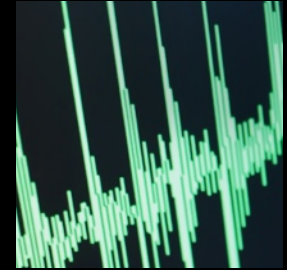
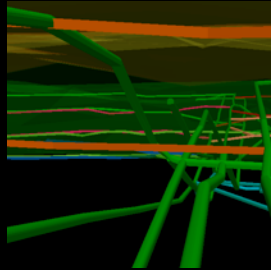
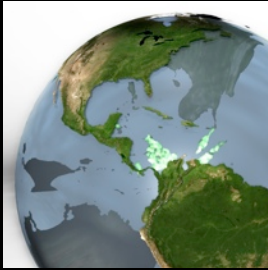




# INTERNATIONAL FAULT SLIP CONTROL RESEARCH INITIATIVE



## BACKGROUND

Of the most common types of rockbursts in underground mines (fault slip, pillar burst and strain burst), fault slip (FS) is often the most disruptive. Despite an increasing number of incidents worldwide and the consequent huge economic impact on mines as well as the health & safety risk to workers, and despite significant advances in seismic data interpretation, relatively little focused research has been undertaken to address the problem of controlling energy release from FS-events in mining.

In deep, geologically complex ore bodies, fault slip incidents are thought to occur in part due to stress variations on critically stressed faults induced by mining activities. However, there are many unknowns, such as why some faults are more prone to slip, or to propagating (rupturing) than others and how the potential energy release associated with them can be controlled. It is thus imperative for the mining industry to better understand the cause(s) of fault slip and develop the tools to deal with and control them.

## VISION

To execute an internationally-recognized underground research initiative to minimize risks to mines and miners from fault-slip events and to improve fault slip control/management techniques.

## OBJECTIVES

1. Create a better understanding of the mechanisms causing fault slip in underground mines and produce recommendations on how to minimize the risk to the safety of miners and the economic future of deep mines (minimize investor risk).
2. Establish a fault slip test site(s) as a “living laboratory” for researchers to carry out research projects designed to understand the causes of and how to control the energy release associated with underground fault slip events.
3. Provide a test site(s) for technology developers to experiment with and verify new technologies designed to monitor failure processes and energy release associated with underground fault slip events.

## FUNDING FRAMEWORK

Due to the innovative, multi-disciplinary and globally-reaching nature of the project, it is anticipated that in excess of \$20 million in funding will be required from industrial partners and research, development and human resource funding agencies at all levels of government. Related programs have funding deadlines throughout the year and, as such, multiple large-scale proposal submissions are planned for start-up as well as implementation stages.

## PROGRAM PARTNERSHIPS

Such an ambitious program will depend on the enthusiastic participation of leading researchers and research groups, a cooperative effort to solicit the support required for successful funding applications, and most importantly, will require active collaboration with research institutions and private sector supporters alike.

Seed funding to support the development of this research initiative will be provided by CEMI. In this regard, CEMI also plans to attract funding for start-up projects during the experimental design phase and will establish a collaborative approach to facility operations and management within an appropriate governance framework. International collaborations will be critical to establishing and operating the facility as well as for tackling the major technical challenges.

### POTENTIAL PARTNERS

The following companies have either already indicated an interest in this planned initiative or are known to be dealing with the effects of fault slip at their mines and thus will be approached to participate in this initiative:

- |                  |                     |
|------------------|---------------------|
| • VALE INCO      | • CODELCO           |
| • XSTRATA NICKEL | • RIO TINTO         |
| • XSTRATA COPPER | • ANGLOGOLD ASHANTI |
| • AGNICO EAGLE   | • BARRICK GOLD      |
| • LAKESHORE GOLD | • LKAB              |
| • GOLDCORP       | • FREEPORT          |

Technology and service providers in related fields such as seismic monitoring and geophysical logging will also be approached.



### TECHNICAL FRAMEWORK

The contemplated program will involve undertaking large-scale research and demonstration projects, many with the funding brought to the project and at the direction of the participating groups themselves and others, in addition to funds generated by CEMI. From a technical/scientific perspective, major challenges fall into one or more of the following categories:

*Structural / engineering geology of complex ore bodies*

Tectonic and structural control identification at pre-feasibility study (PFS) and feasibility study (FS) stages

*Geophysics and geophysical technology utilization for ground characterization*

Rock mass properties and rock mass imaging for exploration data integration

*Induced seismicity, seismic monitoring and data utilization*

Rock mass behaviour tracking and prediction

*Mine engineering for controlled energy release through appropriate mining methods/rates and sequence selection*

Numerical modeling and data integration/visualization for risk assessment at PFS and FS

“Experimental design” workshops are currently in progress with recognized world-leaders in their respective field of expertise and are intended to identify the most critical research gaps, and thus opportunities, in each category and develop a working framework for using an international test site. Since the categories are interdependent, and thus will likely result in cross-disciplinary initiatives when major funding proposals are developed, careful attention is being devoted to ensuring open communication among the respective groups.

For workshop summaries and progress reports please visit: <http://www.miningexcellence.ca/projects/p1071/>.

### HIGH LEVEL PROJECT PLAN

The following schematic outlines the anticipated approach to achieve the stated objectives:

- *Concept and Management*  
CEMI – under the guidance and direction of appropriate administrative and technical advisory committees
- *Test Sites*  
Mining Companies provide access, drill holes, openings etc.; Vale Inco, Xstrata Nickel, Goldcorp, Agnico Eagle, Kirkland Lake Gold, Xstrata Copper, etc.
- *Equipment*  
Capital provided by federal, provincial and other national and international funding agencies; technology development and testing
- *Researchers*  
University students (M.Sc., Ph.D., Post-doctoral fellows), mining companies, institutes; multi-dimensional approach to research, diverse funding sources (through researchers and partners)
- *Solutions*  
Captured in innovative technologies, knowledge transfer via conventional means (publications, reports, presentations) and unconventional means (events, manuals, multi-media, training, etc.)

### OPPORTUNITY TO PARTICIPATE

This project requires creative, motivated partners to help define research topics, identify stakeholders, provide appropriate test sites and contribute financially (in cash and in kind). If you would like to be part of this exciting international initiative, please contact us at [info@miningexcellence.ca](mailto:info@miningexcellence.ca) quoting “FS control” or phone 1-705-673-6568 ext. 3.

### NEXT STEPS

TASK	APPROACH	SUGGESTED TIMEFRAME
1. The cost of FS- business case construction	Poll Industry- compile results	Q2 2010
2. Management/governance framework	Solicit input from key major scientific project advisors	Q3 2009 - Q3 2010
3. Technical/advisory workshops/framework	Identify key research opportunities and leaders	Q3 2009 - Q3 2010
4. Possible funding mechanisms/sources	Solicit advice from key academic/industry and government sources	Q3 2009 - Q4 2010
5. Final experimental design and test site selection	Industry/Academic leaders final experimental design workshop	Q4 2010
6. Commencement of initial research programs		Q4 2010 - Q1 2011