

Summary of Panel on “Minerals for New Technologies and Low Carbon Economies”

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Panelists: **John Drexhage**, Consultant, Climate Change and Sustainable Resource Development, Gatineau Quebec, Canada

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Description: *In a 2017 report from the World Bank entitled “The Growing Role of Minerals and Metals for a Low Carbon Future,” the authors projected more than a one-thousand percent (1000%) rise in demand for metals needed for energy battery storage technologies, and roughly a two hundred percent (200%) rise in relevant metals demand just for wind and solar technologies in order to meet certain goals of the 2015 Paris Agreement on Climate Change signed by more than 170 countries. Correspondingly, the continuing evolution of new communication and information technologies presents dramatically shifting mineral development requirements. The minerals needed to meet these clean energy and other evolving technology-driven developments include lithium, silver cobalt, graphite, rare earth metals and key base metals such as copper, aluminum (bauxite), nickel, zinc, and possibly platinum. Drawing on experience, research and educated forecasting, this panel discussion examined the formidable demand projections and some of the contours of the global challenges presented to meet them, including: (1) the international, national and local legal frameworks in which developers are pursuing these metals; (2) particular environmental permitting and compliance issues associated with certain metals mining and processing operations; (3) the strategic implications of the minerals; (4) policy debates over net carbon footprint reduction potentialities or lack thereof; (5) the disparity of geological information available in developed and underdeveloped regions of the world; and (6) the need for flexibility in meeting demands given uncertainties in how various technologies may develop over the first half of the Twenty-First Century. Special attention will be paid to minerals pursuits in Portugal among other European countries, on the African continent, and in South America, especially Argentina, Chile and Bolivia.*

Program: 1. John Drexhage Presentation

Mr. Drexhage, who was the primary scrivener of the 2017 World Bank report, addressed the general topic of mining and climate change within the context of the Paris Agreement's goal of keeping future increases in the global average temperature to well below 2°C degrees centigrade. Today, renewables trends continue to show strong growth globally, despite: (1) the United States' signal of intent to withdraw from the Agreement; (2) the infancy of Nationally Determined Contributions; and (3) ongoing contentious negotiations surrounding financing, commitment accelerations and operational challenges involving several important aspects of the Agreement. For the mining industry, which is a major contributor to global warming due to its energy use, matching mining-related emissions to inventories is a complex task. The Paris Agreement creates a significant potential for raising operational costs, and a corresponding impetus for dramatic shifts in energy sources. Mineral resource-rich countries such as Brazil, Canada, Chile, Colombia, Indonesia, Peru and South Africa, by the end of 2016 had already signed or ratified economy-wide greenhouse gas mitigation plans that in most cases employ land use measures. Analysis of carbon cost impacts of various commodity production results in some ironies, including that coal generally has a lower production-related footprint than other non-fossil fuel minerals, which in turn justifies governments looking at the big picture in evaluating carbon costs and developing carbon policies and grid support measures. Governments can develop "climate smart" policies for their extractive industries, such as: (1) long-term, consistent and realistic carbon pricing schemes that are rooted in core economic plans; (2) fair-minded and supportive incentive programs for exploration and feasibility studies in "clean energy" minerals and metals; and (3) partnering to enhance water systems and ecosystem resilience, land mitigation and adaptation, and local community priorities and rights where mining is active. For their part, mining companies and investors have the opportunity to be positive, constructive and credible contributors to resilient climate change policies and a "zero carbon" future if they are willing to be flexible with financing and partnering with governments and civil society in developing "life cycle" approaches to operations, infrastructure development, and policies that take into account climate change and decades-long investment impacts. Indications that the mining industry is already working hard to mitigate its impacts on climate change is its trend of commitments to: (1) gaining a low carbon advantage through the electrification of operations using renewable energy resources; (2) contributing to landscape management, infrastructure planning and forest conservation; and (3) adapting to the rapidly changing material requirements and demands of a low carbon energy future as detailed in the 2017 World Bank report.

