



**Mining Cleantech Challenge
A Product Innovation Showcase**

Instructions and Expectations

1. In order to be considered, completion of all application fields is required. You will find the application here: <https://goo.gl/forms/TzhNeJk12jkkbCR22>
2. Deadline for application submission: **5:00 p.m. MDT, Friday, February 15, 2019**
3. The review and selection committee is comprised of representatives from Jolimont Global Mining Systems, Resource Capital Funds, Newmont Mining, Fresnillo, Ausenco, McEwen Mining, Rocky Mountain Institute, Consulate General of Canada - Denver, and Clareo Partners.
4. The expectation of the selection committee is that new strategic development partnerships, and/or potential investment targets will be identified through this process.
5. Please be prepared to attend the full day program on Thursday, March 21, 2019 in Denver.
6. Companies selected to present, as well as those companies that are not selected to present, will be invited to attend the 5:00 – 7:00 p.m. networking reception at the Colorado Governor's Residence at Boettcher Mansion in Denver (on the same property as the presentations).
7. The top 10-12 companies will be notified by Tuesday, February 26 of invitation to the Thursday, March 21, 2019 showcase event in Denver, Colorado.
8. Selected companies will have until Friday, March 1, 2019 to confirm their attendance to Mary Austin at mary@colordocleantech.com or 303-775-2364.
9. A national press release will be distributed announcing the 10-12 showcase companies. You may be asked for a quote.
10. If your company is selected to present in person on March 21, a \$750.00 US Dollar presentation fee will be invoiced. 1-2 of your company executives are invited to attend the full day showcase program. Payment is due within seven days of acceptance.
11. Your product/market-focused presentation (rather than an investor deck) should be no more than 10 minutes, and will be followed by 10 minutes of Q&A from the panel.
12. Travel and expenses to/from Denver will not be reimbursed.
13. You will be notified in advance of the order in which your company will present.
14. The Mining Cleantech Challenge: A Product Innovation Showcase and its partners would like to see:

Innovative Clean Technologies

Post Prototype

ADVANCED MATERIALS AND CHEMICALS (including but not limited to): novel materials or chemicals comprised of no or fewer hazardous chemicals; advanced materials less likely to rust or corrode which will improve containment; improved treating chemicals and detection methods; chemicals to extract hazardous items from produced fluids; new products made from captured CO₂, new ways to capture/separate CO₂ and NGLs.

BLOCKCHAINS (*including but not limited to*)

Blockchains are an immutable, distributed database that opens up new use cases between trust boundaries, such as between disparate organizations. Applications of blockchain technology in mining could include the creation of efficient, trusted marketplaces; or distributed transactional platforms that can provide value in many areas of the business (such as compliance, CSR and social engagement, supply chain efficiency and tracing, and commodity trading). A recent example is the creation of a consortium involving Shell, BP, and Statoil who are working on the development of a blockchain-based energy commodity trading platform, along with three large commodity traders. The common thread found in most emerging blockchain based solutions is increased efficiency between boundaries of trust- either through disintermediation of 3rd parties or by enabling the digitization of cross organizational processes.

METHANE AND NOX GAS DETECTION OR CONTROL (including but not limited to): Methane, SO₂, CO, CO₂ and other emissions control/reduction/detection from valves, piping and vented sources; control of emissions from tanks and pressure vessels; real-time gas detection and alarm systems.

PLANT OR BIOLOGICAL SOLUTIONS (including but not limited to): salt tolerant vegetation or trees targeted for beneficial use of produced water; vegetation or trees targeted for growth in drill cutting based soils; site or spill remediation solutions. Bio-characterization for produced/released water cleanup, soil remediation.

POWER MANAGEMENT (including but not limited to): more energy efficient and responsive internal combustion engines; efficient and clean generators; more efficient hybrid fuel (hydrogen, diesel and natural gas) engines that coordinate operations to provide power and response. Technologies that can economically convert waste heat sources (reciprocating engine exhaust heat and jacket water heat) into electricity at smaller scales (e.g. 20kW to 250kW). High efficiency engine technologies could include smaller scale natural gas fueled micro-turbine engines (<500kW). Small scale APUs on heavy equipment to eliminate idle during down time; ventilation on demand (VOD).

PRE-CONCENTRATION (including but not limited to) ore sorting at the shovel or mine face; coarse waste reduction prior to the plant; other rejection techniques to reduce energy and reagent application low grade or barren material.

PRODUCTION EFFICIENCY (including but not limited to) analytics to improve availability and utilization of fixed and mobile assets; advanced process control; remote operations management; application of new technology to reduce operating costs.

PRODUCTION MANAGEMENT (including but not limited to) management of mobile fleets in mixed surface/underground environments; real-time activity monitoring in active working areas; data capture/access and telemetry solutions for mixed fleets; proximity warning and collision avoidance; ventilation on demand (VOD).

REMOTE/DISTRIBUTED POWER (including but not limited to): renewable/rechargeable sources including solar, wind, wave, geothermal, nuclear and fuel cells; storage technologies including

batteries, flywheels, compressed air, thermal and pumped hydro-power; modular combined heat and power; micro/islanded grid technology; field gas powered equipment. Specific interest in high efficiency, low-emissions, cold weather-tolerant power generation technologies (50kW to +10MW) applicable to off-grid exploration or mine sites (e.g. methanol fuel cells that can use field-grade methanol, higher efficiency thermoelectric generators, micro-CHP systems).

REMOTE SENSING (including but not limited to): use of unmanned aerial (drone) and satellite-based systems to improve efficiency and safety of operations including; facilities inspections, site progress surveys including stockpiles, environmental monitoring, security monitoring and alarm systems, supply delivery systems.

RESOURCE CHARACTERIZATION AND MINE PLANNING (including but not limited to) improving predictability and accuracy of resource estimates; reductions in elapsed time from sampling to digging (e.g. lab-on-a-rig); geochemistry in resource models and circuit designs; planning tools for combined surface and underground mines.

TAILINGS/WASTE HANDLING AND DISPOSAL (including but not limited to) Reduced water consumption; lower impact/risk tailings disposal techniques; improved management of acid generating material; advances in reclamation, reprocessing of tailings/waste material. Cyanide recovery or exchange, predictive modeling for waste rock dumps, cover material performance and selection.

WATER (including but not limited to): real-time monitoring including efficient sampling and analysis; beneficial re-use of produced water including recycling or conversion to solid salt suitable for secondary use (e.g. winter road maintenance or dust control); recycling of process water; new disposal methods; minimization of water volumes; well bore integrity monitoring systems; alternative sourcing and processing to freshwater; metals treatment, water-less processing, minimization or treatment of nitrogen species, ion exchange resins for sulfate solutions, specifically tailored toward penalty speciation, functional RO.

Please contact Mary Austin with any questions.

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303-775-2364