

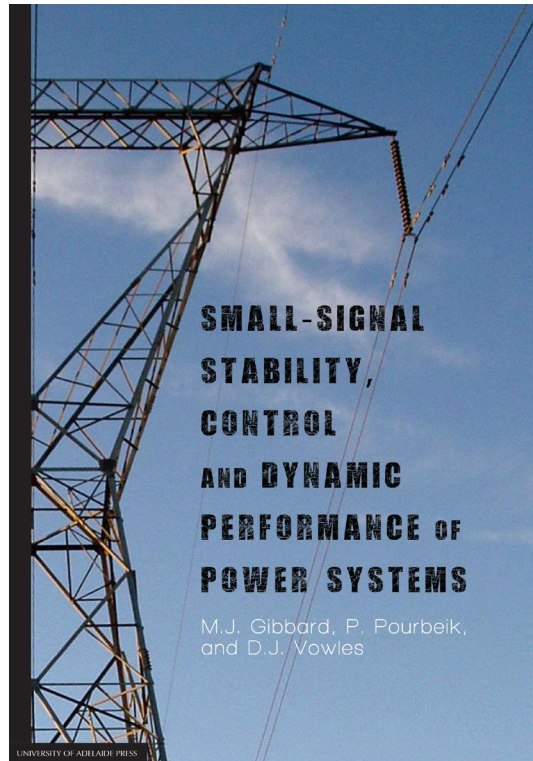
Mine Operational Vehicle Electrification (MOVE) Project

A/Prof. Wen L. Soong
University of Adelaide

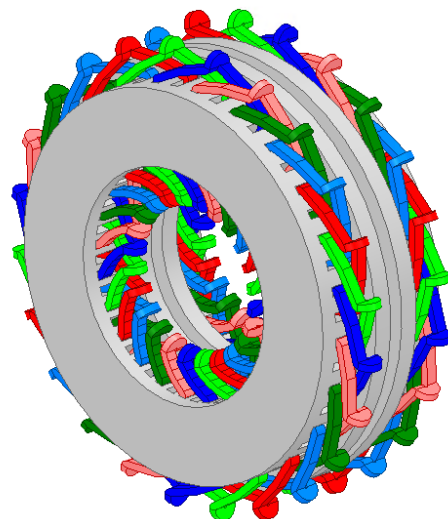
Net Zero Emission Mining WA
01 September 2022



Power Engineering @ University of Adelaide



Power System Dynamics
Mudpack software



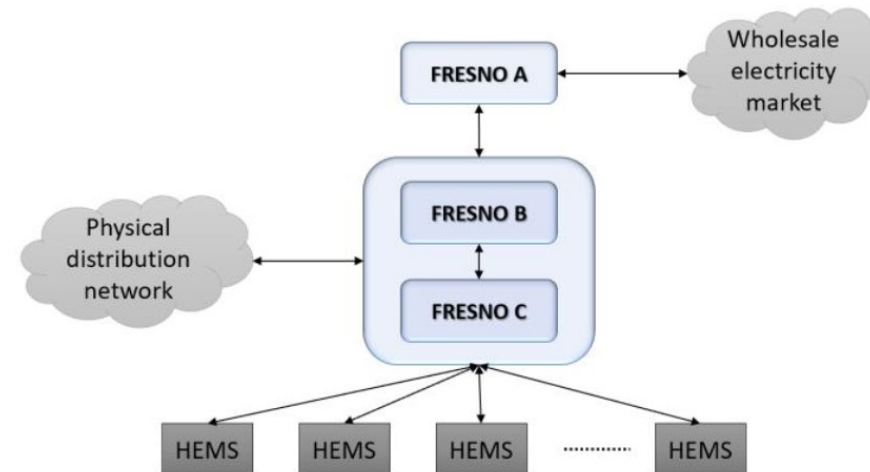
Electric Machine and Drives
Axial-flux machines



Aust. Energy Storage Knowledge Bank
270kW/270kWh



Australian Government
Australian Renewable Energy Agency



Flexible Aggregator Simulation Software
renewables, EVs,
smart grid simulation

watts



THE UNIVERSITY
of ADELAIDE

Need for Mine Electrification

Aggregated volume of Scope 1 and 2 emission of eight mining companies is 1 MtCO₂

True value impacts of full electrification of a mine can be demonstrated ...with one of the largest areas being **ventilation (~35% of emission generation)**.

A Case Study in Transformative Collaboration, The Electric Mine Consortium.



Building climate resilience has been identified as a trend for redefining mining and metals organizations

Tracking the Trends 2022 - Redefining Mining, Deloitte.

Zero-emission vehicles (ZEVs) can reach total-cost-of-driving parity with conventional diesel vehicles by 2035 for all medium- and heavy-duty (MD/HD) vehicle classes (without incentives).

