

THE NEW MINING RESEARCH CHALLENGES

Session 3

Aligning an applied research & innovation program with industry needs



Mr. Paul Revell

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General Manager – Research & Innovation

ALIGNING AN APPLIED RESEARCH & INNOVATION PROGRAM WITH INDUSTRY NEEDS

Role of an applied research & development program

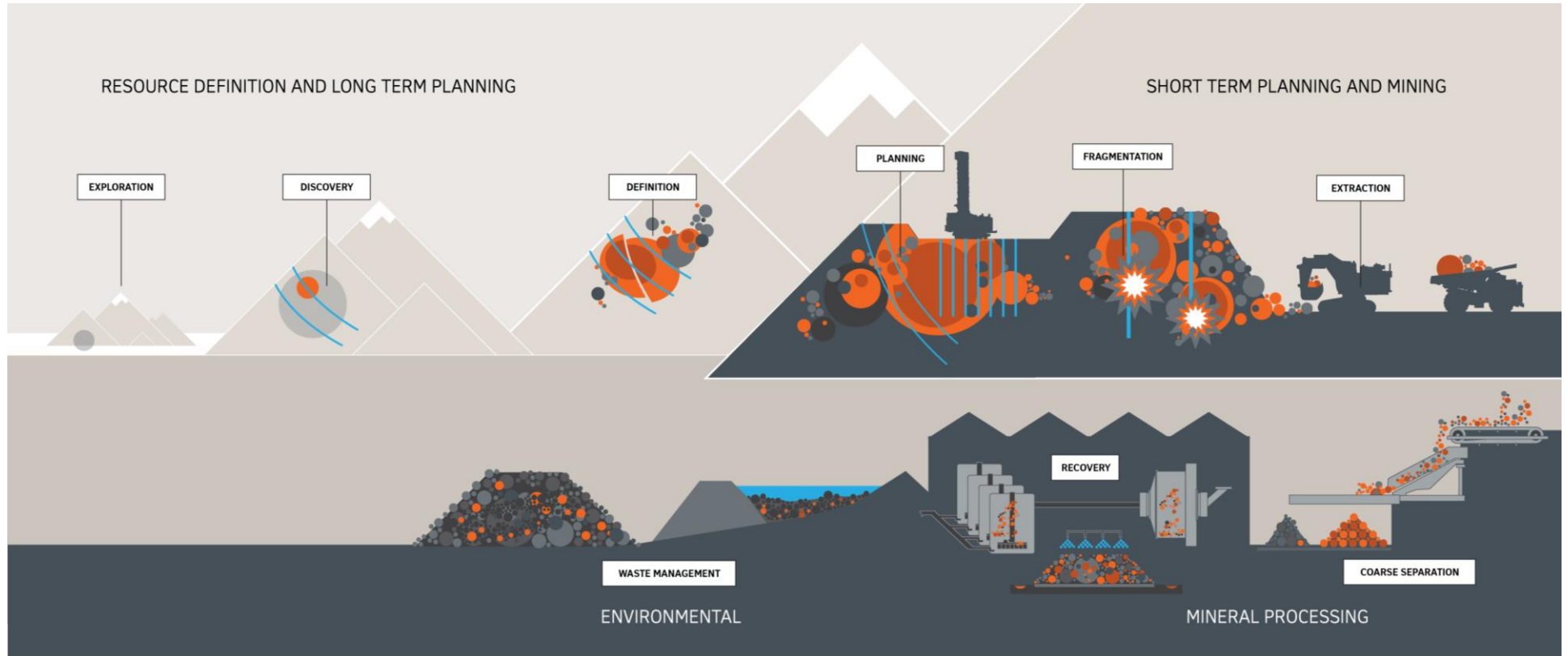
- Understand the mining workflow, and the constraints to productivity
- Identify enabling technologies that address the constraint
- Develop and explain the value proposition for uptake of the technology
- Form partnerships to develop the technology and turn it into a product

Then, leverage the effort of the uptake

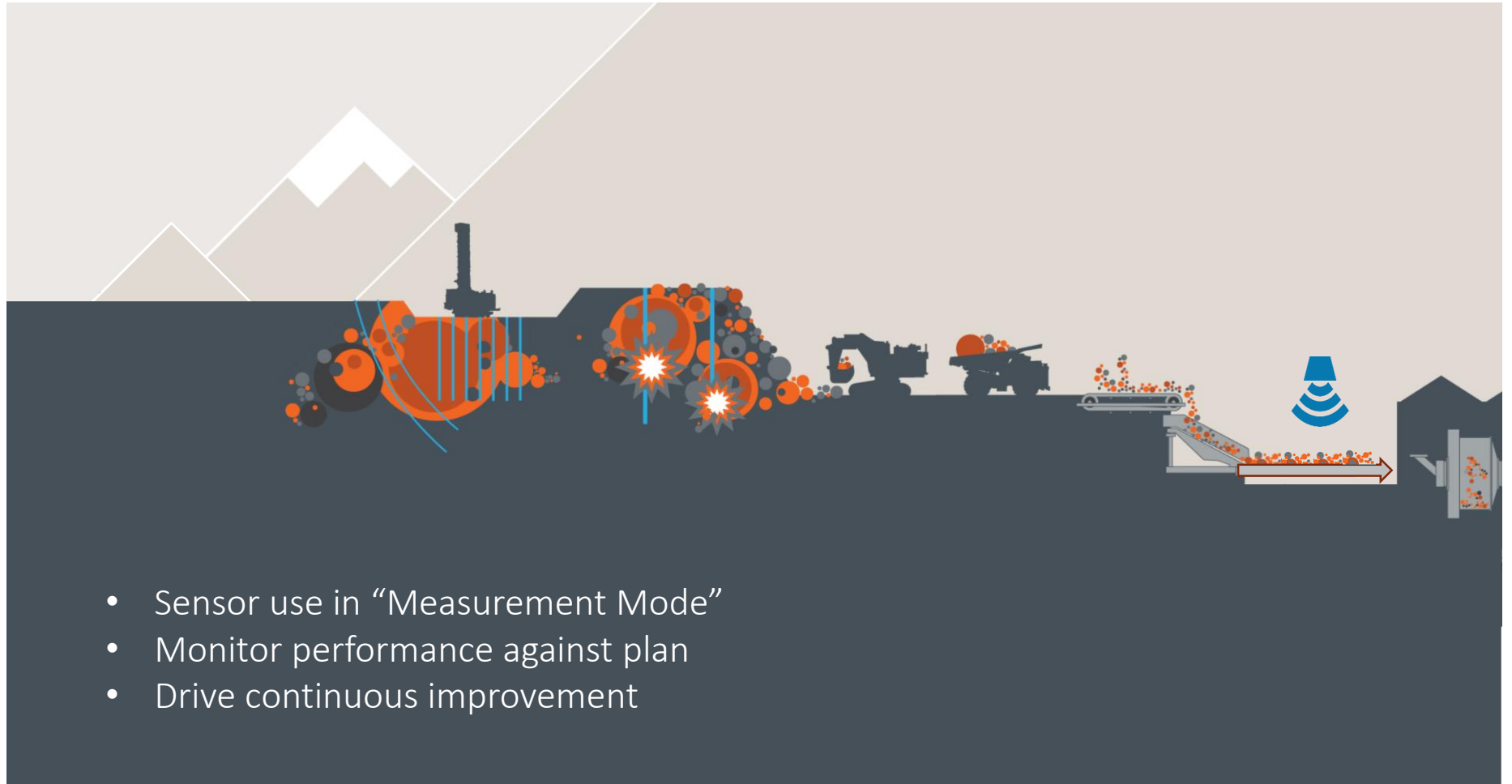
- **Develop additional value adding use cases for the same technology**
- **Position the new use cases for uptake once the prototyping of the base case technology has been completed**

