

# Oilsands Mining Performance



04.04.23



# Executive Summary

- A productive and efficient mining fleet is a key part to the success of oilsands mining.
- With the size and scale of the mining operations in the oilsands, a focus on asset optimization is critical to allow for a safe, predictable and profitable operation.
- Will explore the operational focused actions to maximize asset value in a large-scale mining operation.





# Introduction





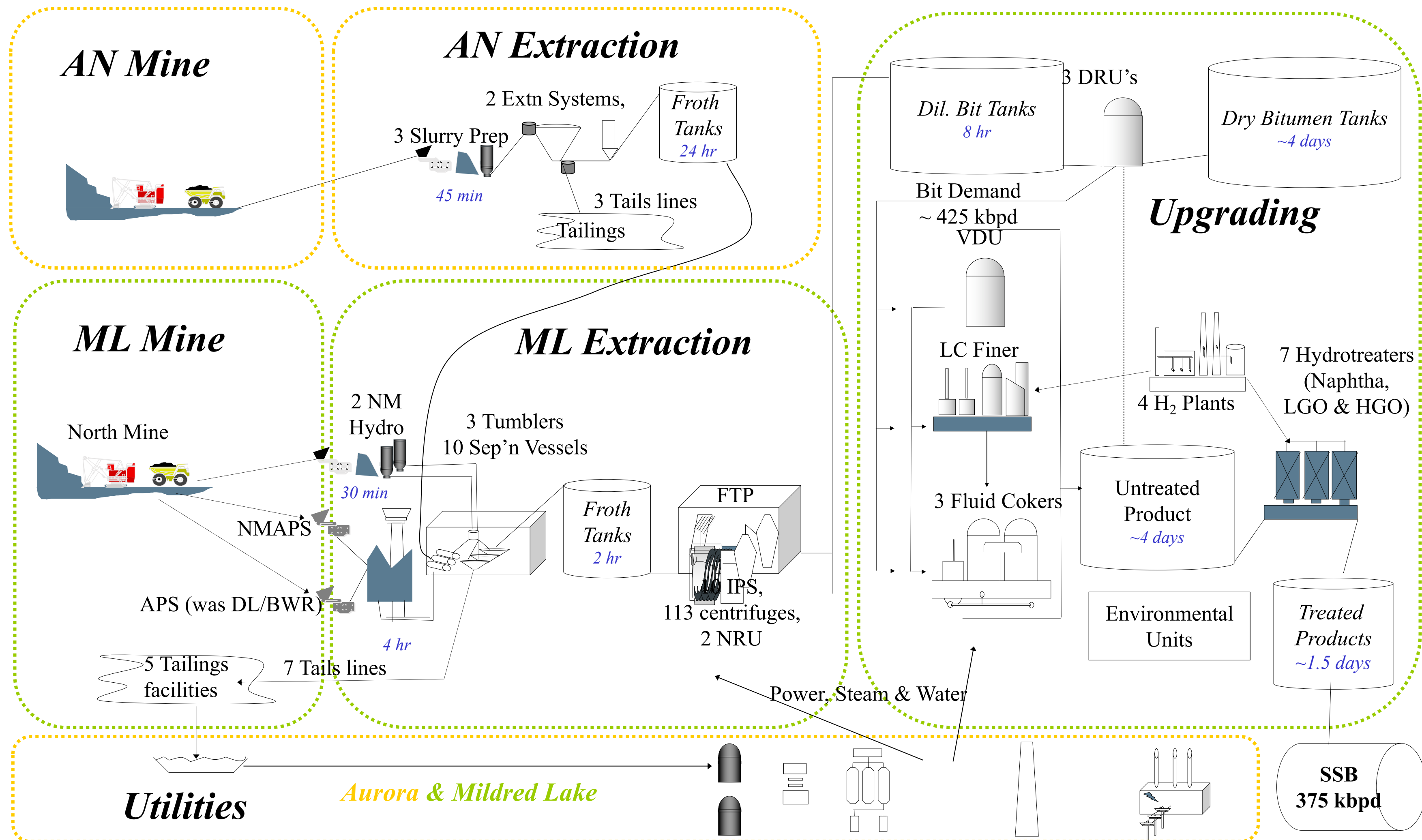
# Who We Are

## The Oilsands

- Alberta is the largest crude oil producer in Canada, accounting for more than **82%** of the country's production. Two-thirds of this oil comes from the oil sands.
- There are about **170 billion barrels** of proven crude oil reserves in Canada, which makes it the **third-largest supply** in the world.
- **Canada is the fourth-largest producer and exporter** of oil in the world. Two-thirds of Canada's crude oil is exported, with the majority going to the United States.



# Production System





# Safe Operations





# Human and Organizational Performance (HOP)

- Error is normal – People make mistakes
- Blame fixes nothing – Seek improvements, not blame
- Learning and improving are vital – Workers are problem solvers
- Context drives behaviour – Ask what is failing, not who is failing
- How you respond to failure matters – Encourage other to share openly

**THE FIVE PRINCIPLES OF HUMAN & ORGANIZATIONAL PERFORMANCE**  
*Developed by Dr. Todd Conklin, expert in Human & Organizational Performance*

**ERROR IS NORMAL.**  
Even the best people make mistakes.  
Error is not a problem to be solved but a fact. The problem is a system that didn't protect the worker when a mistake was made. Systems should never be dependent on workers being perfect. No one is perfect.

**BLAME FIXES NOTHING.**  
Don't find blame. Fix systems.  
Don't limit yourself to the quest for worker error or procedural non-compliance, you will always find both. Instead, seek controls and safeguards to prevent the next event.

**LEARNING AND IMPROVING ARE VITAL.**  
Workers are not a problem to be solved, but the problem solvers.  
What systems, processes and tools do you have to openly elicit feedback?  
How open are you to receiving honest feedback?  
How committed are you to making changes based on feedback received?

