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An image of the possible fuel cell lunar explorer (source: Toyota Corporation)

DEFYING GRAVITY

Fuel cells using platinum catalysts could power future lunar exploration

The so-called "billionaires' space race" has breathed new life into the concept of space travel. Entrepreneurs Elon Musk and Jeff Bezos, while probably best known as founders of their respective corporations, Tesla and Amazon, are both working with the US space agency, NASA, to develop technology to take humans to the Moon, and possibly beyond.

It is Musk's ambition to make space travel to Mars a reality, and at the end of May this year he came one step closer to achieving his goal when his SpaceX project launched a crewed spacecraft into space from the US for the first time in nearly a decade. On 31 May, SpaceX's Dragon capsule docked successfully with the International Space Station.

Platinum and space exploration

Revived interest in space travel has seen a collaboration between the Japanese Aerospace Exploration Agency (JAXA) and Toyota Motor Corporation (Toyota) aimed at joint research into developing a lunar rover that uses platinum-based fuel cell electric vehicle technologies. Of course, platinum is no stranger to space travel having been used in fuel cells on spacecraft during the original space race of the 1960s, which culminated in the first-ever moon landing in 1969.

Over the course of the three-year joint research period, which started in 2019, JAXA and Toyota will manufacture, test, and evaluate prototypes, with the goal of developing a manned, pressurised lunar rover to explore the surface of the moon as part of an international project.

The rover will be used for missions to explore the moon's polar regions, with the aim of both investigating the possibility of using the moon's resources — such as frozen water — and of acquiring technologies that enable exploration of the surfaces of massive celestial bodies.

The next-generation Mirai FCEV (source: Toyota Corporation)

Even with the limited amount of energy that can be transported to the moon, the pressurised rover could have a total lunar-surface cruising range of more than 10,000 km due to the high energy density fuel cells can provide.

The collaboration draws upon Toyota's market-leading knowledge of proton exchange membrane (PEM) technology, the same as that used in its commercially available hydrogen-powered fuel cell electric vehicle (FCEV), the Mirai. Here, as in the rover, hydrogen and oxygen combine to generate electricity, with heat and water the only by-products.

Platinum catalysts are central to PEM fuel cell technology, which is essential if the potential of hydrogen to power our transport here on earth is to be fully realised, with all the associated environmental benefits such as zero tailpipe emissions.

Many investors recognise the upside potential in longer-term platinum demand growth which could come as the hydrogen economy expands, bringing with it wider adoption of FCEVs. In the near term, demand for FCEVs is being driven by the heavy-duty market segment (buses and trucks), where supporting infrastructure is available or being developed, especially in port locations and cities.

Contacts:
Brendan Clifford, Investor Development, bclifford@platinuminvestment.com
Trevor Raymond, Research, traymond@platinuminvestment.com
David Wilson, Research, dwilson@platinuminvestment.com
Vicki Barker, Investor Communications, vbarker@platinuminvestment.com