DOWNLOAD PDF SECTOR SPECIFIC CONTRIBUTION INNOVATIONS: EXPLORATION, DEVELOPMENT, AND PRODUCTION TECHNOLOGIES

Chapter 1 : Â» Natural Gas and Technology www.nxgvision.com

Different types of innovation play a role at various stages (e.g. in earlier stages, incremental innovation is often associated with the adoption of foreign technology). Opportunities for successful innovation experiments and a potentially different framework for development are emerging.

Natural Resources Technology innovation for the mineral resources sector Australian mineral resource exploration and development can only deliver positive economic and community benefits, and decrease environmental impacts, if it remains efficient and sustainable through ongoing investment in technological innovation. This Mineral Resources Position Statement supports the ATSE Strategy Plan which sets out the priorities and approaches the Academy will take to promote the application of technological sciences and engineering into innovation for the benefit of Australia. The Minerals Resource Sector The mining sector has been a key contributor to the Australian economy, underpinned by large export earnings and capital investments. Australia is a leading producer of minerals for the world and produces 19 minerals in significant amounts from nearly operating mines. Over the past decade, economic growth has increased demand for mineral products worldwide. The economic extraction of previously uneconomic mineral deposits has been made possible as a result of innovations and improvements in mining techniques and processing technologies. As part of the resources cycle, excessive expansions in mining operations have led to oversupply in some commodities. Further, many companies view exploration in Australia as mature and are moving their exploration efforts to other countries with perceived higher potential for new discoveries. This has led to a continuing decline in minerals exploration investment in Australia. To remain competitive and continue to grow, the minerals industry in Australia needs to ensure it continues to invest in the discovery of new resources, significantly improves productivity, and addresses all aspects of cost and licence to operate. Investing in advances in technology that act as solutions to sustainable development of the industry will be vital for developing higher environmental standards without compromising business objectives. Enhanced engagement and knowledge translation between industry players of all sizes and researchers is needed so that Australia can remain globally competitive. It is essential that producers in Australia engage in the best up- and down-stream technologies to enhance productivity outcomes. Licence to operate issues, including energy and water use, emissions, and managing environmental and heritage impacts will remain crucial. Respectful engagement across sectors to enable confidence in decision making will be more important than ever. Technical innovation has a major role to play in meeting these economic, social and environmental objectives, and as so many are site specific, there needs to be an ever expanding effort to research and develop a range of technologies to achieve these objectives. This technical innovation should also provide opportunities for new industries supplying equipment, consumables and services to the global mineral resources industry. The Development Challenges The mineral resources industry will continue to face a broad range of challenges to remain competitive. The impact of the economic challenges of falling commodity prices, supply and demand fluctuations and exchange rates need to be cushioned by enhanced productivity. Technological innovation-led productivity can be built on a foundation of exploration technologies that can find additional economic deposits. Improvements also need to be sought continually in drilling, blasting, excavation stability, load and haul, crushing, beneficiation, extraction, transport and quality control. Environmental impact issues including emissions footprint and post-production development and remediation are important from the perspective of the social licence to operate and financial viability. Water issues such as below water table mining, dust control, mineral processing, waste water recovery, and ground water quality need to be appropriately managed and monitored. Ongoing improvements to health and safety processes will be critical in ensuring a safe and incident free workplace. Encouraging education and infrastructure development will be important for local and regional development, as will working with the social sciences and humanities for better workforce, family and community outcomes. Boosting science, technology, engineering and mathematics STEM education will be important for meeting future workforce needs. Each of these issues require active engagement across a range of stakeholders to deliver solutions, so developing evidence-based information on the performance and impacts of mineral development is important for public debate and to influence policy. Priority Focus Areas Mineral resource management driven by technology, science and innovation will be important in advancing the sector. Priority focus areas include: Australia has challenges as well as advantages in exploration methods, instrument development, and data processing and interpretation. Barriers to exploration derive from the widespread cover of potential mineralisation by highly weathered and transported materials. Productivity improvements are required for Australia to remain a leading resource and energy exporter. It will be essential to access and analyse large volumes of data to identify and monitor improvements. Appropriate technologies will increase productivity and streamline processes. The resource sector in Australia must develop strategies for rapid commercialisation and deployment of new technologies. This is particularly important to underpin the Australian METS sector, which is an area of growing competitive advantage, but one that will need to continually introduce improved technologies if it is to maintain an international leadership position. New technologies are changing the skill sets for trades and paraprofessionals. Australia must maintain appropriate education infrastructure and forecast the skills that will be required to support the way mines will operate in the future. Collaboration between the resources industry, academia and government is crucial in specifying the gaps and unproductive overlaps in the national research effort. In addition, collaboration will be important for the development of professionals through both practical and theoretical training, graduate placements and internships, scholarships and ongoing ways to keep academics informed by the latest practices. Sustainable development of the minerals industry should aim to have a net positive impact on both environment and community, including improved health and safety outcomes. The use of technical innovation in lifting sustainable development should emphasise proper scientific assessment of risks and technological solutions. The Way Forward ATSE believes that to ensure Australia has an efficient and sustainable mineral resources sector there are three themes that need to be considered in an integrated approach to effective policy: Exploration Australia can ensure the sustainable and competitive future of a commodity-diverse minerals industry through future world-class exploration for, and discoveries of, the highest value traditional and non-traditional resources. Productivity The development of technology-based industries to provide equipment, consumables and services to the mineral resources sector needs to be fostered, along with the development of yet more innovative technologies in mining, beneficiation, and metallurgical processes. Measures are required to increase the collaboration between publicly funded researchers and the mining sector. More accessible and expanded collections of evidence-based information on the environmental impact of mineral development will be important to inform the public debate and influence government policy.