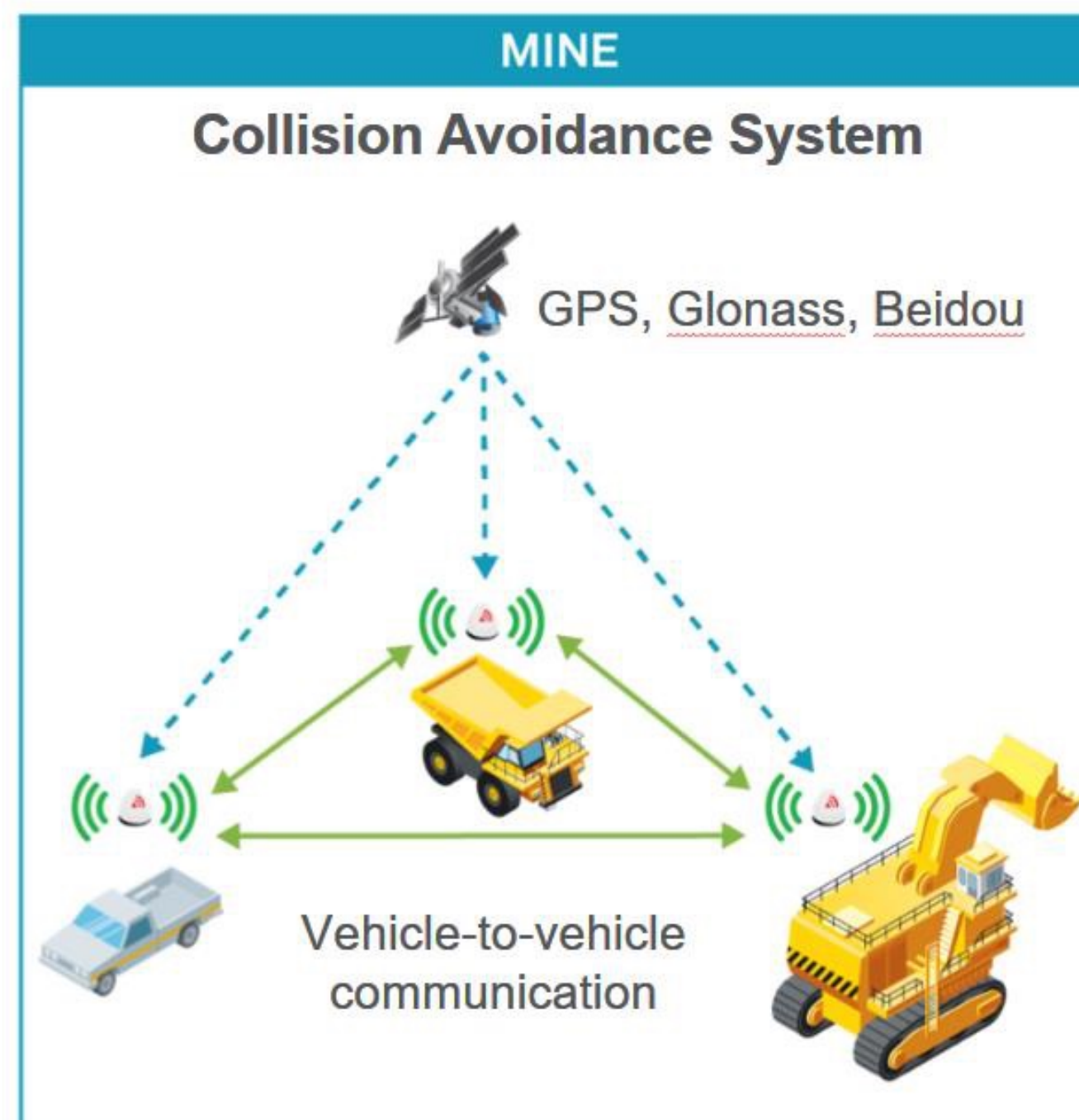
**CONTEXT DRIVES BEHAVIOUR.**  
Workers do what they do for a reason, and the reason makes sense to the worker given the context.  
If you aren't achieving successful outcomes don't ask WHO is failing ask WHAT is failing.

**HOW YOU RESPOND TO FAILURE MATTERS.**  
You can blame and punish or you can learn and improve, but you can't do both.  
Focus on learning, understand what is happening when nothing bad is happening, and encourage workers to share openly when things are going wrong.



# Technology - Collision Awareness System (CAS)

- Mining collision awareness technology.
- Over 1,500 units equipped.
- Uses real-time GPS information.



Awareness of nearby vehicles



Alerting operators to a potential collision risk



Warnings levels relate to the risk of a potential accident with another vehicle.