2. Karen Narwold Presentation

Ms. Narwold, a top executive and legal counsel with a world-leading producer of lithium, which is a battery mineral that will be integral to the world's future of low carbon economies, provided an overview of Albemarle's operations on four continents (Australia, North America, South America and Europe) and addressed legal challenges in each location as well as sustainable mining and governance innovations that echoed several of the themes developed by Mr. Drexhage's talk. The company pursues lithium through brine mining and production operations at Salar de Atacama and Antofagasta in Chile and at Silver Peak in the United States (Nevada), Spodumene ore mining and production in Greenbushes, Australia, and lithium recycling pilot operations in the European Union. In its pursuit of sustainable mining and continuous innovation through which it enjoys a "license to operate," the company employs natural resources and environmental stewardship principles as well as agreements with communities relating to communications, development and compliance. In Chile, solar evaporation in the desert salt flats of Salar de Atacama provide zero CO2 emission opportunities for brine concentrating that, if fossil fuels were used, would result in hundreds of thousands of pounds of CO2 per hour, and more than a million tons of CO2 per year. In 2017, Chilean authorities approved a "Lithium-yield Optimization Project" designed to achieve sustainable mining practices that minimize brine pumping, fresh water use, chemical components, additional water and solid wastes and energy consumption. Under the umbrella of certain legal protections for indigenous communities, the company also partners extensively with the multiple, relatively sophisticated Chilean indigenous communities in the areas of its operations, some of whom claim certain occupied territories and/or consider certain features to be part of their patrimony. At the operations in Australia, water for mineral processing is sourced from rainfall, and conservation is a high priority, with process water recovered and recycled. Lithium companies are researching alternative extraction processes, such as solvent and metal organic framework extraction, electrocoagulation, ion exchange and nanofiltration, but most have been rejected to date due to such concerns as the inability to fully remove harmful chemicals and the requirements for significant electric power and additional fresh water supplies. In searching for new lithium resources, factors taken into account in evaluating resource recoverability include not only technical criteria such as energy use, water needs and waste profiles, but also investment criteria, geopolitical risks and sustainability considerations in a changing world with increasing disclosure requests about climate change. Environment, society and governance (ESG) principles are now an integrated part of overall company strategies. Among the legal challenges, choices must be made from among several existing and emerging international reporting standards.

3. Ana Elizabeth Bastida Presentation

Dr Bastida provided context and shared insights from ongoing research on law and public policy debates about the development and production of lithium commodities within what has become known as the “Lithium Triangle” in South America, an area straddling portions of Chile, Bolivia and Argentina. The Lithium Triangle is estimated to contain approximately 70% of the world’s lithium reserves, making it a critical target for international investment driven by the growing demand for battery minerals for energy economies worldwide that are trending toward maximization of electric energy and away from consumption of fossil fuels and greenhouse gas emissions in the wake of the Paris Agreement and United Nation’s establishment of Sustainable Development Goals. The mining sector will be instrumental in heeding calls for coherent development that integrates environmental, social and economic dimensions under policy priorities that are emerging to advance a sustainable development agenda in all three countries. In Chile, lithium is considered as a strategic mineral reserved to the State. Apart from the two companies operating in the rich Salar de Atacama, the State-owned Codelco has established a subsidiary, Salar de Maricunga S.p.A., to develop Salar de Maricunga. This was one of recommendations of the National Lithium Commission established by the Ministry of Mines in 2014, that released a 2015 report, Lithium Policy and Governance of Salt Flats, to recommend public policy pathways for lithium development. Pursuant to research suggesting that lithium brines in the “Salares” are natural dynamic ecosystems of great fragility that have a “hydrodynamic behavior,” with the potential for extraction to affect concentrations in adjacent properties, the report calls for a “paradigmatic change” to ensure a “shared value” approach among communities and projects; legal regime revisions to expand contracts in use for petroleum development to development of lithium; and innovation and technological clusters in all phases of the value chain including the fabrication of lithium products. Bolivia –where the constitution of 2009 mandates adding value and industrialising minerals - has established agency oversight and a state-owned company centered on evaporitic resources, invested in four pilot plants to produce lithium carbonate and assembly batteries, and commissioned the design of an industrial plant for lithium carbonate to a German firm in 2015. In Argentina, as a general rule, lithium is subject to the concession regime established under the Mining Code, whereby mineral rights are granted following an objective, non-discretionary criteria on a first-come first served basis. Downstream user companies are investing in lithium projects. Some provinces are pursuing initiatives to add value and have acted on the development of guidelines, and the formation of a provincial state-owned company and a private-public partnership to install the first lithium-ion cell factory. Important questions going forward include: (1) what role will multi-stakeholder groups and innovative governance play in solving environmental and societal demands; (2) how must existing regimes, regulatory tools adapt and evolve to advance sustainable development?