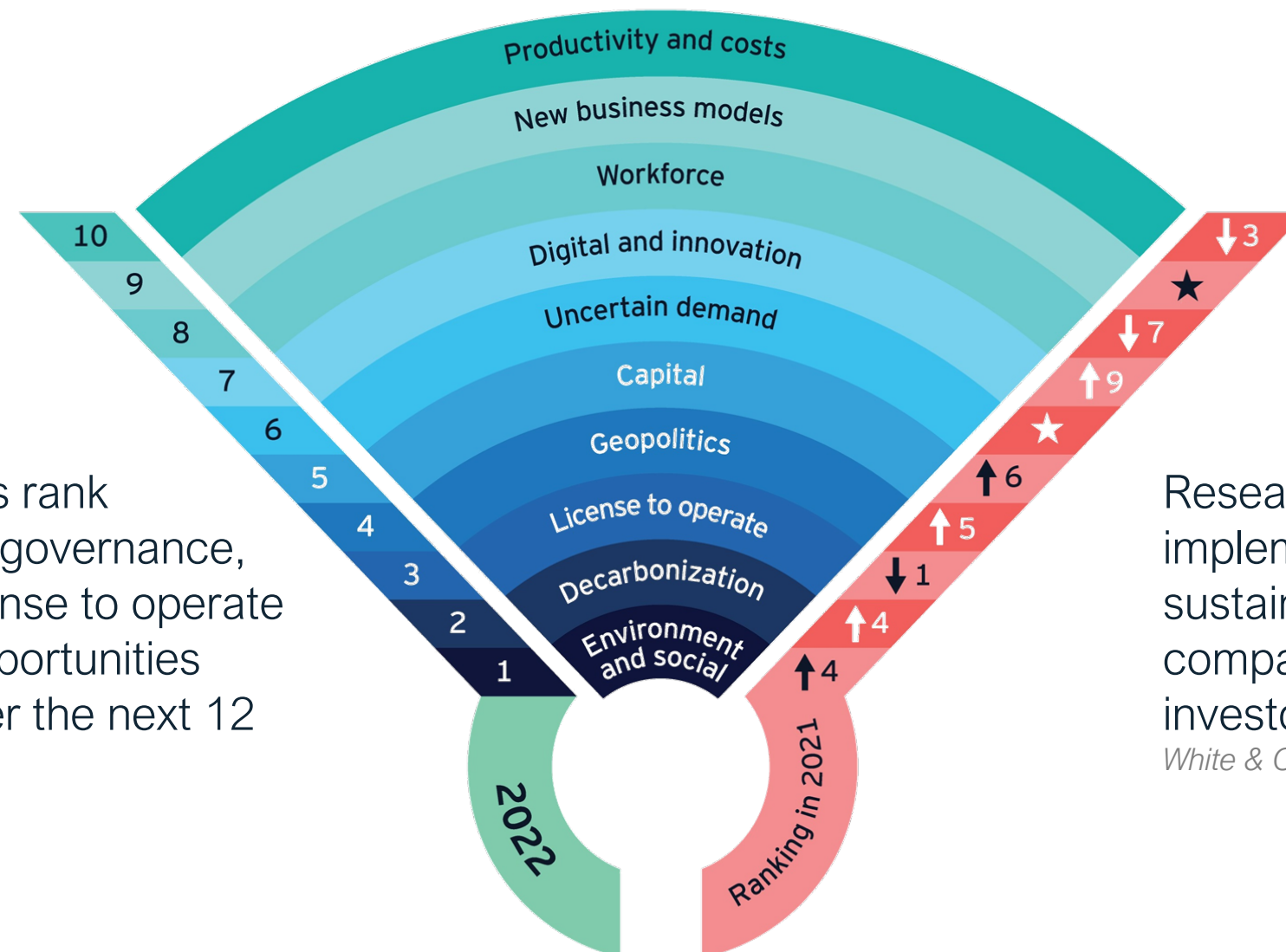
Decarbonizing Medium- & Heavy-Duty On-Road Vehicles: Zero-Emission Vehicles Cost Analysis , NREL.



Need for Mine Electrification

Global mining executives rank environment, social and governance, decarbonization and license to operate as the top three risks/opportunities facing their business over the next 12 months

EY, October 2021, [link](#)



Research shows that after successful implementation of ESG and sustainability initiatives, mining companies become more attractive to investors and financiers alike.