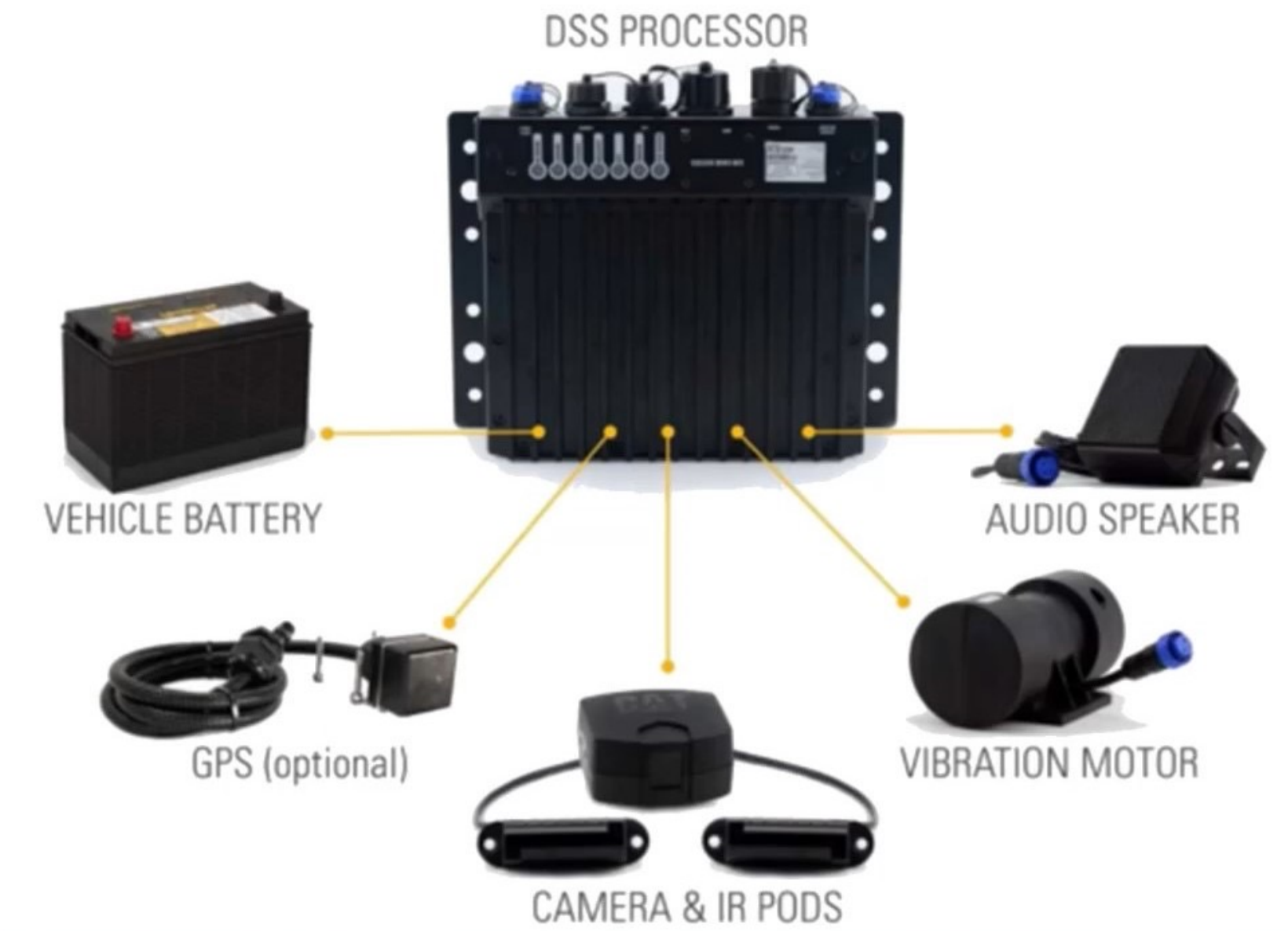


# Fatigue Management

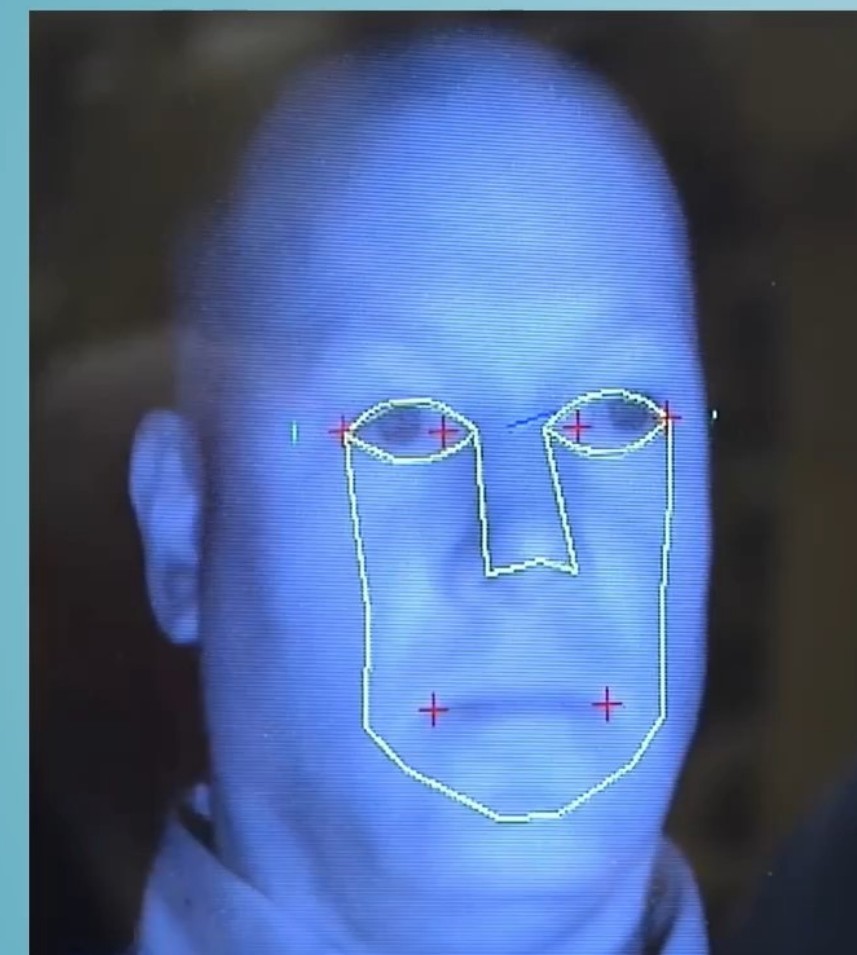
- Driver Safety System (DSS)



## Driver Safety System Components



## Driver Safety System



In-Cab Camera



Forward-Facing Camera



Seat Vibrator





# Responsible Operations





# Indigenous Relations and Mining

- Performance is measure by more than just tonnes
- Economic inclusion of local Indigenous communities is a core value
- Ensure our mining strategy benefits those here long before us





Availability





# Maintenance Practices and Technologies – One Team Approach

- Design it Right
  - Start at the foundation and understand what we are dealing with
  - Collaboration with industry and Vendors
  - Technology
- Maintain it right
  - Equipment strategies
  - Technology
  - Vendor relationship and engagement
  - Shops set up for the right equipment
- Operate it Right
  - Training
  - Alarm Management
  - Human factors and training.