Chapter 2 : Five ways technology can help the economy | World Economic Forum

Then they identified the physics behind each function, monitored vibration data and performed analytics on the mechanical specific energy equations. This resulted in an increase in ROP from m per day to m per day (ft per day to ft per day).

CCB Borgward, Exhibition and Conference Center; Messe Bremen, Findorffstrasse ; Programme Objectives The Workshop will discuss space science, technologies and applications in support of economic, social and environmental development with a focus on the role of industries as key player to offer innovation and infrastructure needed for sustainable development. In particular, the Workshop will be a forum to share experiences of leaders in space industries, for networking amongst decision-makers in governments and opportunities for start-ups and emerging space related business in developing countries. The main objectives of the Workshop are to: This workshop shall provide inputs on potential areas for partnerships considering the needs of developing countries, in particular Africa; Propose actions to progress in the definition of pilot projects that could foster collaboration; Promote collaboration in capacity-building at regional and international levels; Exploring the role of space industry in cooperation on the use of space for global health; and Exploring the role of space industry towards building resilient space technologies and applications. Space for socio-economic development Participants are encouraged to present their vision and provide examples of space applications programmes supporting socio-economic development in their countries and region. The session is expected to discuss the challenges faced in mainstreaming space-based inputs in national development providing; policy inputs that can be incorporated into national planning or strategies; and recommendations on the integration of space data with in-situ data, in particular, of national missions engaged in achieving targets of important global frameworks namely, the Agenda for Sustainable Development, the Sendai Framework on Disaster Risk Reduction , and the Paris Agreement stemming from the United Nations Framework Convention on Climate Change Conference of the Parties 21 COP The session will provide comprehensive discussion on contribution of space in achieving targets of these frameworks Session 2: Space applications for developing countries, in particular those in the Africa Developing countries are facing major challenges due to fast pace of development and it is crucial for these countries to ensure that it is sustainable. The session will provide presentations on specific applications towards supporting developing countries. Presentations from industry from developing countries are encouraged. The emphasis will be given to the experience and needs of the countries that are beginning to use space for development. The session will attempt to address the challenges developing countries are facing in using space technologies and proposals on how to overcome these challenges. Experience sharing of space-related industries, start-ups and emerging industries from Developing Countries The session will engage the space-related industries to share their insight on space-related innovations and infrastructure, success stories and technology trends for the benefit of start-ups and emerging businesses from developing countries. The start-ups and emerging industries will also be provided opportunities to share their experiences, difficulties and lessons learnt. The session expects to bring together space related industries ranging from satellite and hardware manufacturing to end user application and services developers. Space industries for supporting specific Sustainable Development Goals The session will discuss how investment in space and supporting infrastructure by public and private actors will bring long-term benefits to the society. The SDG 9 highlights that technological progress is key to finding lasting solutions to both economic and environmental challenges, such as providing new jobs and investing in scientific research and innovation are important ways to facilitate sustainable development. The SDG 17 aims to enhance partnerships. This Workshop will contribute to the modalities such as North-South, South-South, regional and international cooperation on and access to science, technology and innovation and enhance knowledge sharing. Breakout sessions Breakout parallel sessions will be organised on specific topics to get contribution from the participants on the objectives of the workshop. The topics for breakout sessions are:

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Improving access to Earth observation technologies and data for socio-economic benefits; Developing programmes to help developing countries with technical advisory services and capacity building support to develop space-based applications; and Space investments and socio-economic impacts- Raising awareness amongst decision-makers to invest more in space related industries. Poster Session Participants may indicate their interest in exhibiting posters. There no provision for a screen presence for virtual posters. Target Audience and Expected Participants The Workshop is being planned for a total of participants including, engineers, innovators, educators, and policy-and-decision makers and senior experts from the following groups: Participants should be in senior managerial or decision-making responsibility at governmental agencies, national and regional institutions, intergovernmental and non-governmental organizations or industry. For self-funded participants, priority will be given to the ones presenting a paper to IAC.

Chapter 3 : Technology Industry Trends | Deloitte US

The development of technology-based industries to provide equipment, consumables and services to the mineral resources sector needs to be fostered, along with the development of yet more innovative technologies in mining, beneficiation, and metallurgical processes.

Kennecott Utah Copper Corporation. National Stone, Sand and Gravel Association. Page 26 Share Cite Suggested Citation: Evolutionary and Revolutionary Technologies for Mining. The National Academies Press. The trench is then widened by removing the overburden from a parallel adjoining cut and placing it in the previous opening where the deposit has been removed. This method is commonly used in places where the topography and the deposit are generally flat. Reclamation is generally concurrent with mining. Strip mining is commonly used for mining coal seams and phosphate beds. In hilly terrain the mining of the overburden and the deposit usually a coal seam follows the contour around the hill and into the hillside up to the economic limits; hence it is called contour mining. In dredging, a suction device an agitator and a slurry pump or other mechanical devices are mounted on a floating barge to dig sand, gravel, or other unconsolidated materials under the water and transport them to land. As the material in a location is exhausted, the dredge moves forward, often constructing and carrying its own lake with it to new ground. Hydraulic mining uses water power to fracture and transport a bench of Earth or gravel for further processing. Hydraulic mining is used for placer deposits of gold, tin, and other metals. Surface mining equipment is similar to construction equipment e. Surface mining today is characterized by very large equipment e. Underground Mining Underground mining is used when the deposit is too deep for surface mining or there is a restriction on the use of the surface land. The deposit is accessed from the surface by vertical shafts, horizontal adits, or inclines Figure The deposit itself is developed by criss-crossing openings called levels, cross-cuts, raises, etc. The drilling, blasting, loading, and transporting of ore from active working areas faces are carried out according to a mining plan. If the deposit is soft, such as coal, potash, or salt, mechanical means can be used to cut and load the deposit, thereby eliminating the need FIGURE A conceptual representation of the general layout of a modern mine, the methods of mining, and the technology used. Page 27 Share Cite Suggested Citation: In hard-rock mines carefully planned drilling into the ore and blasting with dynamite or ammonium-nitrate explosives are common. Underground metal-mining methods may be unsupported, supported, and caving methods, and there are numerous variations of each. Open stopes, room-and-pillar, and sublevel stoping methods are the most common unsupported methods; cut-and-fill stoping when the fill is often waste from the mine and mill tailings is the most common method of supported underground mining Figure Because of the high costs associated with supported and unsupported mining methods, open stoping with caving methods is used whenever feasible. Underground coal mining today is basically done by two methods: The former is essential for developing large blocks of coal for longwall extraction. Page 28 Share Cite Suggested Citation: The production and productivity of individual, continuous, and longwall production units have increased consistently over the years. In the last two decades longwall mining in the U. Currently, about 60 longwall faces produce about million tons of coal per year. However, the production rate depends on the width of the face, the thickness of the seam, and the system for removing the coal from the face. In longwall mining, operations are concentrated along face from meters to meters wide. The height of extraction is usually the thickness of the coal seam. The length of the longwall block is about 3, meters to 5, meters. In a 3 meter thick coal seam the amount of coal in place in a block is six to seven million tons. The basic equipment is a shearer a cutting machine mounted on a steel conveyor that moves it along the face Figure The conveyor discharges the coal onto a conveyor belt for transport out of the mine. The longwall face crew, the shearer, and the face conveyor are under a continuous canopy of steel created by supports called shields. The shields, face conveyor, and shearer are connected to each other and move in a programmed sequence so that the longwall face is always supported as the shearer continuously cuts the coal in slices about 1 meter thick. The shearer is much like a cheese slicer running back and forth across a block of cheese. Technology Needs In simple terms mining involves breaking in-situ materials and hauling the broken materials out of the mine, while ensuring the health and safety of miners and the economic viability of the operation. Since the early s, a relentless search has been under way for new and innovative mining technologies that can improve health, safety, and productivity. In recent decades another driver has been a growing awareness of the adverse environmental and ecological impacts of mining. Markers along the trail of mining extraction technology include the invention of the safety lamp, and safe use of dynamite for fragmentation, the safe use of electricity, the development of continuous miners for cutting coal, the invention of rock bolts for ground support, open-pit mining Page 29 Share Cite Suggested Citation: At the turn of the twenty-first century, even as the U. For example, the inability to ascertain the conditions ahead in the mining face impedes rapid advance and creates health and safety hazards. As mining progresses to greater depths the increase