillary equipment to utilise road.
SEGMENT 2	8.8 Mtpa	11 years	Ex-pit road dedicated to haul ore to primary crusher. Flexible road width.

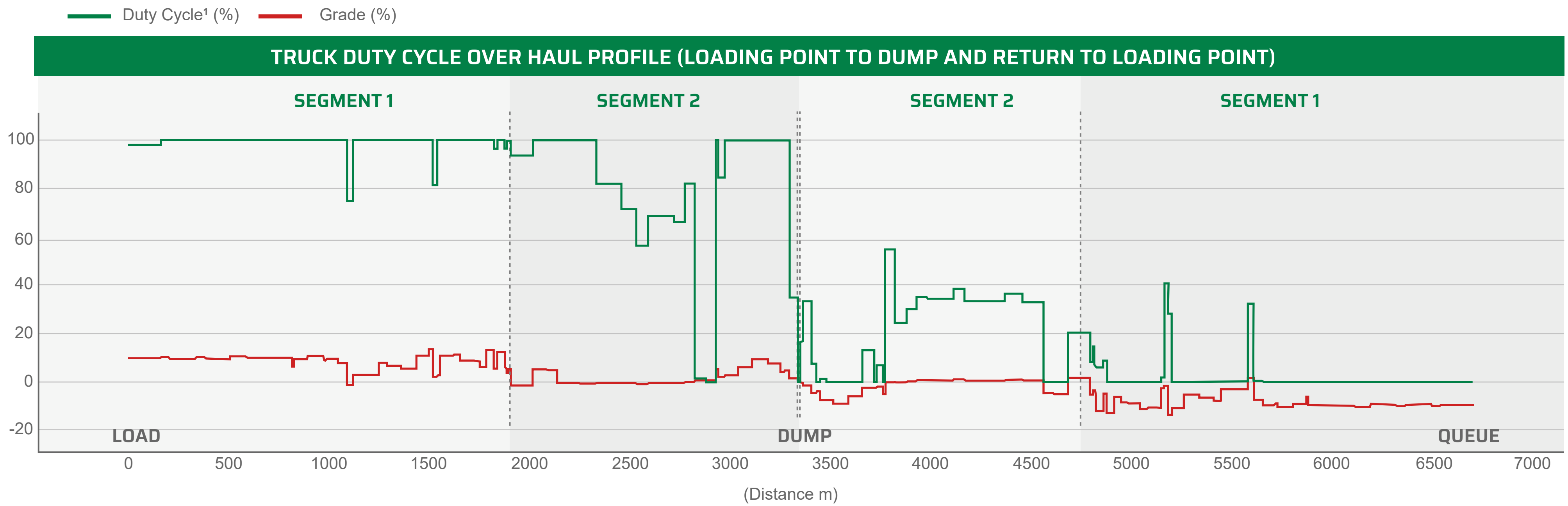
HAUL PROFILE CROSS-SECTION (ONE-WAY)



TRUCK SPEED OVER HAUL PROFILE (LOADING POINT TO CRUSHER AND RETURN TO LOADING POINT)



