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## In a Major Milestone, Ad Astra Rocket Company and Cummins Inc. Successfully Use Hydrogen/Biogas to Power a Cummins Generator in Costa Rica

LIBERIA, GUANACASTE, COSTA RICA – In a significant scientific and environmental achievement, a combined team of engineers and technicians from Ad Astra Rocket Company and Cummins Power Generation, a business unit of global power leader Cummins Inc., (NYSE: CMI) have successfully powered a Cummins-built electrical generator using mixtures of hydrogen and biogas.

The team's success goes hand-in-hand with a parallel and ongoing technology development to store hydrogen affordably - previous methods have been costly. The teams also designed a reliable process to mix and control hydrogen and biogas, and use together as an efficient energy source. These achievements could have long-term positive impacts especially in the developing world where energy resources are more scarce and less affordable.

"This is a tremendous achievement in terms of the science and engineering as well as the environmental benefits associated with the use of hydrogen and biogas," said Franklin Chang Díaz, CEO, Ad Astra. "The teams from Ad Astra, Cummins and EARTH University came together and used their combined talents and creativity to achieve this key milestone. I am looking forward to the next phase of this program."

"We are pleased to be part of this incredible achievement," said Tony Satterthwaite, President, Cummins Power Generation and Vice President, Cummins Inc. "This is innovation at its finest and innovation is one of our Company's core values. Further, at Cummins, part of our mission demands that everything we do creates a cleaner, healthier and safer environment and exploring, and investing in new and diverse fuel alternatives helps us meet that important mission."

The electrical generator designed and manufactured by Cummins is part of an experimental 7.5 kW renewable energy system being studied for potential commercialization by a combined team from Ad Astra Rocket Company, Cummins Inc. and EARTH University in Costa Rica.

Other components of this system include an Ad Astra designed solar and wind-based hydrogen production and storage system. Ad Astra is developing this system in collaboration with Costa

Rica's state-owned oil refinery, RECOPE. In addition, biogas production from biodigestors is being studied by EARTH University.

Friday's commissioning tests are the result of careful preparation and safety reviews conducted by the engineering team. A full battery of experiments will follow to complete full system characterization and optimization. The Friday tests were conducted with hydrogen-propane mixtures in preparation for the first methane deliveries, which will follow the commissioning demonstration.

The collaborative project was initiated in July of 2011 as part of an integrated renewable energy concept being studied by Ad Astra with application to distributed power architectures and other derivative uses worldwide.

Ad Astra Rocket will conduct the experimental characterization of the system and the production of hydrogen gas, while EARTH University will manage the production and delivery of methane gas, generated in bio-digesters from organic waste.

## ABOUT AD ASTRA

Established in 2005, Ad Astra Rocket Company is the developer of the VASIMR<sup>®</sup> engine, an advanced plasma space propulsion system aimed at the emerging in-space transportation market. Ad Astra also owns and operates Ad Astra Servicios Energéticos y Ambientales (AASEA) and Ad Astra Rocket Company, Costa Rica, respectively research and development subsidiaries in the US and Guanacaste, Costa Rica. Through its subsidiaries, the company also develops earthbound high technology applications in renewable energy, advanced manufacturing and applied physics. Located near the NASA Johnson Space Center, Ad Astra has its main laboratory and corporate headquarters at 141 W. Bay Area Boulevard in Webster, Texas, USA. Press releases can be found on the Web at <a href="http://www.adastrarocket.com/aarc/">http://www.adastrarocket.com/aarc/</a>. Follow us on Linkedin at:<a href="http://www.linkedin.com/company/ad-astra-rocket-company">http://www.linkedin.com/company/ad-astra-rocket-company</a> and on Facebook at:<a href="https://www.facebook.com/AdAstraRocketCompany?fref=ts">https://www.facebook.com/AdAstraRocketCompany?fref=ts</a>

## About Cummins

Cummins Inc., a global power leader, is a corporation of complementary business units that design, manufacture, distribute and service diesel and natural gas engines and related technologies, including fuel systems, controls, air handling, filtration, emission solutions and electrical power generation systems. Headquartered in Columbus, Indiana, (USA) Cummins currently employs approximately 46,000 people worldwide and serves customers in approximately 190 countries and territories through a network of approximately 600 company-owned and independent distributor locations and approximately 6,500 dealer locations. Cummins earned \$1.66 billion on sales of \$17.3 billion in 2012. Press releases can be found on the Web at <u>www.cummins.com</u>. Follow Cummins on Twitter at @Cummins and on YouTube at CumminsInc.