Testimony of Frank Alix before the Senate Committee on Energy and Natural Resources; Hearing on Recent Advances in Clean Coal Technology, August 1, 2007

Good morning Mr. Chairman and Members of the Committee. Thank you for the opportunity to share Powerspan's perspective on advances in clean coal technology. It is an honor to be invited here to speak. My name is Frank Alix and I am CEO of Powerspan Corp. Powerspan is a clean energy technology company headquartered in New Hampshire. I am a co-founder of the Company and a co-inventor on several of Powerspan's patents.

Powerspan has been in the business of developing and commercializing clean coal technology since its inception in 1994. In order to fund technology development, the company has raised over $70 million from private, institutional, and corporate investors. Our most significant clean coal technology success to date has been the development and commercialization of our ECO® technology, which is an advanced multi-pollutant control technology to reduce emissions of sulfur dioxide (SO_2), nitrogen oxides (NOx), mercury (Hg), and fine particles ($PM_{2.5}$) in a single system. FirstEnergy Corp. of Akron, Ohio has been a major supporter, providing the host site for ECO commercialization activities, as well as substantial financial contributions.

Over the past three years, we have successfully operated a 50-megawatt (MW) scale commercial ECO unit at FirstEnergy's R. E. Burger Plant in Shadyside, Ohio. This unit has demonstrated that ECO is capable of achieving outlet emissions below current Best Available Control Technology for coal plants, and comparable to outlet emissions from natural gas combined cycle power plants. ECO also produces a valuable fertilizer product, avoiding the landfill disposal of flue gas desulfurization waste. Furthermore, the ECO system minimizes water use because it requires no wastewater treatment or disposal.

Commercial ECO cost estimates prepared by prospective customers and their engineers indicate that ECO capital and operating costs would normally be about 20% less than the combined costs of the separate control systems required to achieve comparable reductions. For a 600 MW plant, this equates to an annual costs savings of $5-10 million.

Although the utility industry has a conservative approach to new technology adoption, the environmental and economic advantages of our ECO technology has resulted in some significant commercial progress. Within the past year, FirstEnergy announced a commitment to install an ECO system on its Burger Plant, Units 4 and 5, an installation valued at approximately $168 million. Additionally, AMP-Ohio recently announced a commitment to ECO for its proposed 1,000 MW plant in Meigs County, Ohio. This commitment was driven in part by the promise of a new technology Powerspan is developing for CO_2 capture, which we call ECO_2™. The ECO_2 process is a post-combustion CO_2 capture process for conventional power plants. The ECO_2 technology is readily integrated with our ECO process and is suitable for retrofit to the existing coal-fired generating fleet as well as for new coal-fired plants.

Since 2004, Powerspan and the U.S. Department of Energy's (DOE) National Energy Technology Laboratory (NETL) have worked together to develop the ECO_2 process. The regenerative process uses an ammonia-based solution to capture CO_2 in flue gas. The CO_2 capture takes place after the NOx, SO_2, mercury, and fine particulate matter are captured. Once the CO_2 is captured, the ammonia-based solution is regenerated to release CO_2 in a form that is ready for geological storage.

Pilot scale testing of our ECO_2 technology is scheduled to begin in early 2008 at FirstEnergy's Burger Plant. The ECO_2 pilot unit will process a 1-MW flue gas stream and produce 20 tons of CO_2 per day, achieving a 90% CO_2 capture rate. We plan to provide the captured CO_2 for on-site sequestration in an 8,000-foot well. FirstEnergy is collaborating with the Midwest Regional Carbon Sequestration Partnership on the sequestration test project. This pilot program could be the first such project to demonstrate both CO_2 capture and sequestration ("CCS") at a coal-fired power plant.

The ECO_2 pilot program provides the opportunity to confirm process design and cost estimates, and prepare for large scale capture and sequestration projects. Initial estimates developed by the U.S. Department of Energy indicate that our ammonia-based CO_2 capture process could provide significant savings compared to commercially available amine-based

CO_2 capture technologies. Our own estimates, based on extensive lab testing, indicate that commercial ECO_2 systems should be able to capture and compress 90% of CO_2 from conventional coal-fired power plants at a cost of about $20 per ton.

Regarding prospects for deploying ECO_2 at commercial scale, Powerspan and its commercial partners—Siemens, and Fluor—are currently evaluating opportunities to deploy commercial scale demonstration units that would process a 100-MW flue gas stream and produce approximately 1,000,000 tons of CO_2 per year for use in enhanced oil recovery or geological sequestration. A project of this size would be among the largest CO_2 capture operations in the world and would serve to demonstrate the commercial readiness of ECO_2 for full-scale power plant applications. With anticipated success of the ECO_2 pilot unit, we would expect our first commercial demonstration project to begin operating in 2011, and full-scale commercial units to be operating by 2015.

Although large scale-up projects, such as taking ECO_2 from a 1-MW pilot to a 100-MW commercial demonstration, contain some risk, we believe the risk is manageable because the equipment used in the ECO_2 process—large absorbers, pumps, heat exchangers, and compressors—have all been used in other commercial applications. The "technology" in ECO_2 is innovative process chemistry. Commercial application of this unique technology holds no special challenges that we can foresee, and therefore has a high probability of commercial success.

We agree with the recent MIT study on coal that places a high priority on the commercial demonstration of CO_2 capture from several alternative coal combustion and conversion technologies, as well as CO_2 sequestration at a scale of 1 million tons per year. However, such an undertaking will require substantial resources. The recently proposed 30% investment tax credit and $10-20 per ton CO_2 sequestration credit is exactly the type of incentive needed and shows the Senate is prepared to provide the required leadership. It is important that such incentives apply to both pre- and post-combustion technologies, like ECO_2, and require that CO_2 capture and sequestration be accomplished at a reasonably large scale. Additionally, in order to move large-scale CCS projects ahead as rapidly as

possible, the incentives should apply to retrofits at existing coal-fired plants. Otherwise, we would need to wait for new plants to be built with CCS, which could unnecessarily delay such demonstrations for several years.

There is growing concern that the need to address climate change combined with the expanding use of coal presents an intractable problem, one where the tradeoff is between severe environmental or economic consequences. At Powerspan, we believe the necessary clean coal technology is near at hand, and the tradeoff need not be severe. Our ECO technology, which has the capability to produce a near zero-emission coal-fired power plant, is commercially available, is being commercially deployed, and will set a new emission standard for coal-fired plants. Our ECO_2 technology, which is being developed for 90% capture of CO_2 from conventional coal-fired plants, is on a well-defined path toward commercialization using currently available commercial equipment. The cost of wide spread deployment of CO_2 capture technologies such as ECO_2 appear manageable, particularly when one considers that post-combustion approaches such as ECO_2 preserve the huge investment in existing coal-fired power plants, and avoid the need to replace a major portion of the power generating fleet.

Thank you Mr. Chairman. I would be pleased to answer any questions that you or other Committee members may have.