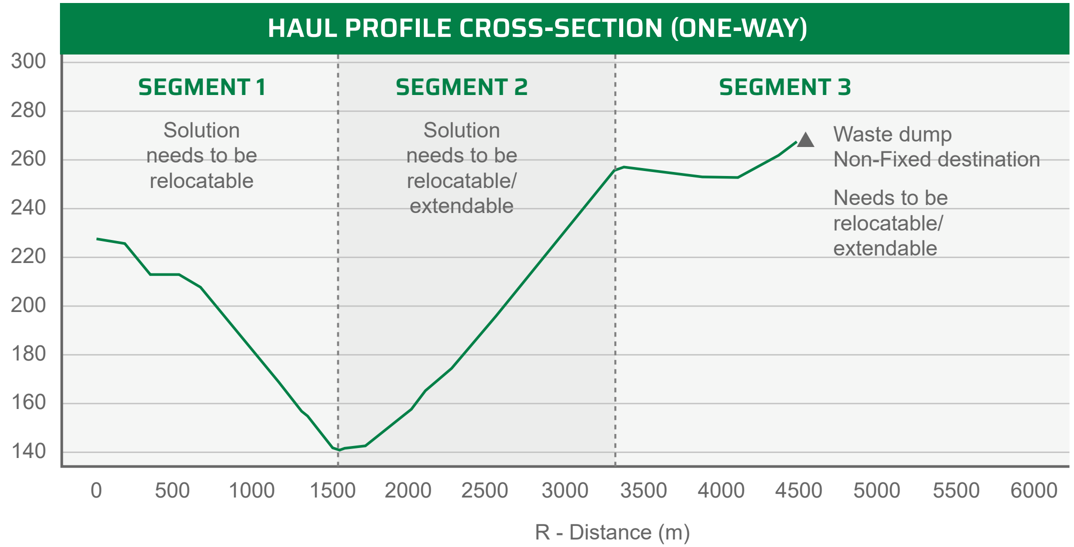
PROFILE B

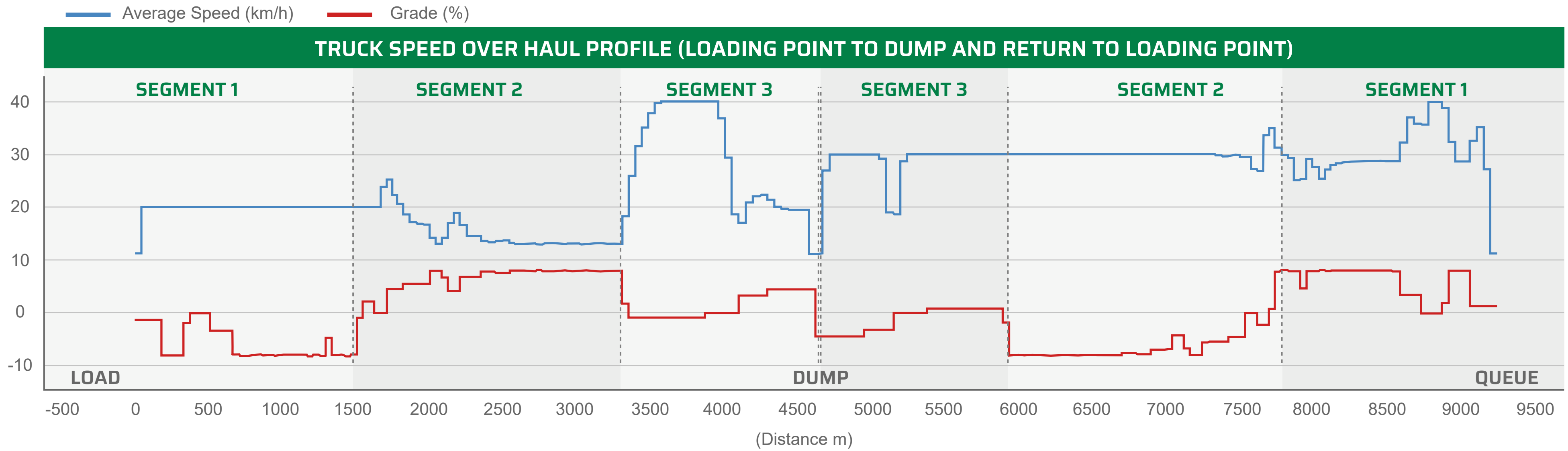


[1]Duty Cycle - the percentage of maximum engine load

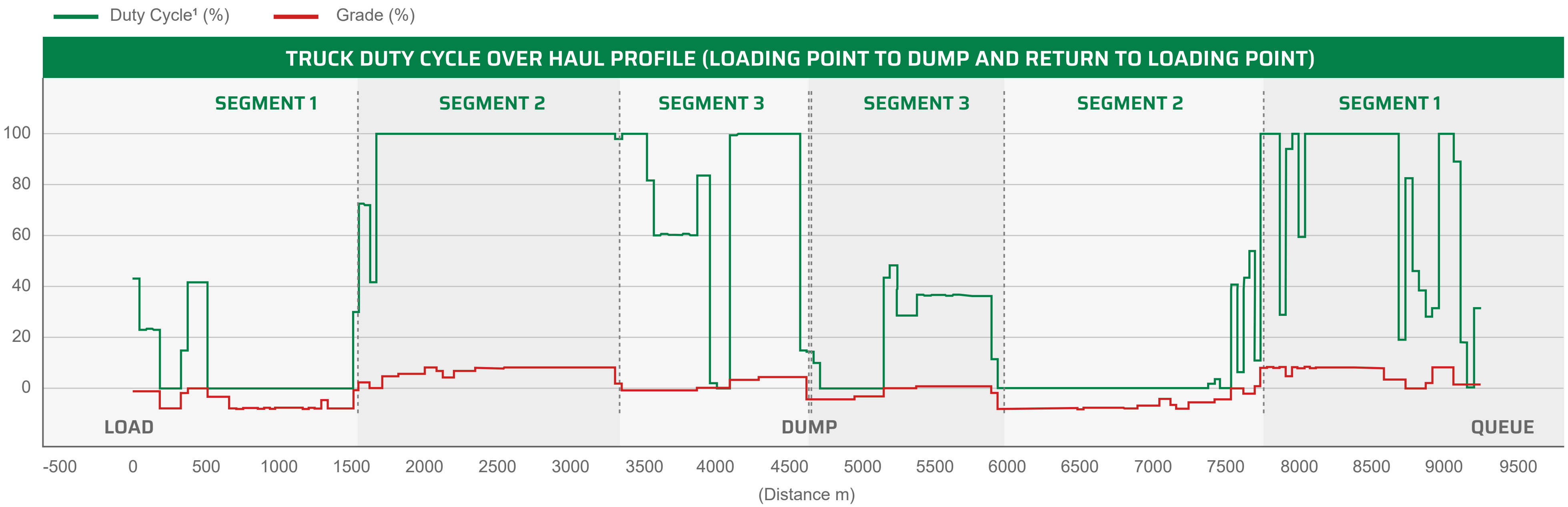
PROFILE C

	TONNAGE	LIFE	COMMENT
SEGMENT 1	16.5 Mtpa	1 years	Used by one truck & shovel fleet for year. Very mobile location. Solution must be relocatable/extendable. Road width may be restricted. Must allow for ancillary equipment to utilise road.
SEGMENT 2	32 Mtpa	3 years	Bridge and main ramp used by two truck & shovel fleets. Bridge location/ elevation changes as mining progresses. Solution must be relocatable. Road width may be restricted. Must allow for ancillary equipment to utilise road.
