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## **(I) Cryogenics in Mining, Deep Mine Cooling By Converting The Heat To Electricity.**

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Chilling an underground mining project becomes more costly as the depth increases. The air temperature increases as it descends due to auto-compression, additional heat from the host rock, equipment and processes is inevitable. A move to battery powered vehicles may allow for less air flow, legislation changes pending, but battery powered vehicles and the charging process liberate heat. The susceptibility of less air to additional heat becomes an issue if management intends to maintain the same level of activity. This paper discusses the cost comparison results of a feasibility study for a planned mine expansion and prototype testing data of a patent pending cryogenic chilling system. Cryogenic liquids store energy, effectively the heat from the mine is converted to electricity.

Furthermore, compressed air can be produced whilst simultaneously chilling (5000 cfm produces 1.2 MW chilling) and motive force, engines for equipment can be fueled by cryogenic liquids, a vehicle would produce cool clean air for exhaust with about 1/3 motive power to 2/3 chilling. The results obtained from a prototype system, approximately the size of a small spot chilling system, demonstrates conclusively that rapid response to heat added to the air flow is a feature; therefore, Chilling on Demand™ is a feature that can overcome the issues of heat management at lower air flows. Since the chilling is delivered by a cryogenic fluid, extending the depth of a mine only requires an additional surface liquefier module and a longer pipe. Since the system can provide chilling on demand it compliments chilling on demand increasing the economic benefit of installed VOD systems.

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