Case Study : Use of sensors in the mining value chain

MINING VALUE CHAIN



SENSORS IN MEASUREMENT MODE



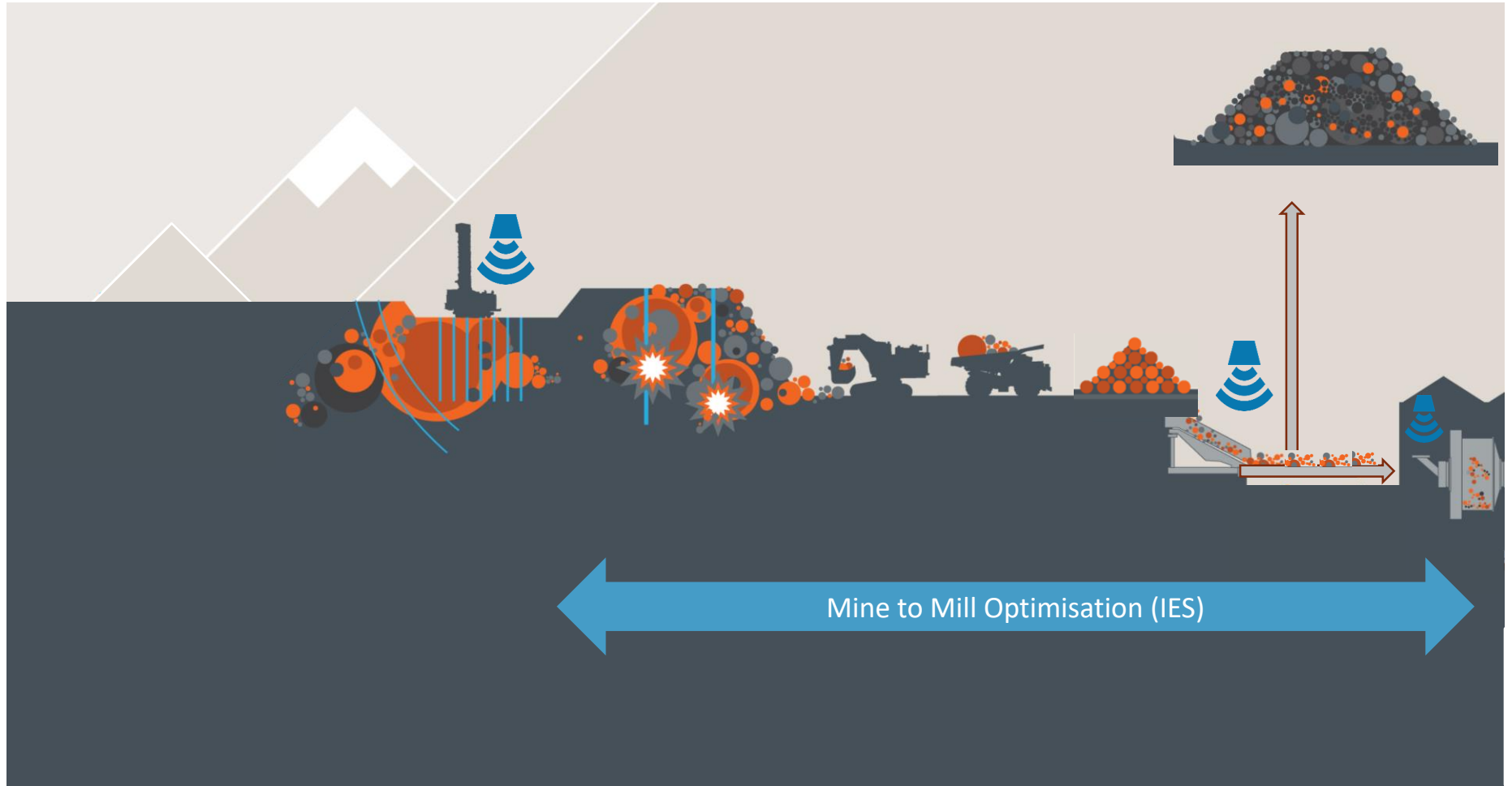
SENSORS IN INTERVENTION MODE



- Emerging trend of Sensor use in “Intervention Mode”
- Sensed data used to intervene in the process and determine material destinations
- Significantly higher value add than Measurement Mode
- 80% of CRC ORE Mining Participants now actively prototyping in this space

What other use cases are there ?