White & Case, September 2021, [link](#)

About the FBICRC MOVE Project



PROJECT TITLE

Assessment, design and operation of battery-supported electric mining vehicles and machinery

ULTIMATE GOAL

To provide the **Australian mining industry** with the **tools** and **information** needed to **help transition their operations to using battery-supported electric vehicles** and associated stationary machinery

TWO CASE STUDIES

- Leinster Underground Mine, WA (BHP)
- Nova Operation, WA (IGO)

FBICRC MOVE Project Partners



MINING INDUSTRY



CONSULTING



INSTITUTES, GOVERNMENTS & UNIVERSITIES



Work Packages



ENERGY system study and data collection

DEVELOPMENT of a detailed energy consumption plan for the existing fleet and machinery



DEVELOPMENT of the toolkit to design backbone energy infrastructure

PROPOSAL for sensing and communication networks to monitor and control electrified machinery



DEVELOPMENT of software, tools and frameworks for the management of mine site EV fleets and associated infrastructure



IDENTIFYING the required skills of the future workforce and producing training materials

DELIVERING short courses

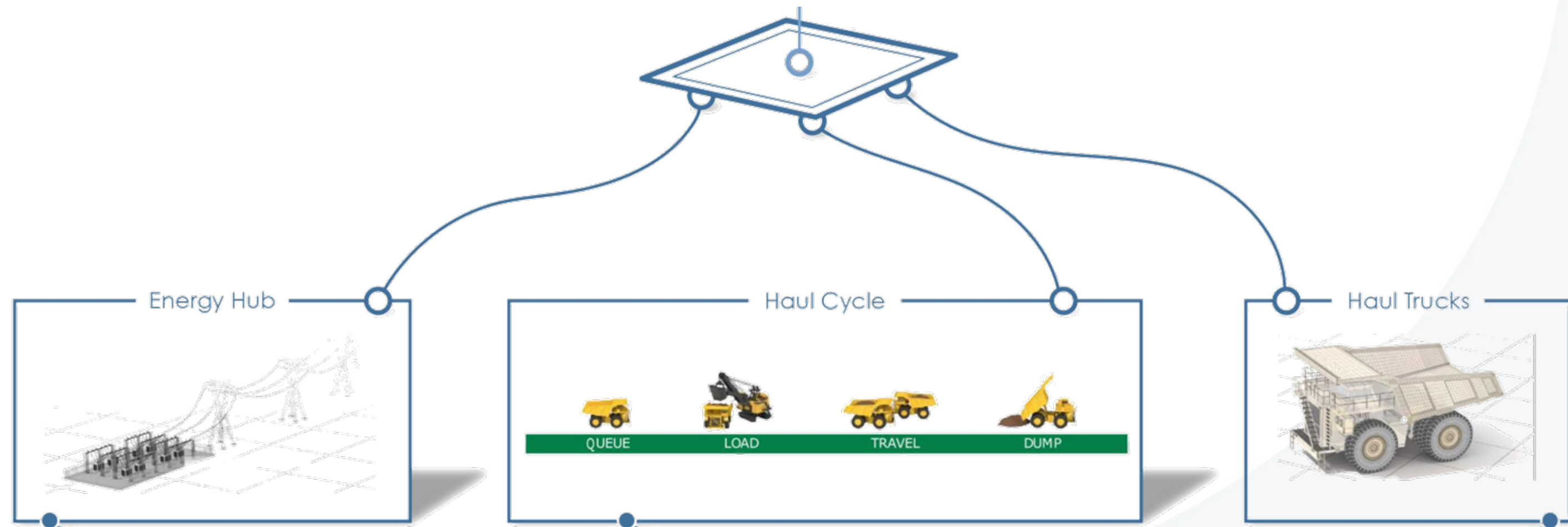
Main Questions

- 1 How much **battery power and capability** is needed onboard the vehicles?
- 2 When, where, and how should the battery should be **recharged**?
- 3 What is the required **energy infrastructure** to generate and deliver electricity?
- 4 What are the skills required for the **future workforce** of full electric mines?
- 5 What is a sensible **mine electrification strategy** considering **costs, benefits and risks**?



Major Deliverables: tools to assist in ...

- 1) **Vehicle Scheduling/Optimisation:** charging, productivity, costs, redundancy etc
- 2) **Energy Infrastructure Design:** charging, renewables, storage, back-up etc



Economic Implications

- Reduced operating costs
 - Reduced ventilation energy costs (can be up to 70% of operating costs)
 - Reduced vehicle energy and maintenance costs
 - Reduced sensitivity to fuel price variations
- Potential for higher productivity
 - improved data monitoring
 - pathway to automation



Major Outcomes

- 1 Helping mining companies respond to the challenge of transitioning to net zero and developing “greener” products by **creating a road map to net zero operation**
- 2 Lowering operating costs and improving productivity
- 3 Improving on-site health and safety
- 4 Demonstrating the capabilities and benefits of new technologies



make
history.