# Productivity Operational Improvements





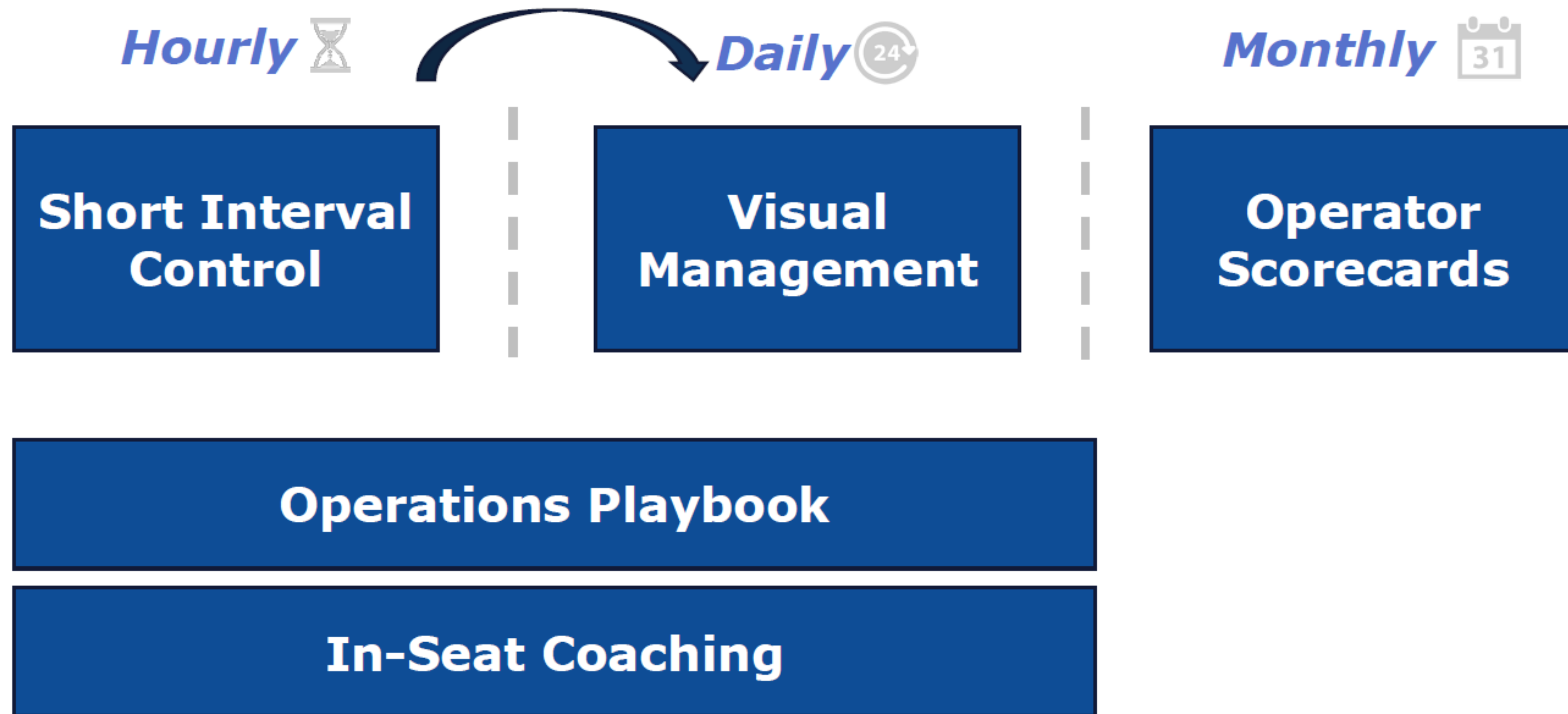
# Productivity Improvements – Constant Focus

- Constant, consistent focus on truck performance
- Fleet Management System
- Data Informed
  - Get the information to the real time decision makers
  - Reinforce performance
- Technology – Autonomous Haul Systems





# Management Operating System





# Technology, Looking Forward and Decarbonization





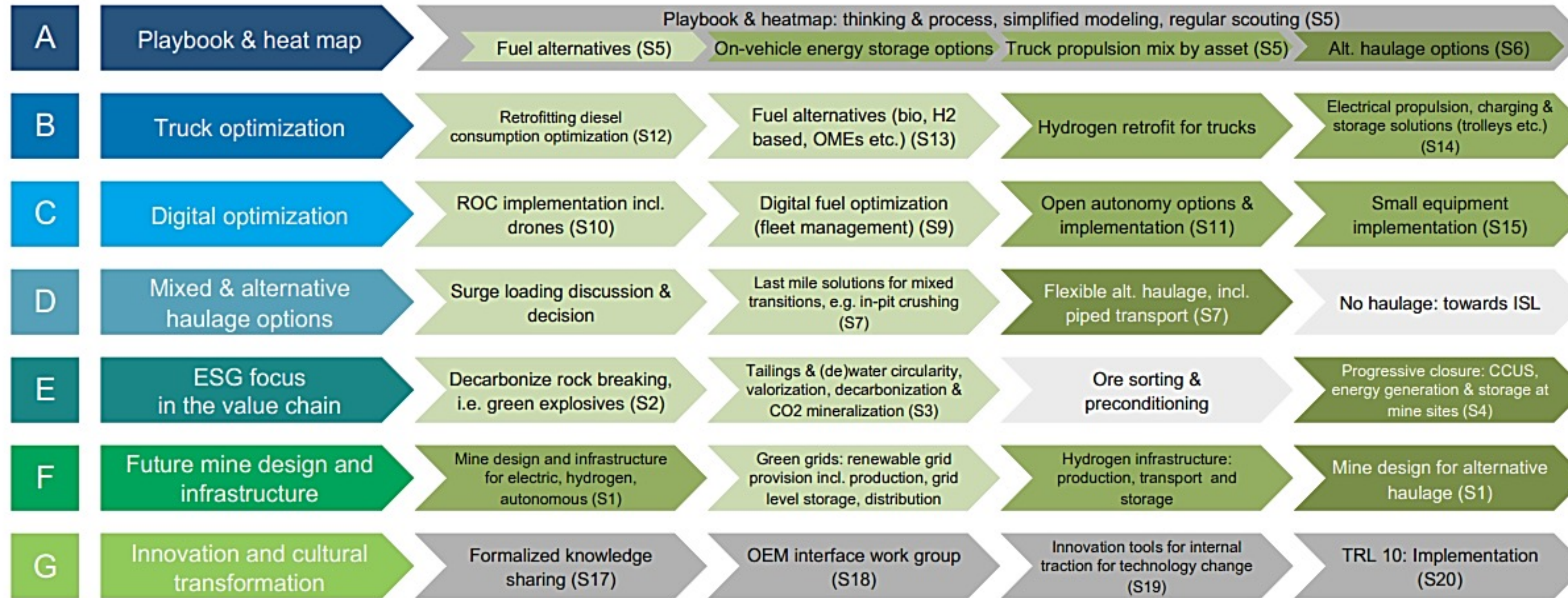
# Looking Forward

- The Future now:
  - Autonomous Haulage System (AHS)
- Research and Development (R&D)
- Collaboration
  - Canadian Mining Innovation Council (CMIC)
  - Pathways
  - COSIA





# Looking Forward - CMIC Surface Mining Roadmap



Developed through collaborative workshops between Canadian Mining Innovation Council member companies in Q4 2022.