USE CASE #1 – M2M OPTIMISATION



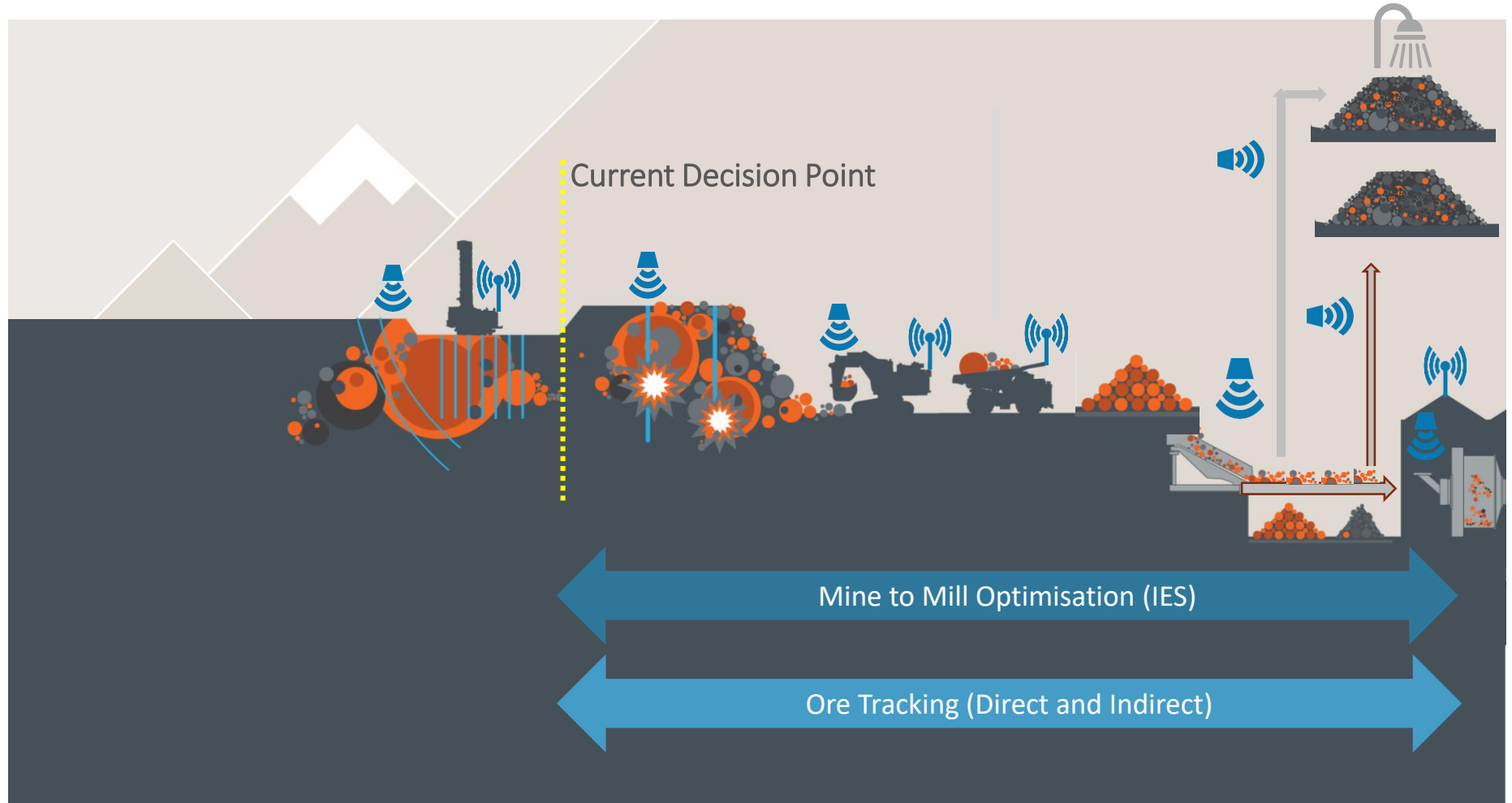
USE CASE #2 – ORE TRACKING



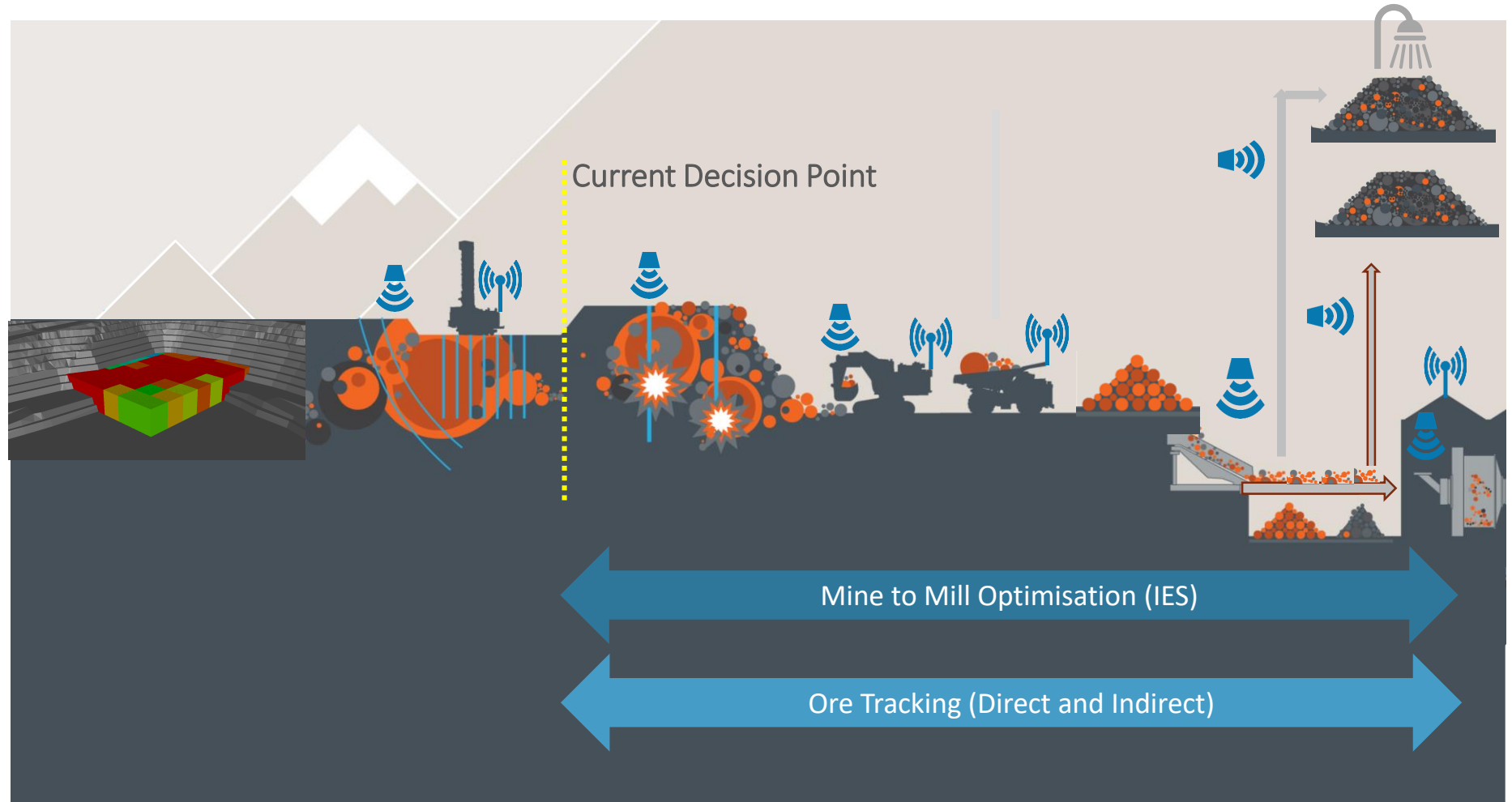
USE CASE #3 - SENSORS IN PLANNING



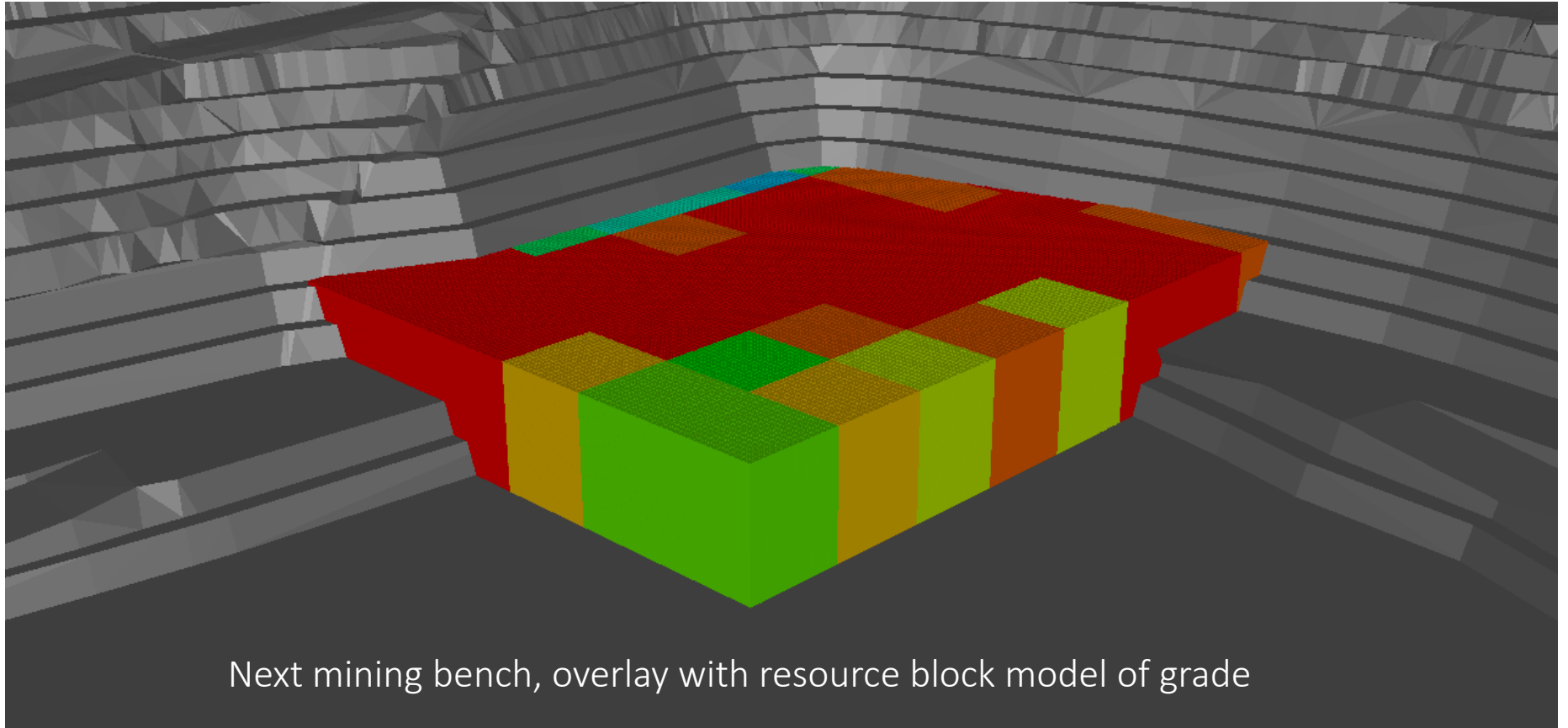
USE CASE #3 - SENSORS IN PLANNING