in rock stress requires innovative designs for ensuring the short-term and long-term stability of the mine structure. Truly continuous mining will require innovative fragmentation and material-handling systems. In addition, sensing, analyzing, and communicating data and information will become increasingly important. Mining environments also present unique challenges to the design and operation of equipment. Composed of a large number of complex components, mining systems must be extremely reliable. Therefore, innovative maintenance strategies, supported by modern monitoring technologies, will be necessary for increasing the productive operational time of equipment and the mining system as a whole. Look-Ahead Technologies Unexpected geological conditions during the mining process can threaten worker safety and may decrease productivity. Geological problems encountered in mining can include local thinning or thickening of the deposit, the loss of the deposit itself, unexpected dikes and faults, and intersections of gas and water reservoirs. Even with detailed advanced exploration at closely spaced intervals, mining operations have been affected by many problems, such as gas outbursts, water inundations, dangerous strata conditions, and severe operational problems, that can result in injuries to personnel, as well as major losses of equipment and decreases in production. Advances in in-ground geophysics could lead to the development of new technologies for predicting geological conditions in advance of the mining face defined here as look-ahead technology. Three major technology areas are involved in systems that can interrogate the rock mass ahead of a working face: All three areas should be pursued in parallel to effect progress in the development of a usable system. Research on the development of specific sensors and sensor systems has focused on seismic methods. In underground mining the mining machine if mining is continuous can be used as a sound source, and receivers can be placed in arrays just behind the working face. For drilling and blasting operations, either on the surface or underground, blast pulses can be used to interrogate rock adjacent to the rock being moved. However, numerous difficulties have been encountered, even with this relatively straightforward approach. Current seismic systems are not designed to receive and process multiple signals or continuous-wave sources, such as those from the mining machine. In another study an NRC panel concluded that controlled blasting methods could generate strong enough signals for analysis and suitable for geotechnical investigations NRC, b. Other sensing methods that could be explored include electromagnetics and ground-penetrating radar. Combinations of sensing methods should also be explored to maximize the overlaying of multiple data sets. The second major area that requires additional research is data processing methods for interpreting sensor data. The mining industry has a critical need for processing algorithms that can take advantage of current parallel-processing technologies. Currently, the processing of seismic data can take many hours or days. Real-time turnaround in minutes in processing will be necessary for the data to be useful for continuous mining. The third area of need is data display and visualization, which are closely related to the processing and interpretation of data. The data cannot be quickly assessed unless they are in a form that can be readily reviewed. The need for visualizing data, especially in three dimensions, is not unique to the mining industry. In fact, it is being addressed by many technical communities, especially in numerical analysis and simulation. Ongoing work could be leveraged and extended to meet the needs of the mining industry. With look-ahead technology unexpected features and events could be detected and avoided or additional engineering measures put in place to prevent injuries and damage to equipment. The economic benefits of anticipating the narrowing or widening of the mined strata or other changes in the geologic nature of the orebody would also be substantial. Cutting and Fragmentation Mechanized cutting of rock for underground construction and mining has long been a focus area of technology development NRC, a. For coal and soft rock, high-production cutting tools and machines have been available for some time and continue to be improved, especially in cutter designs that minimize dust and optimize fragment size for downstream moving and processing. Hardrock presents much more difficult problems. Tunnel-boring machines can cut hardrock at reasonable rates, but the cutters are expensive and wear out rapidly, and the machines require very high thust and specific energy the quantity of energy required to excavate a unit of volume. In addition, tunnel-boring machines are not mobile enough to follow sharply changing or dipping ore bodies. Page 30 Share Cite Suggested Citation: Blasting is also used to move large amounts of overburden blast casting in some surface mining operations. Improved blasting methods for more precise rock movement and better control of the fragment sizes would reduce the cost of overbreak removal, as well as the cost of downstream processing. Recommended areas for research and development in cutting and fragmentation are the development of hardrock cutting methods and tools and improved blast designs. Research on the design of more mobile, rapid, and reliable hardrock excavation would benefit both the mining and underground construction industries. Early focus of this research should be on a better understanding of fracture mechanisms in rock so that better cutters can be designed NRC, b. In addition, preconditioning the rock with water jets, thermal impulses, explosive impulses, or other techniques are promising technologies for weakening rock, which would make subsequent mechanical cutting easier. Novel combinations of preconditioning and cutting should also be investigated. Numerous ideas for the rapid excavation of hard rock were explored in the early s, motivated by the defense community. These concepts should be re-examined in light of technological improvements in the last 20 years that could make some of the concepts more feasible Conroy et al. Improvements in blast design e. New methods of explosive tailoring and timing would also have significant benefits. Research into novel applications of blasting technology for the preparation of in-situ rubble beds for processing would help overcome some of the major barriers to the development of large-scale, in-situ processing methods. New developments in micro-explosives that could be pumped into thin fractures and detonated should be explored for their applications to in-situ fracturing and increasing permeability for processing. These methods would also have applications for coal gasification and in-situ leaching.