SEGMENT 3	16 Mtpa	1 years	Ramp to dump site - used by 1 truck & shovel fleet. Very mobile location. Solution must be relocatable.





PROFILE C



[1] ***Duty Cycle - the percentage of maximum engine load***

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SUPPLEMENTARY TECHNICAL INFORMATION

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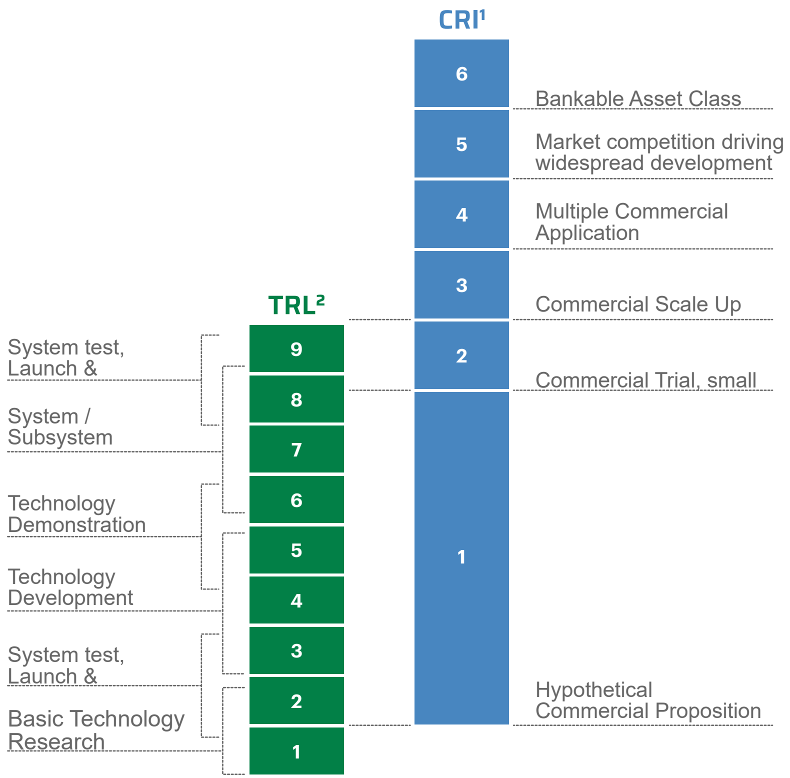
TRL FRAMEWORK



[1]*Commercial Readiness Index*
[2]*Technology Readiness Level*

Reference documents: ARENA (https://arena.gov.au/)

- *Technology Readiness Levels for Renewable Energy Sectors: https://arena.gov.au/assets/2014/02/Technology-Readiness-Levels.pdf*
- *Commercial Readiness Index for Renewable Energy Sectors: https://arena.gov.au/assets/2014/02/Commercial-Readiness-Index.pdf*

