

ClearSign Establishes Solid Fuel Working Group with Sponsorship from Industry Leaders

Covanta and Great River Energy join working group to help accelerate commercialization of Electrodynamic Combustion Control™ technology.

SEATTLE, July 10, 2014 /PRNewswire/ -- [ClearSign Combustion Corporation](#) (NASDAQ: CLIR), an emerging leader in combustion and emissions control technology for industrial, commercial and utility markets, today announced the formation of a Solid Fuel Working Group. According to the company, this group of key industry stakeholders have a shared interest in the clean, efficient use of solid fuels and in the potential for ClearSign's technology to address some of their most challenging operating and environmental challenges. The group was formed to help guide and support product development efforts and to help accelerate the commercialization of the company's Electrodynamic Combustion Control™ (ECC™) technology, and member companies have already provided great insight into key challenges and opportunities.

The founding members of ClearSign's working group are [Covanta](#) (NYSE: CVA), a world leader in sustainable waste management and renewable energy and [Great River Energy](#), a regional energy cooperative based in Minnesota that provides energy from a range of sources including both coal and biomass-based waste to energy systems.

Several other US companies have committed to join and support the working group and ClearSign has recently extended an invitation to several international companies as well.

Working group member companies have pledged a combination of development funding and in-kind support as well as access to candidate sites for testing and eventual commercial deployment of ClearSign's ECC technology.

"For ClearSign," explained Rick Rutkowski, CEO, "the working group is a great way to coordinate the strong interest we have received from key stakeholders from across the solid-fuels market and to integrate their real-world experience and requirements into our development progress. It's an equally great way for ClearSign to focus and fine tune our development planning through the ongoing interaction with the many subject matter experts represented among the group. We are grateful to have the participation of such a distinguished group of users and suppliers of solid fuel based energy systems and we anticipate that the ranks of this interest group will continue to grow."

ClearSign's goal is to employ its proprietary techniques for applying high voltage electrostatic charges to flames to deliver retrofit solutions and new designs that it believes may substantially improve both the environmental performance and operating economics of industrial and utility scale combustion systems that use solid fuels as their primary feedstock. The company will target improvements in thermal performance, energy efficiency and process throughput along with reductions in criteria pollutants including particulate matter and PM2.5, carbon monoxide (CO) and NOx, and has already seen very promising results in several areas.

ClearSign is targeting industrial combustion of solid fuels and waste to energy as market entry points for its ECC technology. Systems at this scale use grate-fired stoker type combustors in which the coarsely processed fuel is delivered onto a moving grate and fired from beneath the grate. The company's development platform is designed to resemble a small-scale continuous feed reactor of this type.

Industrial Combustion of Solid Fuels

Industrial scale combustion of solid fuels typically includes the use of waste fuels such as agricultural or wood waste or municipal solid waste. Industries that generate substantial amounts of agricultural or biomass waste can often recover substantial energy from this waste by efficiently converting it into an affordable source of process heat or electrical power that can then be used in their own processes.

Waste to energy plants can also be a clean and energy efficient means of recycling and utilizing a community's waste stream to provide electric power to commercial and residential users in the area.

Solid fuels provide an affordable alternative source of energy that reduces requirements from other sources. Environmental regulators recommend the clean combustion of solid fuels over landfilling, biodegradation or composting because it avoids the much greater greenhouse gas impact of the methane emissions that would be associated with these methods.

However, while industrial scale combustion of waste fuels offers many advantages, significant challenges remain with regard to both energy efficiency and environmental performance of the grate-fired combustion

systems that are typically used to generate process heat, steam or electrical power from this class of fuels.

According to ClearSign Chief Technology Officer Joe Colannino, combustion of solid fuels can be especially challenging because both their chemical composition, and their physical form can be complex and highly variable. The challenge is further compounded by the two-phase chemistry that is basic to combustion of solids and the need to mix adequate and uniform levels of oxygen with a fuel that is in a solid form.

"It's difficult to create an environment in which you can efficiently and cleanly combust such a heterogeneous fuel mix in a controlled and repeatable manner," Colannino says. "Our working group partners and other companies have done an incredible job of controlling for the multiple emissions types including particulate matter, CO, NOx that are common to combustion of solid fuels, however in many cases, after-treatment systems such as ESPs, baghouses, and SCR's are required, often increasing operational complexity and expense."

ClearSign has demonstrated techniques based on its proprietary ECC technology for shaping flames and suppressing emissions at the flame source that promise to improve energy efficiency and dramatically reduce the emissions associated with combustion of solid fuels.

ClearSign believes that its technology can reduce the cost of installing, upgrading or operating after-treatment systems, while delivering improved thermal efficiency and increased system capacity to more than offset any costs associated with owning and operating the equipment.

"Our goal," Rutkowski added, "is to deliver technology to our working group partners, and others like them that may help to improve energy efficiency and operate more productively and at a lower cost."

About ClearSign Combustion Corporation

ClearSign Combustion Corporation designs and develops technologies that aim to improve key performance characteristics of combustion systems including energy efficiency, emissions control, fuel flexibility and overall cost effectiveness. Our Duplex™ Burner Architecture and Electrodynamic Combustion Control™ (ECC™) platform technologies improve control of flame shape and heat transfer and optimize the complex chemical reactions that occur during combustion in order to minimize harmful emissions. For more information about the Company, please visit www.clearsign.com.

About Covanta

Covanta is a world leader in providing sustainable waste and energy solutions. The Company's 45 Energy-from-Waste facilities provide communities and businesses around the world with environmentally sound solid waste disposal by using waste to generate clean, renewable energy. Annually, Covanta's modern Energy-from-Waste facilities safely and securely convert approximately 20 million tons of waste into clean, renewable electricity to power one million homes and recycle over 440,000 tons of metal. Energy-from-Waste facilities reduce greenhouse gases, complement recycling and are a critical component to sustainable solid waste management. For more information, visit www.covanta.com.

About Great River Energy

Great River Energy is a not-for-profit electric cooperative owned by its 28 member cooperatives. They generate and transmit electricity for those members, located in Minnesota. Great River Energy owns and operates 4,600 miles of transmission line and owns or partly owns more than 100 transmission substations. For more information, visit www.greatriverenergy.com

Cautionary note on forward-looking statements

This press release includes forward-looking information and statements within the meaning of the Private Securities Litigation Reform Act of 1995 and the provisions of Section 27A of the Securities Act of 1933, as amended, and Section 21E of the Securities Exchange Act of 1934, as amended. Except for historical information contained in this release, statements in this release may constitute forward-looking statements regarding our assumptions, projections, expectations, targets, intentions or beliefs about future events that are based on management's belief, as well as assumptions made by, and information currently available to, management. While we believe that our expectations are based upon reasonable assumptions, there can be no assurances that our goals and strategy will be realized. Numerous factors, including risks and uncertainties, may affect our actual results and may cause results to differ materially from those expressed in forward-looking statements made by us or on our behalf. Some of these factors include the acceptance of existing and future products, the impact of competitive products and pricing, general business and economic conditions, and other factors detailed in our Quarterly Report on Form 10-Q and other periodic reports filed with the SEC. We specifically disclaim any obligation to update or revise any forward-looking statement whether as a result of new

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