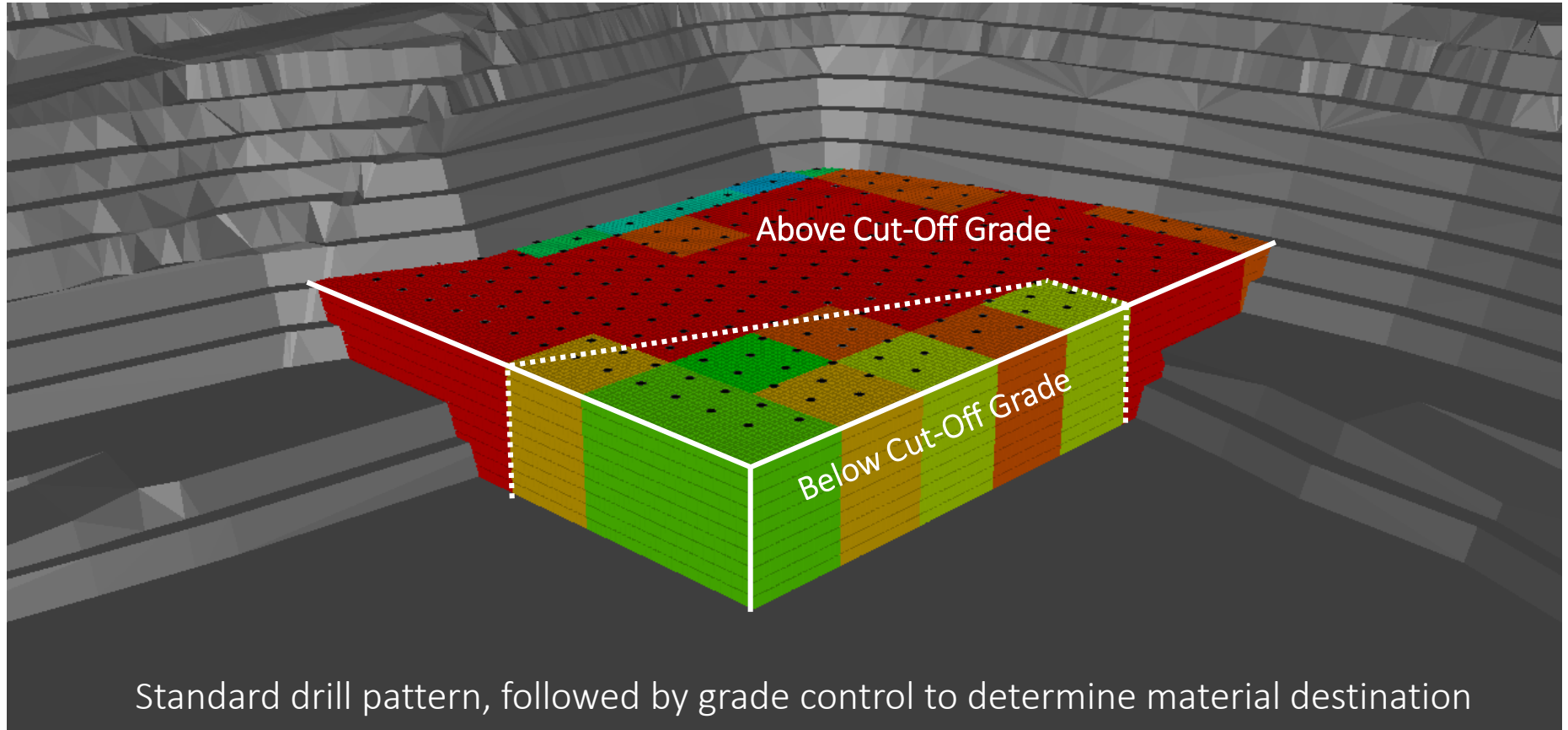
USE CASE #3 - SENSORS IN PLANNING



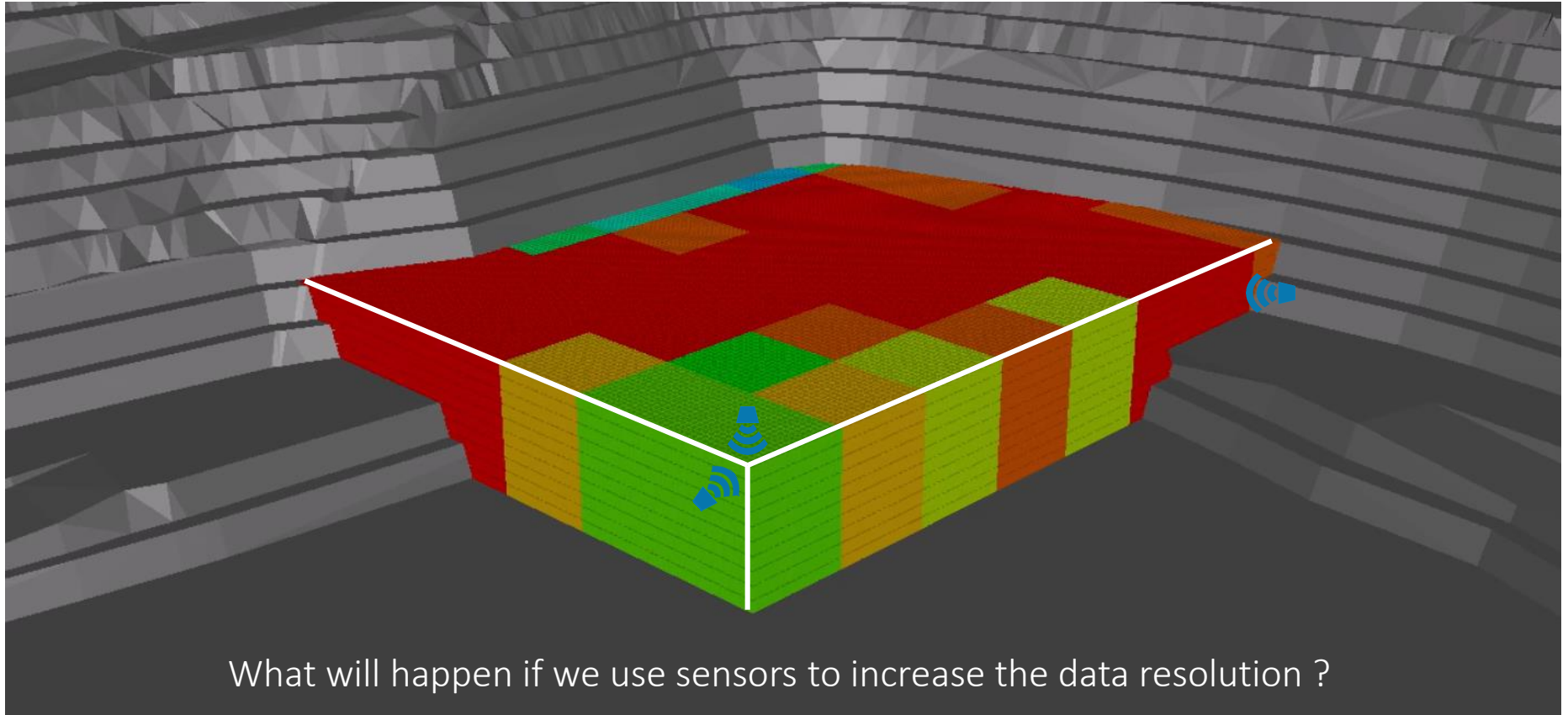
CURRENT SHORT TERM PLANNING



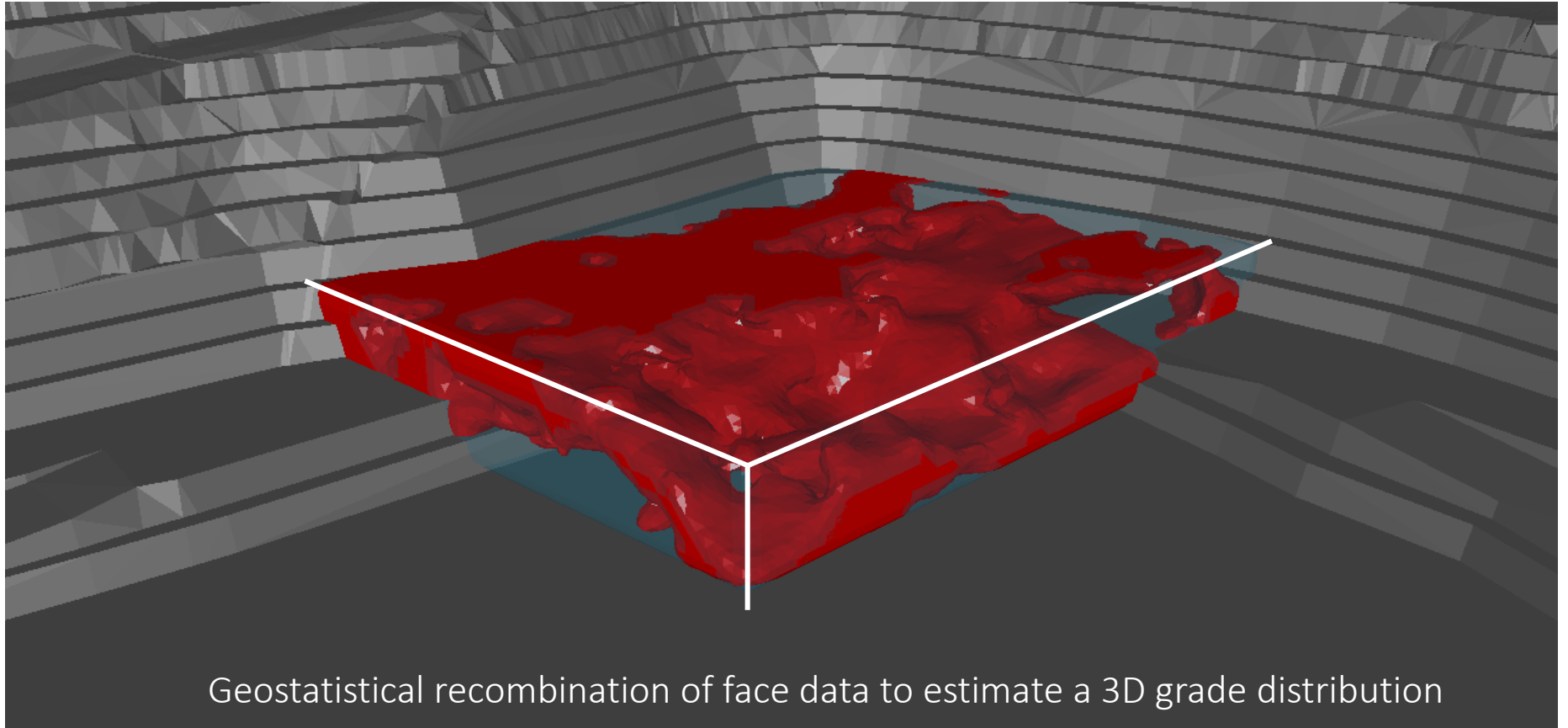
CURRENT SHORT TERM PLANNING



