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## BUILDING THE CASE FOR FLEXIBLE CARBON CAPTURE

**Ali Elkamel, Colin Alie, Peter L. Douglas, Eric Croiset**

Carbon capture and storage (CCS) is an important tool for reducing greenhouse gas emissions from coal-fired generating stations. CO<sub>2</sub>-scrubbing systems, for example, use solvents to pull carbon dioxide from the flue gas before it's released into the atmosphere.

However, because it takes energy to regenerate the solvents used in the process, capturing carbon this way either reduces the power plant's generating capacity or its efficiency, or both.

That's why WISE faculty members Ali Elkamel, Peter Douglas, Eric Croiset and their colleague in Waterloo's Chemical Engineering department are fans of flexible CCS. This approach lets managers adjust the rate of CO<sub>2</sub> recovery based on factors like electricity demand and carbon pricing.

To better assess the costs and benefits of CCS, the UWaterloo team ran scenarios comparing three generating stations: one with no CCS system, one with a fixed CCS unit constantly operating at full capacity, and one with the ability to adjust the amount of CO<sub>2</sub> recovery.

Using a method called short-term resource scheduling, the researchers modeled not only the technical factors such as electricity loads and operating capacity but also changing electricity prices, carbon prices, and more.

Their results showed that flexible CCS reduced greenhouse gas emissions. And although it did not reduce those emissions quite as much as fixed CCS, it maximized the generating station's net revenue.

The other important takeaway is the impact of greenhouse gas mitigation strategies depends on exactly how the electrical system in question operates. Short-term resource scheduling makes it possible to accurately assess that impact.

**Researchers: Ali Elkamel, Colin Alie, Peter L. Douglas, Eric Croiset**

**Source:** Alie, C., Elkamel, A., Douglas, P., Croiset, E. (2016). *Reduced-order modelling of flexible CCS and assessment using short-term resource scheduling approach. International Journal of Greenhouse Gas Control, 48, 253 – 274.*

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