- Launching first projects in 2023:
- Playbook
  - Truck Retrofits

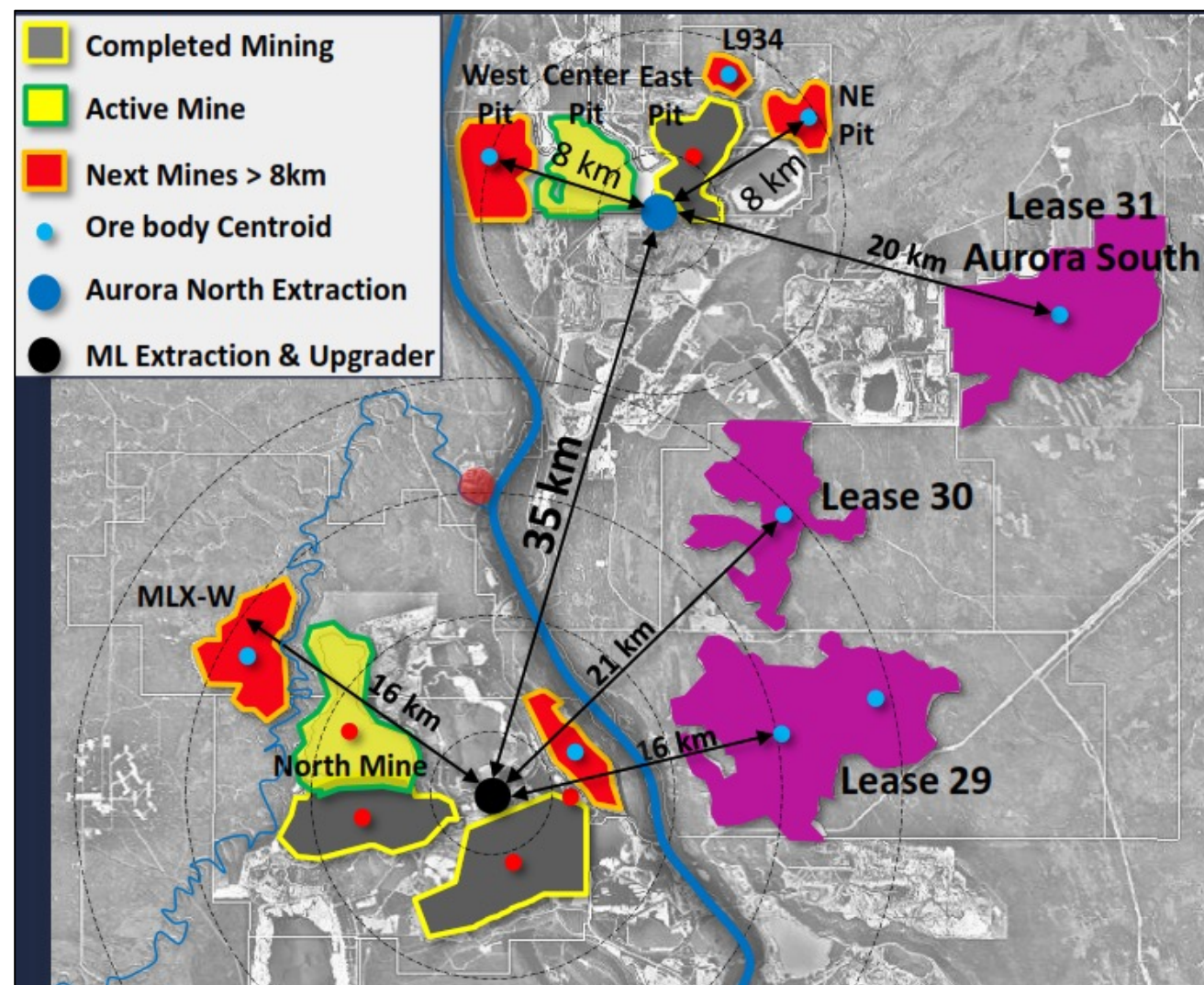


The numbers (S1) to (S20) refer to the project work sheets from the workshop.

