Stanford scientist discusses the challenges and opportunities of carbon sequestration

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When the Environmental Protection Agency issued its first comprehensive report on major greenhouse gas emitters last month, power plants topped the list, accounting for more than 70 percent of industrial carbon dioxide (CO_2) emissions in the United States.

Many climate experts have urged power plants and other industries to capture CO_2 before it gets into the atmosphere and sequester it deep underground – a technique known as carbon capture and storage. This promising technology could prevent the release of billions of tons of greenhouse gas each year, and thus slow the rate of global warming.

So why hasn't carbon capture and storage been adopted worldwide?

"Two major challenges stand in the way of carbon sequestration reaching its full potential," said Sally Benson, professor (research) of energy resources engineering at Stanford University. "One is the high cost of capturing CO_2. The other is an overall lack of confidence in the capacity, safety and permanence of sequestration in deep geological formations."

On Feb. 17, Benson will discuss these and other challenges –including the potential impacts of carbon sequestration on groundwater resources – at a symposium at the annual meeting of the American Association for the Advancement of Science (AAAS).

"Several important issues must be resolved," explained Benson, director

of the Global Climate and Energy Project (GCEP) at Stanford. "For example, which kinds of geological formations will provide safe and secure storage? What monitoring methods can be used to provide assurance that stored CO2 remains trapped underground? And what can be done if a leak develops?"

Since 2007, Benson and her GCEP colleagues have conducted experiments on sandstone and other rocks to assess their capacity to permanently store CO2 miles below the surface. "It's essential that captured CO2 stays underground and doesn't seep back into the atmosphere," she said. "After all, the sole purpose of carbon sequestration is climate mitigation. But at what scale will sequestration be practical, and is this scale sufficient to significantly reduce emissions ?"

Benson pointed to estimates by the International Energy Agency that by 2050, carbon capture and storage from power plants could contribute as much as 10 percent of the total CO2 emissions reduction required to stabilize global warming. But to succeed globally, the technology will have to be applied on a truly global scale.

"We need to make sure that sequestration will be available to people around the world, including rapidly developing countries like China and India, where the use of coal to generate electricity is expected to dramatically increase," she said.

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