TECHNOLOGY READINESS

Level	Summary
1	Basic principles observed and reported: Transition from scientific research to applied research. Essential characteristics and behaviors of systems and architectures. Descriptive tools are mathematical formulations or algorithms.
2	Technology concept and/or application formulated: Applied research. Theory and scientific principles are focused on a specific application area to define the concept. Characteristics of the application are described. Analytical tools are developed for simulation or analysis of the application.
3	Analytical and experimental critical function and/or characteristic proof of concept: Proof of concept validation. Active research and development is initiated with analytical and laboratory studies. Demonstration of technical feasibility using breadboard or brassboard implementations that are exercised with representative data.
4	Component/subsystem validation in laboratory environment: Standalone prototyping implementation and test. Integration of technology elements. Experiments with full-scale problems or data sets.
5	System/subsystem/component validation in relevant environment: Thorough testing of prototyping in representative environment. Basic technology elements integrated with reasonably realistic supporting elements. Prototyping implementations conform to target environment and interfaces.
6	System/subsystem model or prototyping demonstration in a relevant end-to-end environment: Prototyping implementations on full-scale realistic problems. Partially integrated with existing systems. Limited documentation available. Engineering feasibility fully demonstrated in actual system application.
7	System prototyping demonstration in an operational environment: System prototyping demonstration in operational environment. System is at or near scale of the operational system with most functions available for demonstration and test. Well integrated with collateral and ancillary systems. Limited documentation available.
8	Actual system completed and qualified through test and demonstration in an operational environment: End of system development. Fully integrated with operational hardware and software systems. Most user documentation, training documentation, and maintenance documentation completed. All functionality tested in simulated and operational scenarios. Verification and Validation (V&V) completed.
9	Actual system proven through successful operations: Fully integrated with operational hardware/software systems. Actual system has been thoroughly demonstrated and tested in its operation al environment. All documentation completed. Successful operational experience. Sustaining engineering support in place.