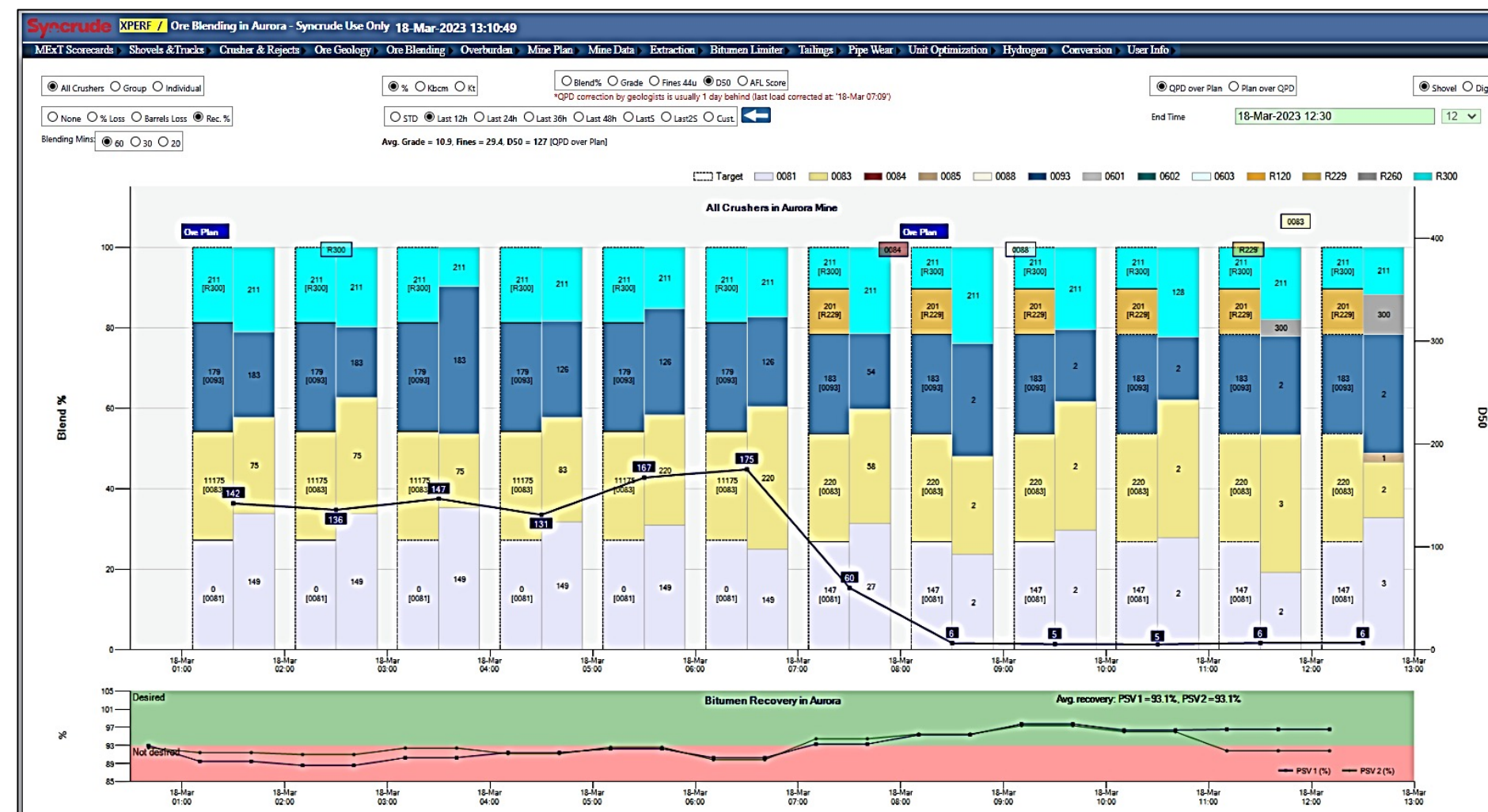


# Looking Forward – The Future

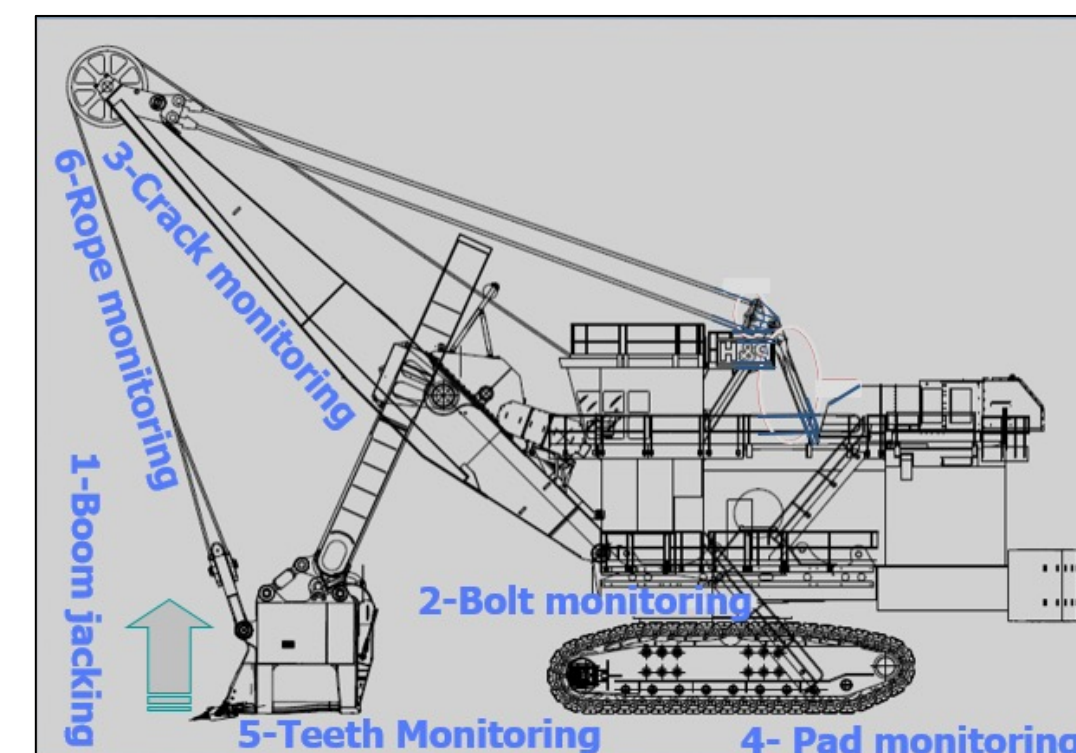
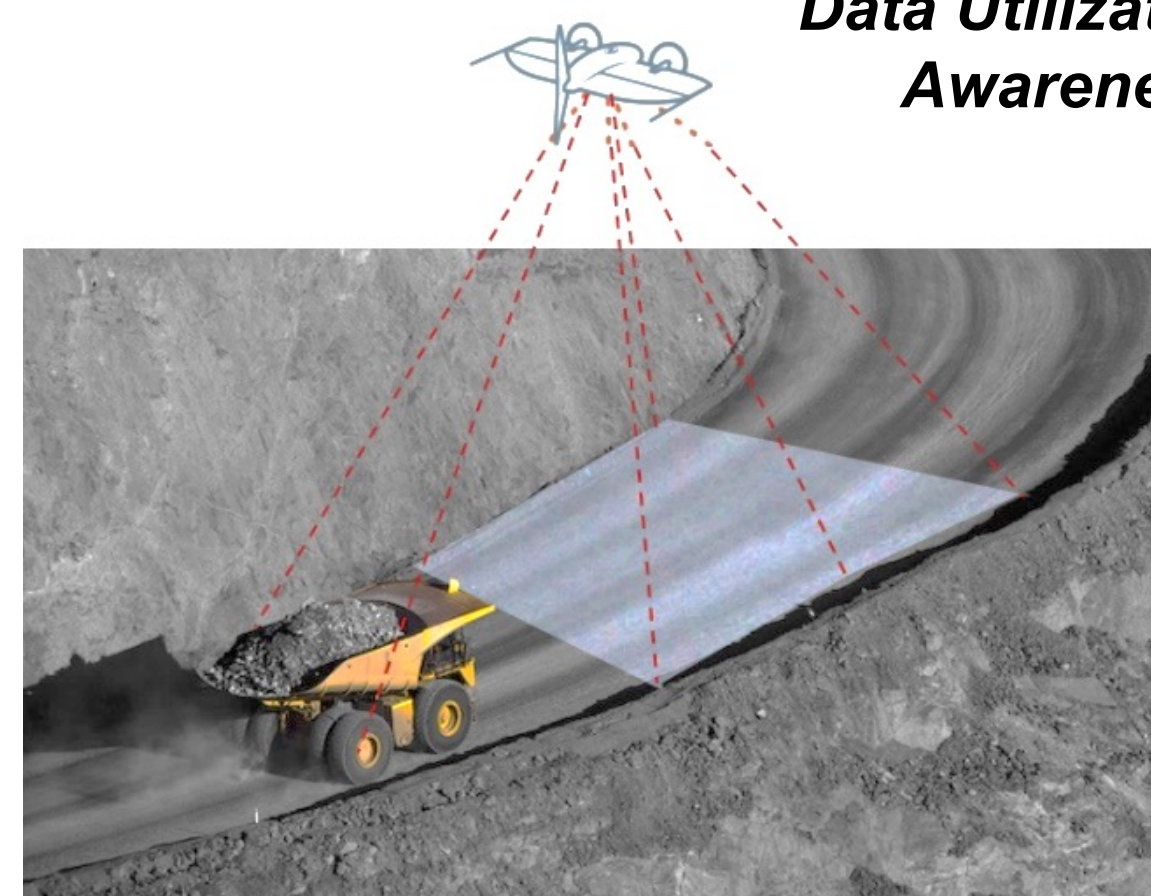
## Hauling Farther