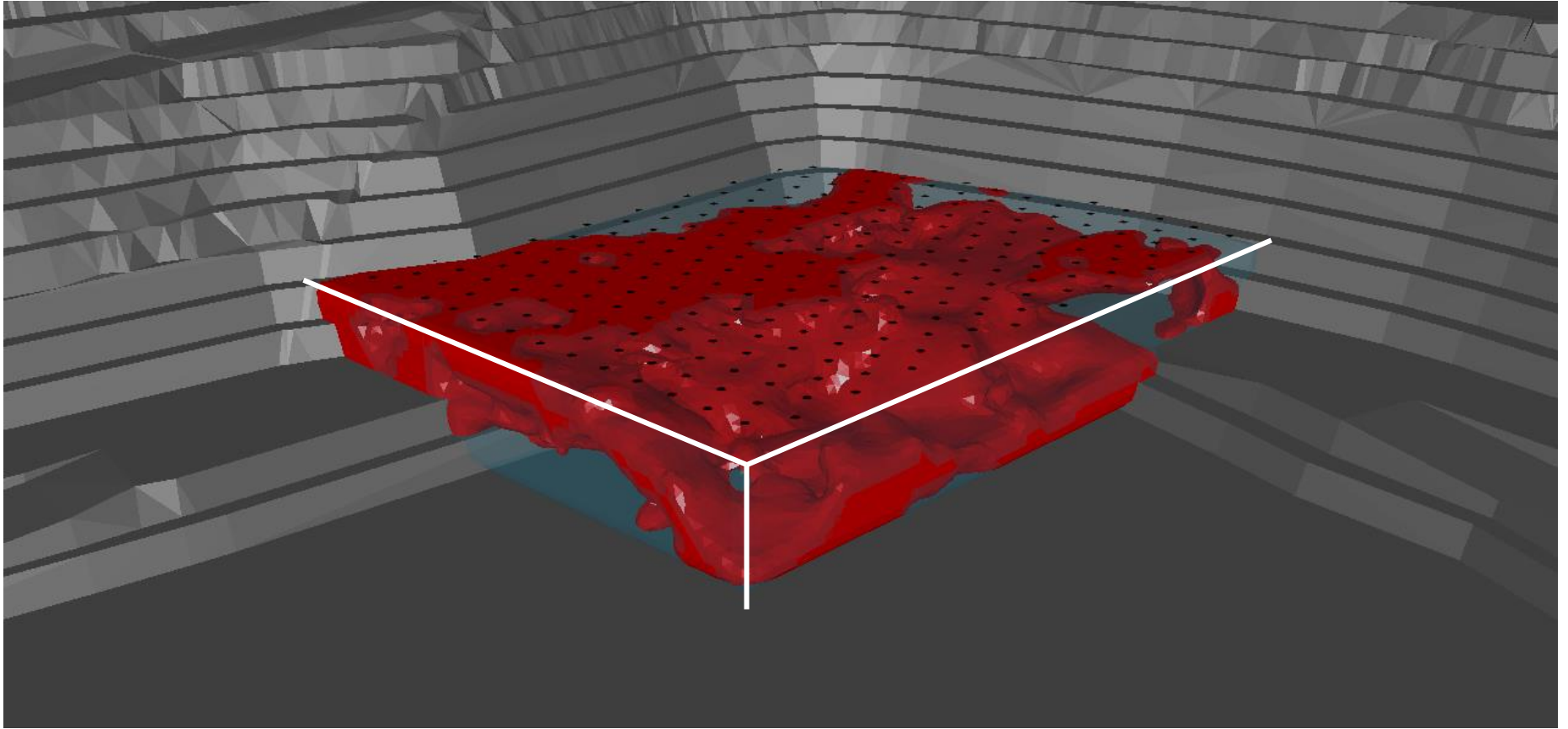
SENSOR INTRODUCTION



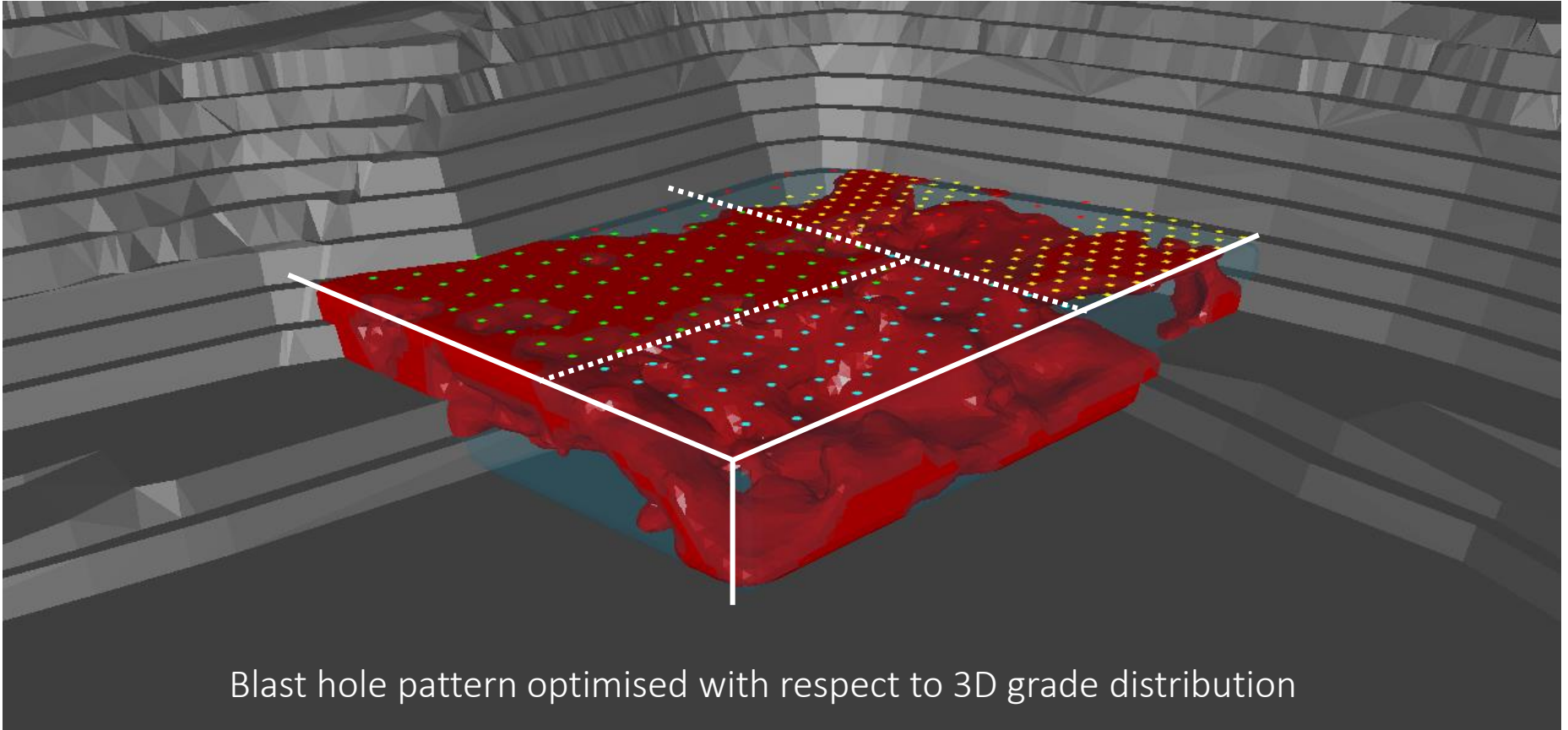
3D ESTIMATION



MOVE FROM A STANDARD BLAST PATTERN...

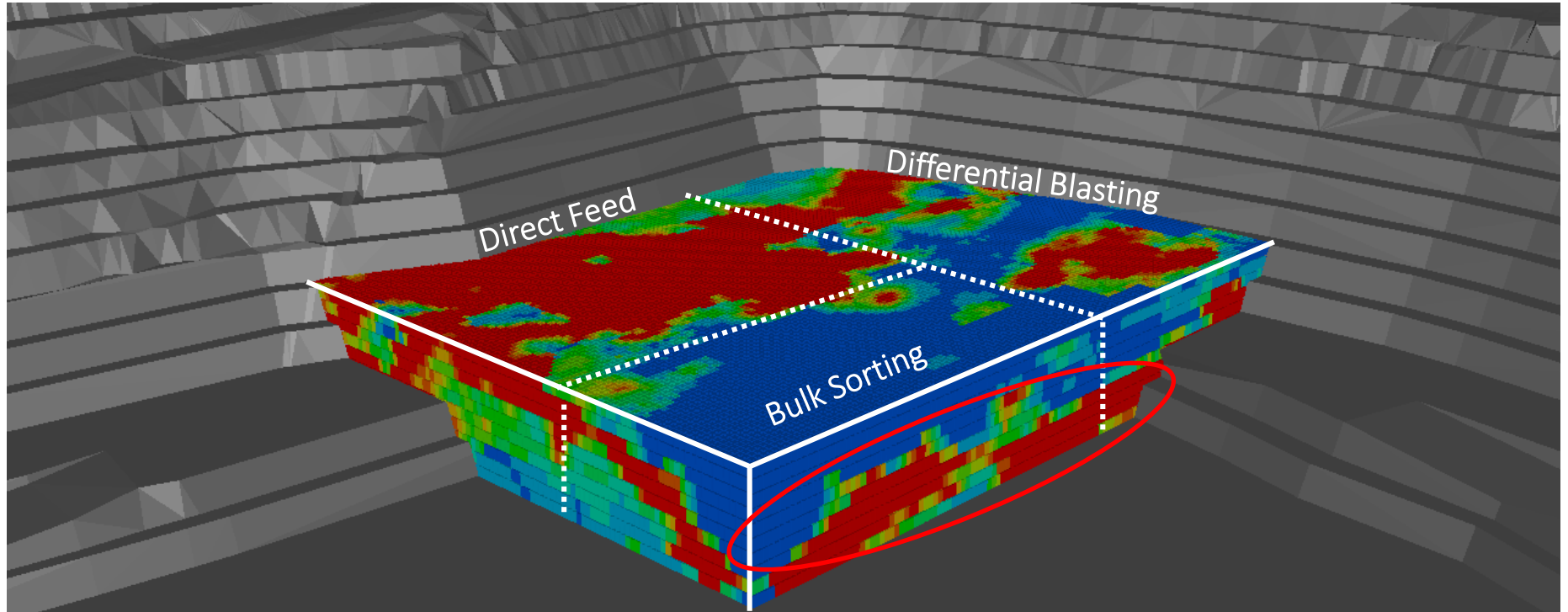


...TO AN OPTIMISED BLAST PATTERN



Blast hole pattern optimised with respect to 3D grade distribution

HIGH RESOLUTION BENCH GRADE MODEL



Identifying opportunities to use alternative material destinations to separate the high grade components that would previously have been “averaged out” and sent to waste