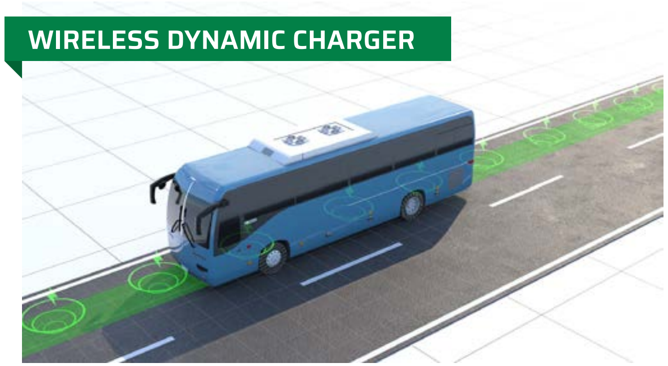
ILLUSTRATIVE CHARGE ON CONCEPTS

Ideas to stimulate thinking
Challenge is not restricted to these concepts

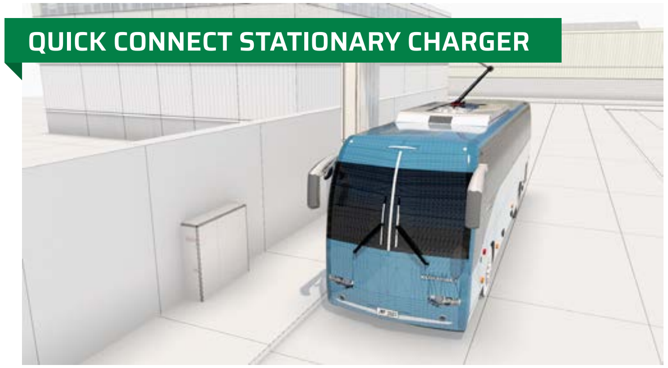
HIGH SPEED DYNAMIC CHARGING

MOBILE AUTONOMOUS CHARGER

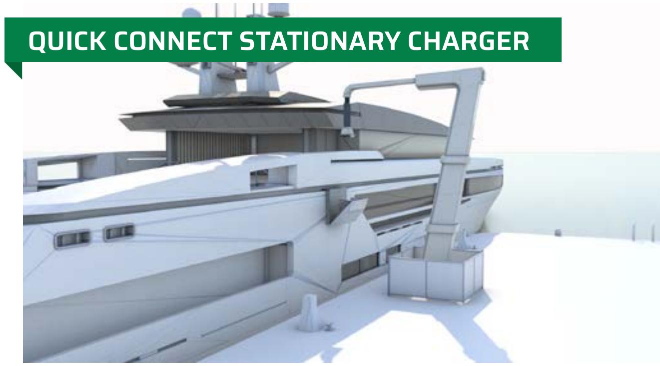
WIRELESS DYNAMIC CHARGER



QUICK CONNECT STATIONARY CHARGER



QUICK CONNECT STATIONARY CHARGER



BATTERY SWAPPING

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SUBMISSION REQUIREMENTS

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TECHNICAL INFORMATION REQUIRED AT INITIAL SUBMISSION

INFORMATION WE ARE REQUESTING

CATEGORY	CRITERIA	INFORMATION REQUESTED
Concept operability	HSE	• Identification of key risks and how they are managed/mitigated
	Energy delivery	• How many kWh can be supplied in a cycle for the supplied haul profiles (target 400kWh) • Breakdown of energy (kWh) and power (kW) transferred to truck, at each interaction point in the cycle • Can the solution simultaneously charge the battery and power the drive train? • Battery: charge rate, chemistry, total energy capacity (kWh), pack weight and volume, cost, round trip efficiency, and state of charge across the haul cycle
	Operational characteristics	• Has this technology/concept been deployed in other sectors? *i If yes, please provide the range of voltage level, current, and power.* *ii If yes, and if the solution applies to moving machinery, what are the current limits on speed, vibration?* • Can the solution be deployed on open spaces, including high levels of dust, fog, heavy rainfall, on unpaved ground? • Are there any major restrictions on elevation and operating temperature? • Can the solution be operated manually, or is a high level of precision needed? For the latter, are there any modifications needed on the truck/cab? • What are the limits of "misalignment" (positioning tolerance) between power source and sink, both vertically and horizontally? • How long does it take to establish the physical connection between source and sink? And for the decoupling? • How long does it need between the physical connection and before charging begins?
	Interoperability	• How the concept connects the truck and the mine grid to deliver electricity • Description of what needs to be located on the truck (weight, volume) and where on truck
	Integration & deployability	Description of: • Vendor to list/describe technology and operations assumptions/constraints. • how it is deployed, extended, relocated (if relevant) • for dynamic charging solutions (minimum turning radius)
Commercialisation	Technology readiness	• Articulation of technology development plan showing timing of key milestones
	Commercial readiness	*Nothing at EOI*
	Vendor capability	• Identification of gaps to commercialize and plan for how gaps will be filled
	Vendor needs	• Articulate Vendor support requirements and preferred commercial model(s) to support commercialization plan (ie equity, commitment to purchase, grant, in-kind etc) including timing
Value	Productivity	*Nothing at EOI*
	Life cycle	*Nothing at EOI*
	Capital intensity	*Nothing at EOI*

INFORMATION WE ARE REQUESTING AT FINAL SUBMISSION (1 of 2)