## Digital & Automated



## More Productive



**Truck Body Build Up with Robotic Laser Welding**

**Haul road condition monitoring with drones** Source: U. of Toronto

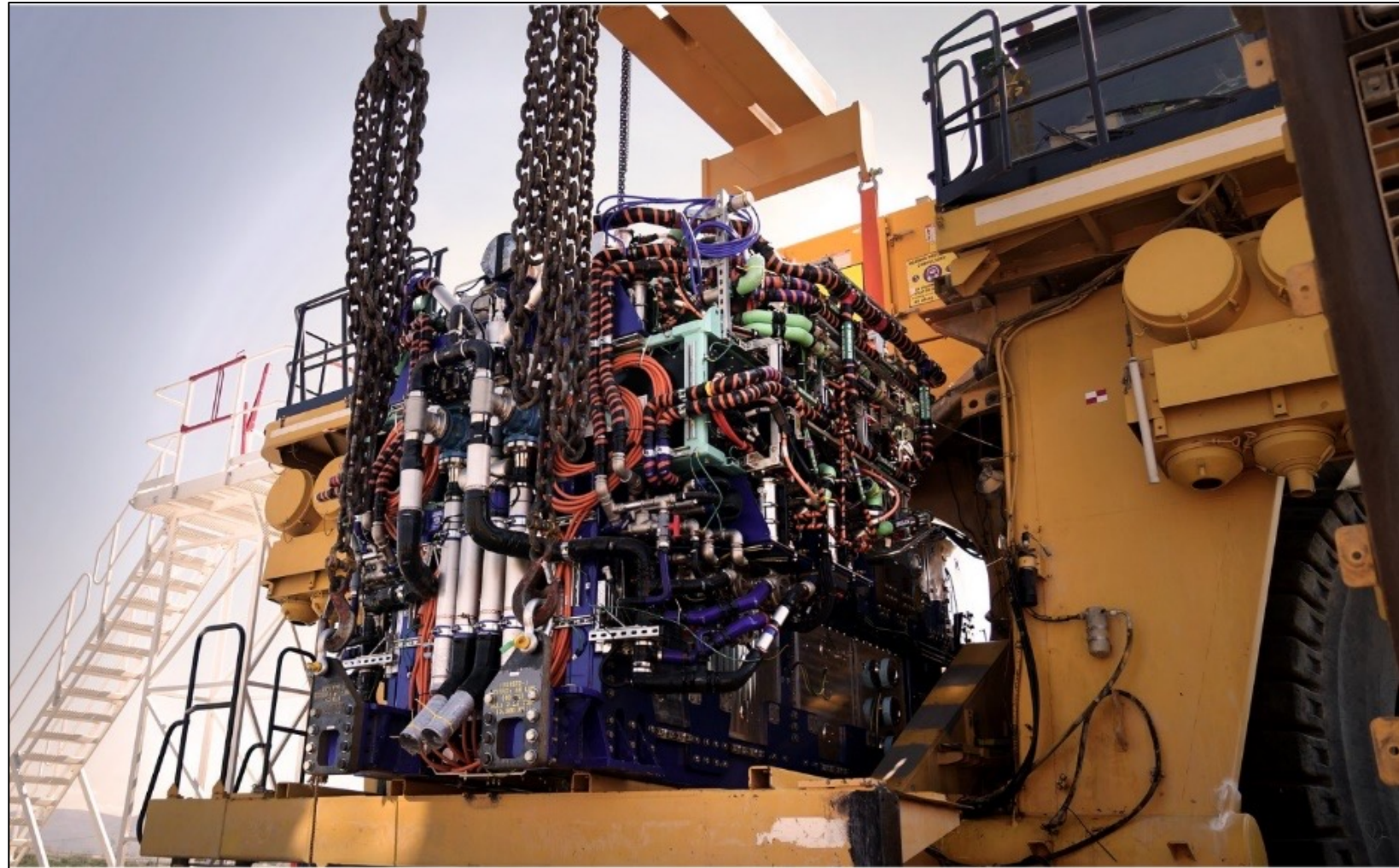
**Shovel Condition Monitoring to Predict Failures & Target Maintenance**