USE CASE #4 - SENSE THE GANGUE AND THE STRUCTURE AS WELL

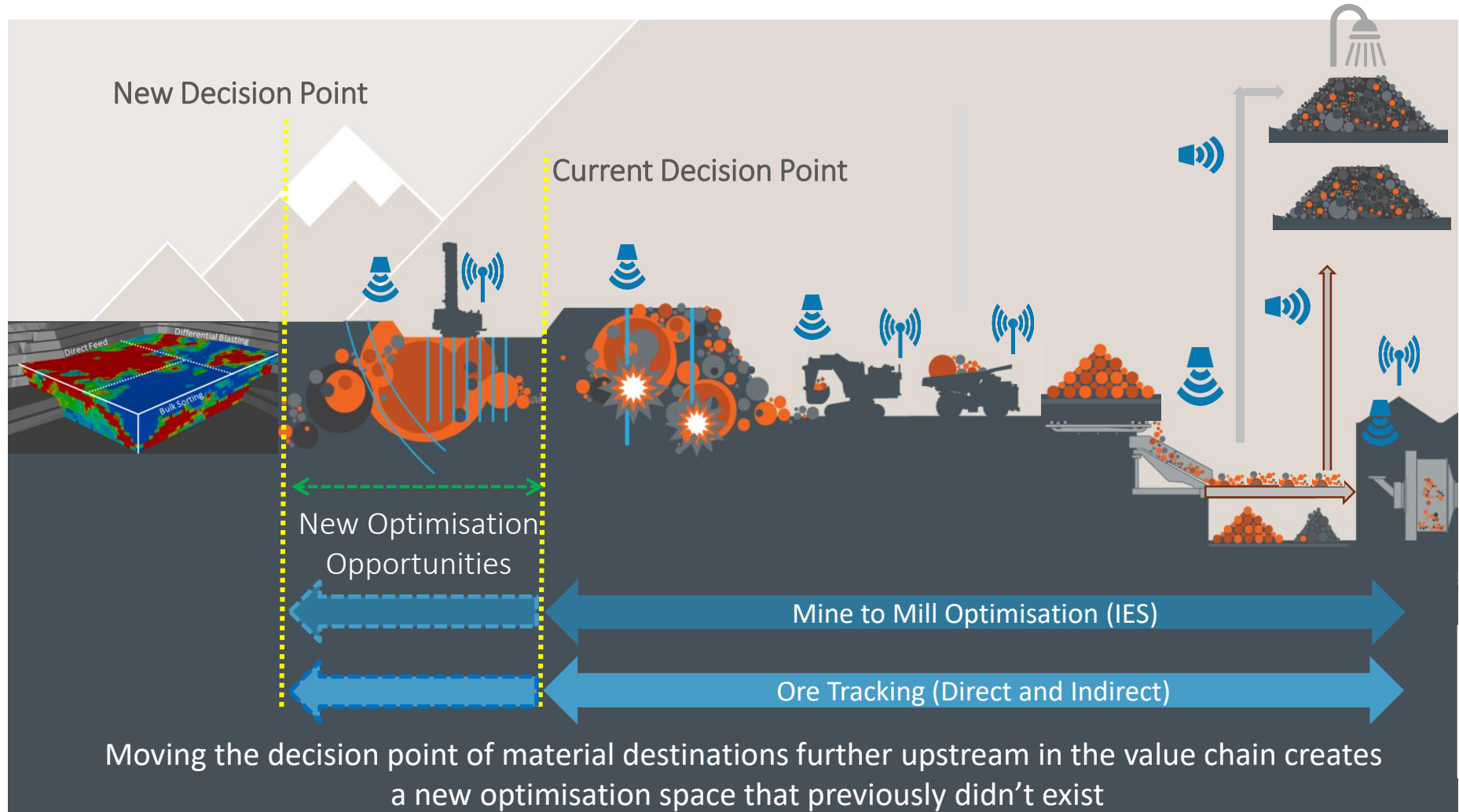


Selective Breakage at Phase Boundaries

It's not all about grade !

- Map the joints and failures
- Measure minerals directly or indirectly to characterise the gangue matrix
- Control the blast and comminution energies to promote fragmentation at phase boundaries
- Preserve economically barren gangue particles at the largest particle size

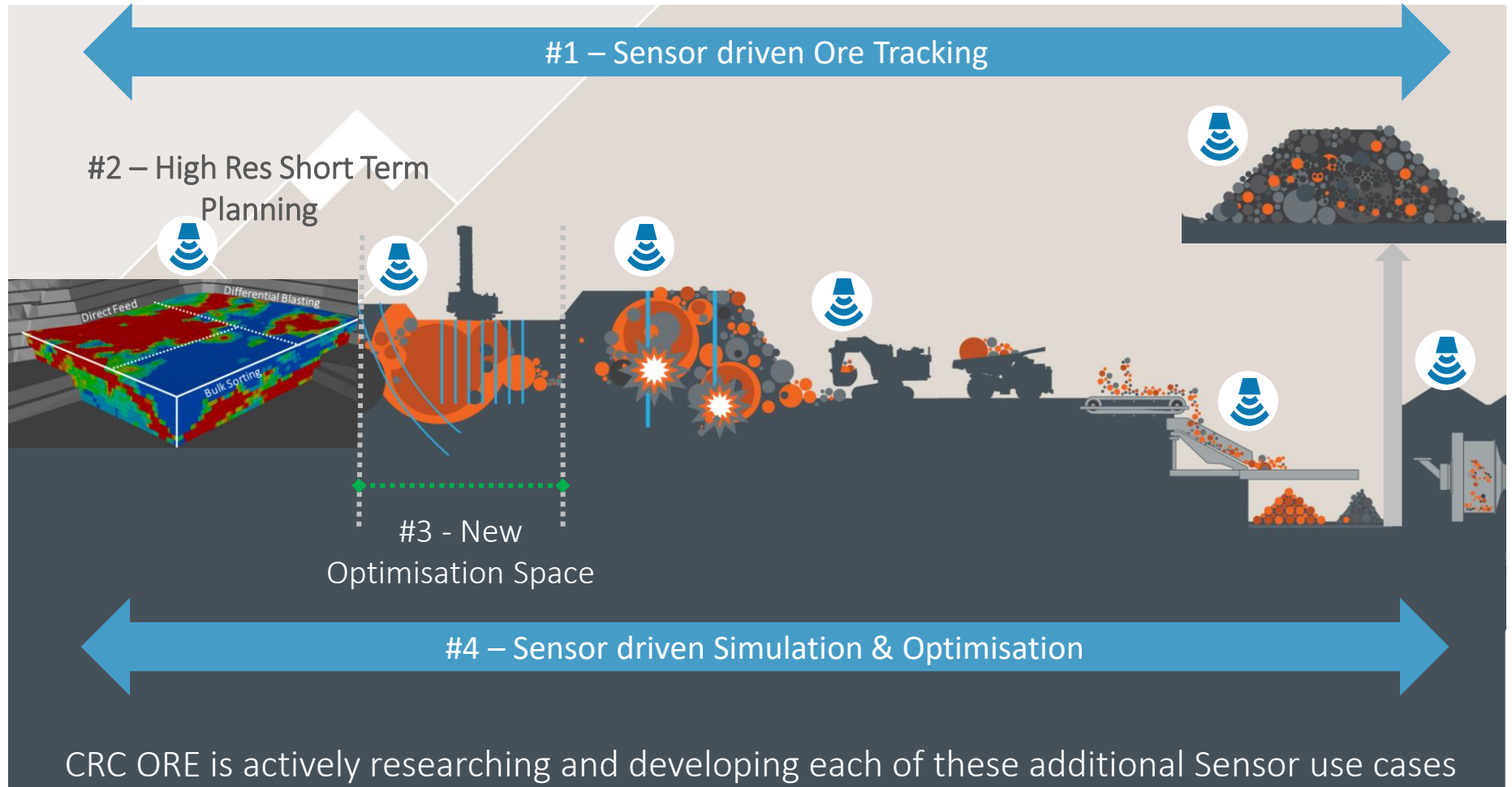
NEW OPPORTUNITIES



SO WHAT'S CHANGED FROM MEASUREMENT MODE?



4 ADDITIONAL USE CASES FOR SENSORS



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*BUILDING COLLABORATIONS BETWEEN
INDUSTRY AND ACADEMIA*

Professor David R Cooke

Director

CODES – Centre for Ore Deposit and Earth Sciences

INDUSTRY, UNIVERSITIES AND RESEARCHERS

DIFFERENT NEEDS, MUTUAL DEPENDENCE



PLANNING FOR INDUSTRY RESEARCH COLLABORATIONS



- *What are the needs of the different parties?*
- *Recognise and facilitate mutual dependences*
- *Understand administrative structures*
- *Resolve misconceptions created by unfamiliarity*

WHAT DOES INDUSTRY NEED FROM UNIVERSITIES?

Well-trained employees

- *Collaboration with groups that have track records for producing graduates with industry-relevant skills*

New or better understanding, new ideas and new tools

- *Strategic advantages for smart, early adopters*



WHAT ELSE DOES INDUSTRY NEED?

Training

- *Workshops, tech transfer meetings, refresher courses, conferences, etc*

**Maintaining /
enhancing a
social license to
operate**



WHAT DO UNIVERSITIES NEED?

- **Jobs / careers for students**
 - *No jobs = no students = no school*
- **In-kind support**
 - Training can be expensive
 - Universities reluctant / unable to fund field and laboratory work



- **Moral and political support**
 - *“Don’t shut them down: We need them”*
- **Relevant projects for research**
 - Essential for training students
 - Essential for developing staff

WHAT DO RESEARCH TEAMS NEED?

