

# #TMS2013: Law of Attraction, Magnets in Renewable Energy

☒ The **Magnets in Renewable Energy** panel at the 2013 Technology Metals Summit or #TMS2013 as we are calling it entitled: *“Law of Attraction – Magnets in Renewable Energy: production today, demand tomorrow, impact of Dy-Less and Dy-Free magnets...”*, will highlight the latest developments in magnet technology as discussed by some of the world’s leading experts on the subject of magnets. The discussion, as suggested by the title, will have an important component in analysing the role of dysprosium, the heavy rare earth metal that has attracted considerable attention lately. Where renewable energy is concerned, dysprosium can replace neodymium in the neodymium-boron-iron alloy magnets for electric and hybrid cars. In wind power, these magnets convert the torque from the turbines themselves to electricity. If it is true that the production of these cars and turbines are destined to grow, the demand for dysprosium will increase, and indeed its price has already grown five-fold in a few years and this will stimulate the search for new deposits of rare earth minerals.

Neodymium (Nd), praseodymium (Pr), dysprosium (Dy), gadolinium (Gd) and terbium (Tb) elements are used to derive the permanent magnets used for wind turbines and for nickel-metal hydride batteries, such as those found in the Toyota Prius. Cerium (Ce) is essential for catalytic converters for cars, to reduce emissions of greenhouse gases. Nd and Pr are also used in automobiles. Then there is the lithium (Li), which is not a rare earth but the lightest of metals, and is vital for the rechargeable batteries of electric vehicles. In short, the rare earths are essential for the technological development of renewable energy.

The panel will be moderated by Gareth Hatch, a Founding

Principal of Technology Metals Research LLC. Dr. Hatch has a strong understanding of rare earth elements and the forces affecting their demand as well as expertise in the design and application of magnetic materials.

The speakers include Steve Constantinides, Director of Technology at Arnold Magnetic Technologies Inc. (Arnold). At Arnold Mr. Constantinides has overseen the development and growth of bonded rare earth magnets, increasing sales, building the Magnetics Technology Center, and, among other things, leading the research & development and engineering activities. Arnold supplies magnets for the reprographic, aerospace & defense industries along with related components for electric motors and many others.

Peter Dent is the VP of Business Development at Electron Energy Corporation, one of the pioneers of permanent magnet technology. Peter has a firsthand understanding of business models related to electro- and superconducting magnets, rare earth materials and powdered metallurgy. Electron Energy (EEC) produces Samarium Cobalt and Neodymium-Iron-Boron (NdFeB) sintered permanent magnets, assemblies and systems, adapting them to a variety of applications. As for renewable energy, EEC has joined forces with the Pacific Northwest National Laboratory (PNNL), which is one of nine United States Department of Energy (DOE) multiprogram national laboratories.

Greg Kroll, director of Sales and Marketing at Molycorp's Magnequench division (NYSE: MCP) will contribute to the discussion drawing on his experience with NdFeB Magnets, their technical Developments and new applications, helping to distinguish bonded and sintered magnets. Molycorp is still operational and it has an opportunity to gain ground in the Chinese magnet market itself thanks to its control of the Magnequench patent, which enables it to use rare earths powder to produce neodymium-iron-boron magnets based on the patented MQP™ powders.

Marc LeVier, a metallurgical engineer, has years of experience in developing technologies for hydrometallurgical, chemical and engineering design processes. Marc LeVier was recently appointed President and Chief Executive Officer of Great Western Minerals Group (TSXV: GWG | OTCQX: GWMGF). He has forty years of mining experience and was a key party in the preparation of the Preliminary Economic Assessment ("PEA") of the Steenkampskraal rare earth project in South Africa. Marc will lead Great Western in its shift from exploration toward manufacturing stage of rare earth permanent magnet alloys thanks to his metallurgical engineering and research background and years of experience in developing technologies for hydrometallurgical, chemical and engineering design processes. Great Western itself is a rare earth processor and its specialty alloys are used in the magnet and battery applications in various industrial sectors.

## The relationship between Renewable Energy and Magnets

Energy consumption over the past forty years has more than doubled worldwide. Much of the more recent growth has come from developing countries. While the United States remains the world's top energy consumer, China is catching up very quickly. To understand just how quickly: the US Energy Information Administration (EIA) reported that China used produced some 20% of its energy from oil, even as OPEC declared this past week that China will surpass the United States in oil imports next year. Moreover, energy consumption increases will be increasingly non-linear, as economic growth patterns improve in parts of Asia and much of Africa. Oil, gas and coal are finite resources and, nuclear energy still faces vociferous objection, which has forced governments and the private sector to look elsewhere, that is in the realm of green or renewable energy. This can be generated through wind turbines, solar panels, hydroelectricity where sufficient water is available, ocean waves or geothermal sources-albeit limited to specific geological areas. As different as these

sources are, they share a need for magnets – yes, even in oil and gas, where the next generation of motors for drilling equipment might well be based on permanent magnet motors.