# Looking Forward – The Future

## Powered Differently (Decarbonized)

**More Flexible**

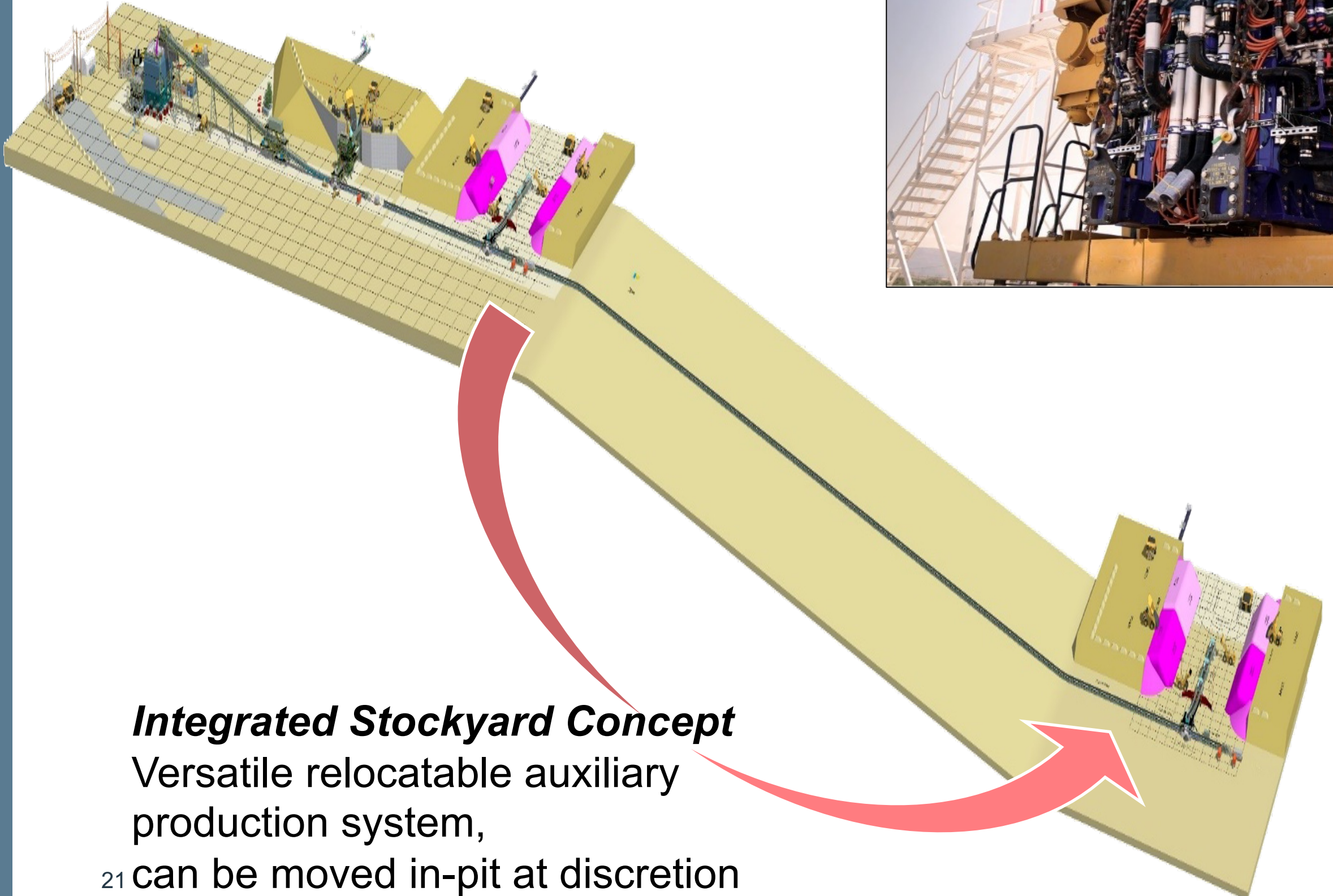


**Hydrogen Power Plant**  
Source: First Mode / Anglo American

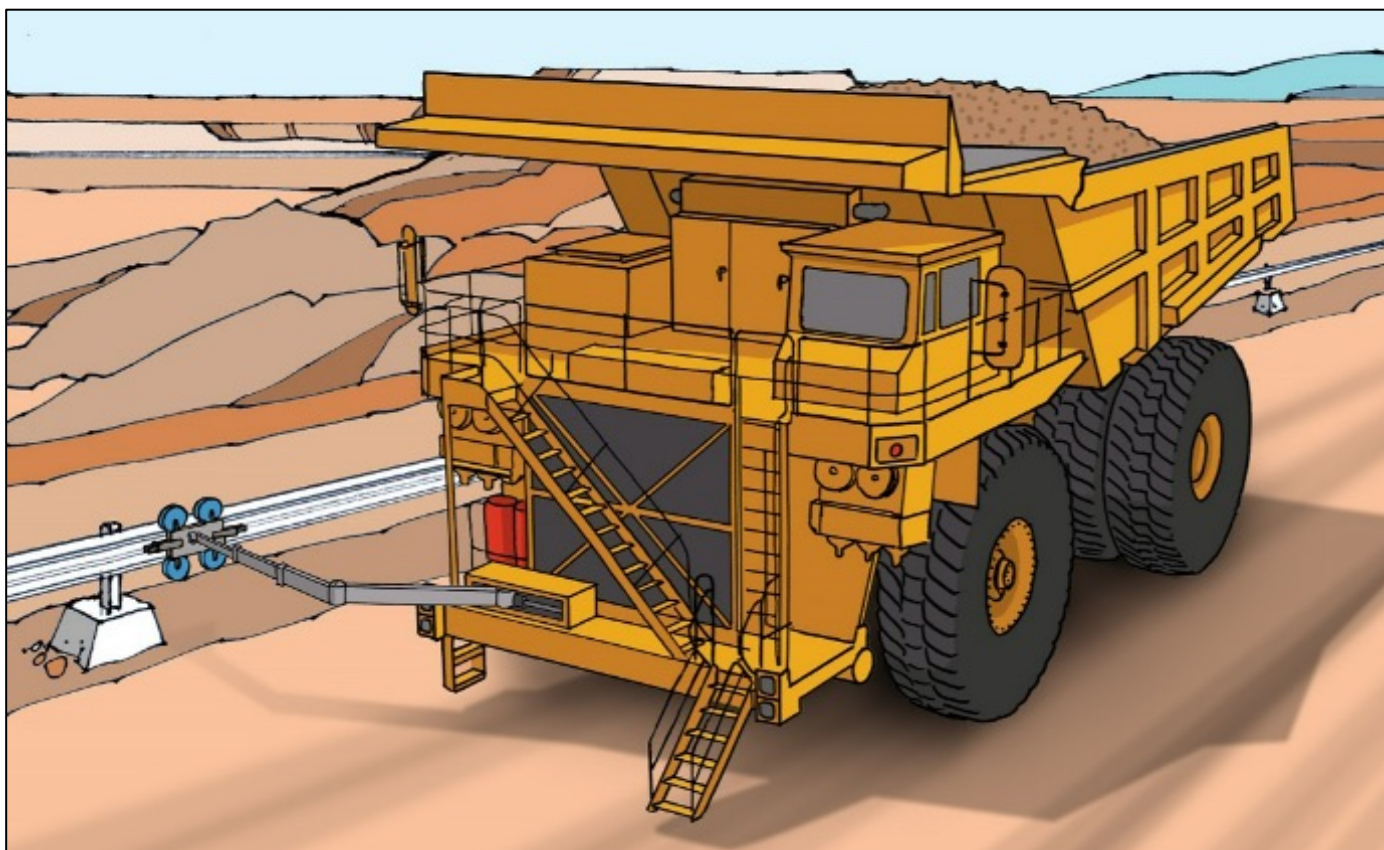


> 1 B  
litres per year of renewable diesel to be produced

On January 26, Imperial Oil Canada confirmed it plans to build a \$720 million renewable diesel facility at its Strathcona refinery near Edmonton. | Screenshot via Twitter/@ImperialOil



**Integrated Stockyard Concept**  
Versatile relocatable auxiliary production system, can be moved in-pit at discretion



**Rail Charging System for Battery-Electric Trucks**  
Source: Bluvein

**Renewable Diesel Available in Future**

Source: The Western Producer





**Thank you**