Access to suitable study sites or materials

- *We cannot work without it*

Relevance

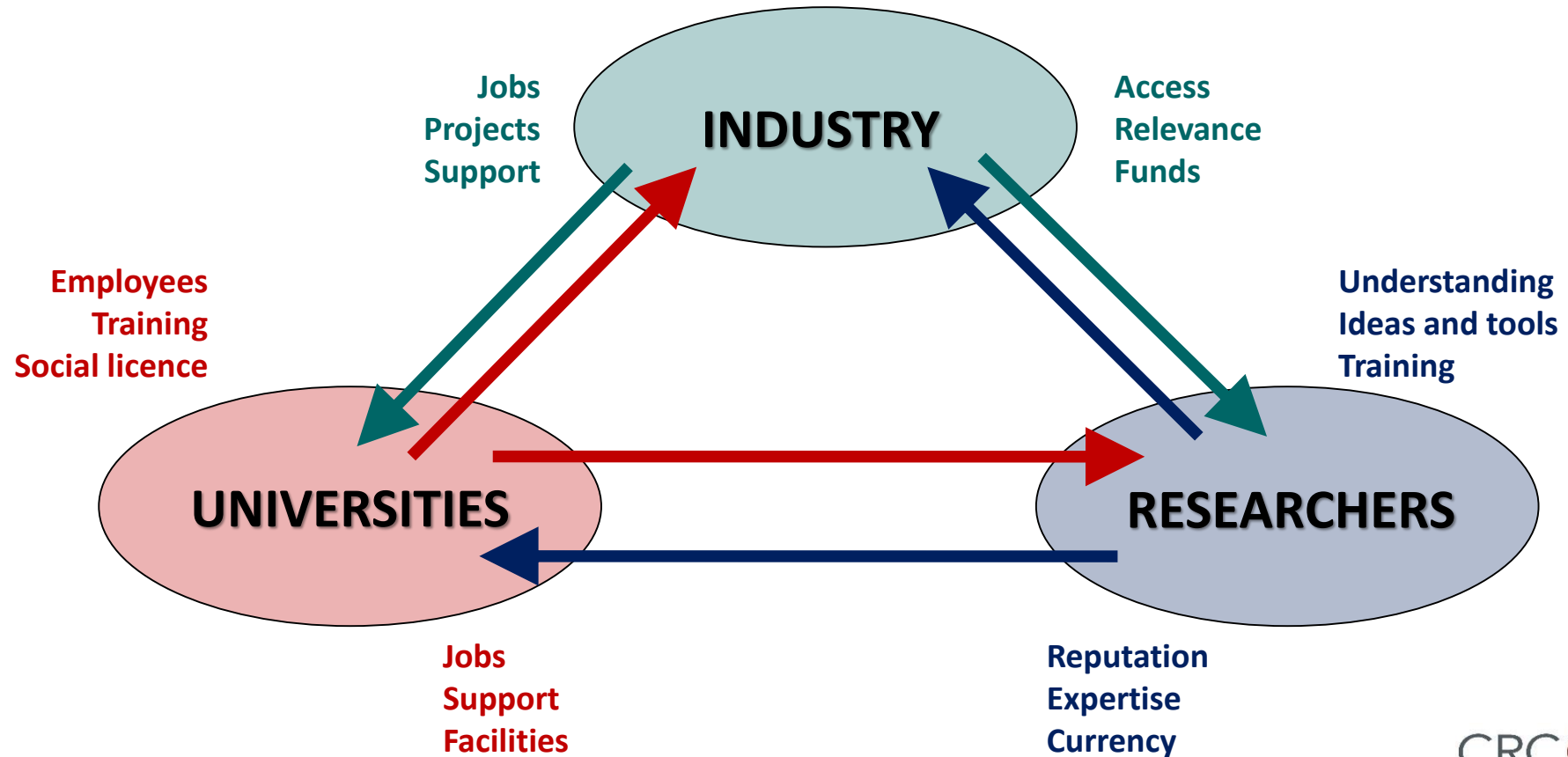
- *Must work on important problems*
- *Industry networking vital*
 - Listen to industry's needs
 - Attend industry conferences
 - Read and publish in industry-preferred journals



Financial support

- *Research costs money*
- *Governments schemes may help to fund pure or applied research (CRC, ARC Discovery, Linkage, ITRH)*
 - Grow a thick skin
 - Prepare for failure

MUTUAL DEPENDENCE



LACK OF MUTUAL UNDERSTANDING

WHERE UNIVERSITIES AND RESEARCHERS GETS IT WRONG

“These companies have lots of money, so they should support us”

- Companies can only support what is good for their shareholders
- Show relevance and support is possible
- Disposable funds are less than you think: budgets rule!



“Companies want this so they should pay for it”

- Companies are individuals; ask for more than one can provide and it is unlikely to happen
- Increasing infrastructure charges can price greedy universities out of the research marketplace

“We consulted with the industry about this...”

- No, you consulted with several individuals in several companies
- Opinions vary widely within and between companies
- Do not expect unanimity

LACK OF MUTUAL UNDERSTANDING

WHERE INDUSTRY GETS IT WRONG

“It is the Government’s job to train scientists”

- Only up to a point
- It is not the Government’s job to produce highly educated unemployed

“I have no responsibility for education”

- If industry wants the product, then it should assist the process, or be prepared to import foreign graduates

“Research is not relevant to us”

- Everything industry does is influenced by past research
- Industry’s future depends on research now and in the future
- If industry wants research that is relevant to its needs, then it needs to support it, otherwise it probably will not happen



BENEFITS OF INDUSTRY RESEARCH COLLABORATIONS

- Opportunities
- Relevance
- Students
- Access
- Funding



FACILITATING RELATIONSHIPS

— RESEARCHERS

Develop relationships with key industry personnel

- *The people who control budgets*

Listen to them – learn what their needs and wants are

- *They will only support what they believe is relevant*

Make proposals easy for them to sell

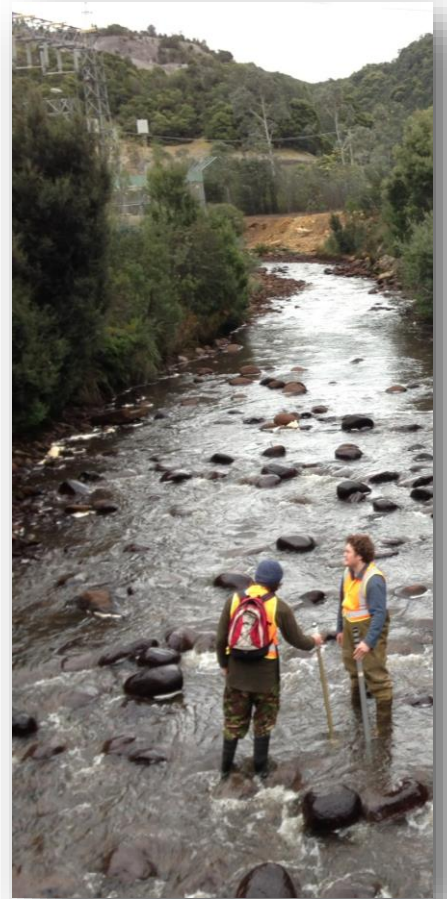
- *An internal industry champion is vital*

They have to justify their decisions – make it easy for them

- *Use the KISS principle!*

Do not be greedy

- *If you stay within the budget of the person approving your proposal, then you have a chance*



RESEARCH COLLABORATIONS ARE BASED ON PEOPLE, NOT CASH!



Large funding schemes designed to facilitate cross-institutional collaborations are not always successful

- Collaborations work best when people genuinely want to work together

Entering collaborations with the view from Day 1 of obtaining as much funding as possible for your team / institution is a recipe for disaster

Being an important member of a productive and successful collaborative team who enjoy working together is a key ingredient to success

CONCLUSIONS



- Researchers, universities and industry generally have poor understanding of each other
- All parties NEED the others; we are mutually dependent
 - The opportunities can be superb for productive research collaborations
- Finding the pathway to developing long-term research collaborations can be very rewarding for all concerned

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