Chapter 4 : Exploration & Production - E&P

The mineral exploration sector, like the rest of the mining industry, is experiencing a boom in activity that has been correlated with the onset of a super-cycle (Heap,).

Explore the latest strategic trends, research and analysis At a time of slowed growth and continued volatility, many countries are looking for policies that will stimulate growth and create new jobs. Information communications technology ICT is not only one of the fastest growing industries â€” directly creating millions of jobs â€” but it is also an important enabler of innovation and development. The number of mobile subscriptions 6. In this new environment, the competitiveness of economies depends on their ability to leverage new technologies. Here are the five common economic effects of ICT. Direct job creation The ICT sector is, and is expected to remain, one of the largest employers. In Australia, building and running the new super-fast National Broadband Network will support 25, jobs annually. Naturally, the growth in different segments is uneven. In the US, for each job in the high-tech industry, five additional jobs , on average, are created in other sectors. In China, this number can reach 2. The doubling of mobile data use caused by the increase in 3G connections boosts GDP per capita growth rate by 0. The Internet accounts for 3. Most of this effect is driven by e-commerce â€” people advertising and selling goods online. Emergence of new services and industries Numerous public services have become available online and through mobile phones. The transition to cloud computing is one of the key trends for modernization. ICT has enabled the emergence of a completely new sector: The contractors are often based in emerging economies. Microwork platforms allow entrepreneurs to significantly cut costs and get access to qualified workers. In , oDesk alone had over 3 million registered contractors who performed 1. This trend had spillover effects on other industries, such as online payment systems. ICT has also contributed to the rise of entrepreneurship, making it much easier for self-starters to access best practices, legal and regulatory information, marketing and investment resources. The Internet provides them with new ways of reaching out to customers and competing for market share. Over the past few years, social media has established itself as a powerful marketing tool. ICT tools employed within companies help to streamline business processes and improve efficiency. The unprecedented explosion of connected devices throughout the world has created new ways for businesses to serve their customers.