CATEGORY	CRITERIA	CRITERIA DESCRIPTION	INFORMATION REQUESTED
Concept operability	HSE	Overall HSE rating and degree to which defensive design and fail-safe principles are incorporated into concept	• Overall risk assessment • dentification of key risks and how they are managed/mitigated • Any restrictions relating to environment in which system operates (eg max/min ambient temperature, elevation, vibration, rainfall). Is there a range of extra design features that would be required for extra low/high ambient conditions • Any supplementary fire protection/Thermal runaway prevention information including but not limited to battery cell/module testing data and certifications (IEC62133, IEC 62660, IEC 61982, ISO 12405, UL Subject 2580, etc.)
	Energy delivery	Concept effectiveness of energy delivery (Breakdown of energy consumed by the truck, energy delivered directly to the drive train, and energy to battery across the haul cycle)	• How many kWh can be supplied in a cycle for the supplied haul profiles (target 400kWh) • Charging topology information (onboard/offboard) and whether bi directional Vehicle to grid (V2G) is contemplated (optional) • Breakdown of energy (kWh) and power (kW) transferred to truck, at each interaction point in the cycle • How many trucks can be charged simultaneously, max charge rates per vehicle and understanding of option to stagger charging on a fleet wide basis • Battery assumptions: charge rate, chemistry, total energy capacity (kWh), pack weight and volume, cost, round trip efficiency, and state of charge across the haul cycle • Can the solution simultaneously charge the battery and power the trucks drive train? • Breakdown of energy delivered direct to drivetrain or via battery (and the associated energy losses) for each haul cycle • Description of the expected impact on power quality resulting from operation of your technology - particularly in relation to power factor, harmonics, phase imbalance and electrical transients
	Operational characteristics	Concept ability to operate in physical environment	• Has this technology/concept been deployed in other sectors? *i If yes, please provide the range of voltage level, current, and power.* *ii If yes, and if the solution applies to moving machinery, what are the current limits on speed, vibration?* • Can the solution be deployed on open spaces, including high levels of dust, fog, heavy rainfall, on unpaved ground? • Are there any major restrictions on altitude and operating temperature? • Can the solution be operated manually, or is a high level of precision needed? For the latter, are there any modifications needed on the truck/cab? • What are the limits of “misalignment” (positioning tolerance) between power source and sink, both vertically and horizontally? • How long does it take to establish the physical connection between source and sink? And for the decoupling? • How long does it need between the physical connection and before charging begins? • Information on whether Vendor has any experience with Energy Management Systems and if so provide details
	Interoperability	How well does the system scale to charge different truck sizes, and how easy would it be to configure to different truck OEMs	• How the solution physically and electrically connects to the truck (assume a high voltage connection point is available on the mine site to supply power) • Is there range of AC supply voltages that the product could be adapted to receive for different installations (i.e standardize voltage to what voltage exists on sites already) • How is it scaled from 220t to 360t payload truck? • What are your requirements of truck Original Equipment Manufacturers (OEMs) to ensure interoperability • Does the battery OEM have any Inverter compatibility requirements (regarding OEMs or technical parameters) • Can the battery OEM provide experience of BMS compliance with specific inverter OEMs • Description of what needs to be located on the truck (weight, volume) and where on truck
	Integration & deployability	Ease of implementing the solution into an operating mine site (and ability to retrofit) - is there an impact to mine operations to deploy the solution - how complex is the solution	Description of: • Vendor to list/describe technology and operations assumptions/constraints. • How it is deployed, relocated, extended (if relevant) • Dynamic Charging solutions (minimum turning radius, required road width, and maximum number of trucks per segment) • How does production continue when system is undergoing maintenance • If relevant, how the solution allows for mining equipment to utilise the same road as your solution (relocating diggers, dozers, water carts etc)

INFORMATION WE ARE REQUESTING AT FINAL SUBMISSION (2 of 2)

CATEGORY	CRITERIA	CRITERIA DESCRIPTION	INFORMATION REQUESTED
Commercialisation	**Technology readiness**	Maturity of concept/technology (TRL) Can the system be trialled on-site by 2023?	• Table showing the Technology Readiness Level rating for each subsystem & articulation of technology development plan showing timing of key milestones • When will the system be ready for trialling on a mine site? • Are there any limitations on where the trial could be conducted (above and beyond limitations on eg max/min ambient temperature, elevation, vibration, rainfall)
	Commercial readiness	Rating of Commercial Readiness (CRI) Time to market *https://arena.gov.au/assets/2014/02/Commercial-Readiness-Index.pdf*	• Commercialization plan showing timing of key milestones and assessment of Commercial Readiness Index • Projected pathway for cost decline as a function of production volume/economies of scale/automation (either entire vehicle or individual components)
	Early implementation	Opportunity to implement technology on existing diesel-electric truck fleets	• For mobile charging concepts, describe if/how it can be applied to provide propulsion to a diesel-electric truck
	Vendor capability	Organisation capability and ability to commercialize	• Clear mapping of development plan requirements against organisation capability, • Identification of gaps to commercialize and plan for how gaps will be filled, • Company track record on new product development, • Experience in delivering product and services to industrial environment
	Vendor needs	Vendor support requirement	• Articulate Vendor support requirements and preferred commercial model(s) to support commercialization plan (ie equity, commitment to purchase, grant, in-kind etc) including timing • Any limitations on Vendor support availability (considering global application)
Value	**Productivity**	Potential impacts on annual production	• Change to cycle time • Expected system availability, reliability • Information regarding redundancy levels for on board components or number of fleet and charging stations • Impact on payload (What part of the contact solution has to be carried by the truck and what is its Volume, Weight)
	Life cycle	Expected life of key equipment and life cycle assessment	• Expected life of key equipment and life cycle assessment including O&M and replacement costs (Project life span and component design life, Capacity degradation, Round trip efficiency, Operating and maintenance costs including capital replacements where applicable)
	Capital intensity	What is the relative capital cost intensity between different proposals	• Capital cost requirements to supply each of the three haul profiles (Profiles A, B and C) • Opportunities for optimisation including future projections with economies of scale and material availability

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