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AT URBANA-CHAMPAIGN

Institute of Natural Resource Sustainability
Illinois State Geological Survey

615 East Peabody Drive
Champaign, Illinois 61820

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Illinois General Assembly

Dear Legislators:

As discussions about the Taylorville Energy Center and FutureGen have progressed, members of the General Assembly have raised questions about the feasibility of carbon capture and sequestration (CCS). These questions have focused around the status of the science and technology, and the mechanics and safety of storing carbon dioxide here in Illinois.

The Midwest Geological Sequestration Consortium (MGSC) led by Illinois State Geological Survey (ISGS) - Advanced Energy Technology Initiative (AETI) has been conducting CCS research since 2000. Significant progress in demonstrating CCS safety and technology has been made through our research program and large-scale demonstration Illinois Basin – Decatur Project (IBDP), as well as similar projects around the US and the World. Moving CCS technology forward to achieve carbon reduction goals requires answers to key questions:

- **What is the Status of Carbon Capture?** Carbon capture is an emerging technology. Several methods of carbon capture are in development and have been demonstrated at pilot-scale. Research is currently being conducted to reduce cost and improve performance of capture technology, using membranes, sorbents, new solvents and other capture mechanisms. Integrated Gasification Combined Cycle (IGCC) power generation provides a nearly pure carbon dioxide (CO_2) stream, making IGCC a viable source from which to capture.

- **How is Carbon Dioxide Stored?** Captured CO_2 will be compressed to a liquid-like state so that it occupies less volume than CO_2 gas. The liquid-like CO_2 will then be injected more than a mile below ground into a porous geologic formation called the Mt. Simon Sandstone for long-term geological storage. The CO_2 will be held in the small pore spaces present in rock.

- **How Can We Know CCS in Illinois is Safe?** The ISGS has collected background information on the subsurface rocks of the Illinois Basin for decades and has been investigating the geology and sequestration potential of the Mt. Simon Sandstone

specifically for more than seven years. We also know that the Mt. Simon formation has served as a safe storage reservoir for a far more volatile substance - natural gas - for decades, and we expect the same performance at Decatur and Taylorville for CO_2 storage. Geophysical techniques can be used to monitor the position of the CO_2 underground and monitoring wells can confirm the position of the CO_2 to ensure that the CO_2 remains in place as expected. Ground water (which only occurs in the top 200-300 feet more than a mile above) and soils will also be extensively monitored.

- **Has CO_2 Been Used in Such a Manner Before?** For more than 20 years, the oil industry has used a technique called enhanced oil recovery (EOR) to extract additional oil from old fields. Each year, more than 50 million metric tons of CO_2 is separated, compressed and injected deep underground using many of the same techniques that will be used for CCS. Projects such as Taylorville Energy Center and FutureGen 2.0 will inject a small fraction of that amount.

- **Why is Illinois Geology Well-suited for CCS?** CO_2 is stored in the pore spaces of geological formations in a porous rock such as a sandstone and sealed in place with an impermeable rock such as a shale. The Illinois Basin rock units are highly suitable for geologic storage with thick and deep porous rock units and multiple shale seals. The Mt. Simon Sandstone lies more than a mile below Taylorville and is estimated to be greater than 1,000 ft thick. It is the deepest sandstone in the Illinois Basin, a bowl-shaped geological feature that holds thousands of feet of rock and underlies most of Illinois, southwestern Indiana, and western Kentucky. The Mt. Simon is covered by the low-porosity Eau Claire Shale, which also has very low permeability, defined as the ability of fluids to flow through a rock, and will therefore permanently hold the CO_2 in the Mt. Simon. Because of thickness, porosity, and areal extent, the Mt. Simon can hold tens of millions of tons of CO_2 within a radius of just about 1 mile from an injection well.

We at ISGS would be happy to answer any further questions.

Sincerely,

Robert J. Finley
Director
Advanced Energy Technology Initiative