



BIG energy seminar series

Addressing the scale and complexity of the global energy challenge.



CARBON CAPTURE AND STORAGE: WHAT ARE THE BIG ISSUES AND OPPORTUNITIES FOR FUTURE ENERGY RESOURCES?

Department of Geological Sciences Colloquium

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Wednesday, April 18, 2012

4:00 p.m., Benson Earth Sciences, Room 180

Summary: Carbon Capture and Storage (CCS) can make significant cuts in Greenhouse Gas emissions and will need to be part of the forward planning for developing future global energy resources. CCS technology comprises a number of steps: 1) CO₂ is captured at the source (e.g., a power plant or gas production facility); 2) the captured CO₂ is compressed to a supercritical state and transported, typically via pipeline, from the source to the geologic storage site; 3) the CO₂ is injected via conventional wells into the geologic reservoir; and, 4) the CO₂ is stored (trapped) in the geologic reservoir, where its movement is carefully monitored and the quantity stored is regularly verified. CCS technology exists today and can be deployed commercially, given the right carbon price signal. Commercial-scale CCS projects are operating in several places around the world, including the Norwegian North Sea, Algeria, Saskatchewan, Canada, and several US fields which use CO₂ for EOR operations. A small-scale demonstration project is also in progress in Australia. Depleted oil and gas fields, which generally have proven geologic traps, reservoirs and seals are ideal sites for storage of injected CO₂. However, storage in saline formations, which rely on other trapping mechanisms such as solubility, residual and mineral trapping may be volumetrically more significant potential trapping mechanisms for CO₂ storage worldwide.

Monitoring the behavior of the stored CO₂ includes an extensive array of established direct and remote sensing technologies that can be deployed on the surface and in boreholes. These technologies record properties such as pressure, temperature, resistivity and sonic responses in both injection and observation wells. Other monitoring involves seismic, microseismic, petrophysical and geochemical sampling including tracer and isotope analysis to track the behavior of CO₂ in the subsurface. While subsurface storage of CO₂ is not without risk, a systematic risk assessment for all geosequestration sites considers both the engineered and natural systems. The engineered systems consist of the wells, the plant and the gathering line; the natural system includes the geology of the site, the reservoir formation, the overlying and underlying formations and the groundwater flow regimes. Carbon capture and storage will undoubtedly provide entirely new challenges to the way we evaluate and monetise our future energy resources. Can these challenges be turned into opportunities? Successful deployment of CCS will require top quality science, new infrastructure, appropriate regulation, clarity on liability issues and acceptance by the community. The suitably skilled organizations and individuals who focus on these aspects stand to benefit tremendously from CCS!

John G. Kaldi, Ph.D.

John Kaldi is the Professor and Chair of Geosequestration at the University of Adelaide, as well the Chief Scientist for the Cooperative Research Centre for Greenhouse Gas Technologies (CO₂CRC). John's expertise is in Carbon Capture and Storage (CCS), reservoir and seal evaluation, and carbonate reservoir geology. John was previously the inaugural head of the Australian School of Petroleum (ASP) and before that, the National Centre for Petroleum Geology and Geophysics (NCPGG) at the University of Adelaide. Prior to academia, he spent over 20 years in the Petroleum Industry in both technical and managerial roles with Shell, Arco and Vico. He is active in numerous professional societies, including SPE and AAPG. He has been an AAPG International Distinguished lecturer and is a recipient of AAPG's Distinguished Service and Honorary Member awards.

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