

Sean T. McCoy, Ph.D.

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Education

- **Carnegie Mellon University**, Pittsburgh, PA (2008), Ph.D., Engineering and Public Policy. Dissertation title “The Economics of CO₂ Transport by Pipeline and Storage in Saline Aquifers and Oil Reservoirs.” Committee members: Edward S. Rubin (Chair), M. Granger Morgan, Jay Apt, Susan D. Hovorka.
- **University of Waterloo**, Waterloo, ON (2003), B.A.Sc, Environmental Engineering (Chemical) with an option in Software Engineering.

Professional Experience

Academic Experience

2011-Present *Adjunct Assistant Professor*

Department of Engineering and Public Policy, Carnegie Mellon University, Pittsburgh, PA.

Advised PhD students working in the area of energy technology at Carnegie Mellon University (and elsewhere).

2008-2011 *Research Engineer and Project Manager*

Department of Engineering and Public Policy, Carnegie Mellon University, Pittsburgh, PA.

Directed the CCS Regulatory Project (www.ccsreg.org) research team, which spanned four institutions, edited all project reports and briefs, and oversaw the approximately \$2 million (USD) project budget. The CCS Regulatory Project was a collaborative effort to develop recommendations for the creation of a US regulatory framework for carbon capture and sequestration (CCS). Advised two PhD students working in the area of CCS.

2003-2008 *Graduate Research Assistant*

Department of Engineering and Public Policy, Carnegie Mellon University, Pittsburgh, PA.

Developed coupled engineering-cost models for the transportation of CO₂ via pipeline and subsequent sequestration of CO₂ in geologic formations for implementation in the Integrated Environmental Control Model (IECM).

2005 *Visiting Scientist*

Bureau of Economic Geology, University of Texas at Austin, Austin, TX.

Refined a geographic information system (GIS) database of CO₂ sources on the Gulf Coast and developed a performance model of CO₂-flood enhanced oil recovery (EOR) for CO₂ storage.

2002

Research Assistant

Department of Chemical Engineering, University of Waterloo, Waterloo, ON.

Optimized the heteropoly acid (HPA) catalyst used by British Petroleum in their Avada process for the production of Ethyl Acetate. Characterized new and spent catalysts using a variety of analytical techniques.

2001

Research Student

Research Center of Supercritical Fluid Technology, Tohoku University, Japan

Developed software to model reactions at high pressures and temperatures with the goal of predicting reaction yields for supercritical reactions (e.g., production of dimethyl carbonate from CO₂).

Government and Industry Experience

2011-Present

Energy Analyst

International Energy Agency, Paris, France

Lead author for the CCS chapter in Energy Technology Perspectives 2012 and contributor to numerous other IEA publications (e.g. 2013 CCS Technology Deployment Roadmap, CCS Legal and Regulatory Review). Managed the IEA International CCS Regulators Network – a forum for regulators and policy makers to discuss issues related to the regulation of CCS technology. Represented the IEA in international standards-making processes relating to CCS. Organized and led over a dozen workshops for policy makers and regulators in IEA member and non-member countries.

2002

Engineering Student

Products Manufacturing and Process Engineering, Shell Canada Limited, Calgary, AB.

Developed simulation models of two new gasoline hydrotreating units for deep desulphurisation of gasoline. Predicted operating limits and control algorithms for the unit using these models.

2001

Research Student

Power and Industrial Systems R&D Laboratory, Hitachi Limited, Japan

Determined the characteristics of a novel supercritical heavy oil demetallisation process, postulated a reaction mechanism for metals removal in this process, and recommended future steps for research.

2000

Operations Engineering Student

Imperial Oil Limited, Basic Chemicals, Sarnia, ON.

Assisted in day-to-day operations and troubleshooting of a gas cracking unit, which produced ethylene, and managed a variety of small projects, ranging from process safety analysis to steam system modifications.

Publications

Peer-Reviewed Publications

1. Fischbeck, P. S.; Gerard, D.; McCoy, S. T., Sensitivity analysis of the build decision for carbon capture and sequestration projects. *Greenhouse Gases: Science and Technology* **2012**, 2, (1), 36-45.
2. Popova, O.H.; Small, M.J.; McCoy, S.T.; Thomas, A.C.; Karimi, B.; Goodman, A.; Carter K.M., Comparative analysis of carbon dioxide storage resource assessment methodologies. *Environmental Geosciences* **2012**, 19, (3), 105-124.
3. Gresham, R.L.; McCoy, S.T.; Apt, J.; Morgan, M.G., Implications of Compensating Property Owners for Geologic Sequestration of CO₂. *Environmental Science & Technology* **2010**, 44, (8), 2897-2903.
4. Jaramillo, P.; Griffin, W.M.; McCoy, S.T., Life Cycle Inventory of CO₂ in an Enhanced Oil Recovery System. *Environmental Science & Technology* **2009**, 43, (21), 8027-8032.
5. McCoy, S.T.; Rubin, E.S., An engineering-economic model of pipeline transport of CO₂ with application to carbon capture and storage. *International Journal of Greenhouse Gas Control* **2008**, 2, (2), 219-229.
6. Wilson, E.J.; Morgan, M.G.; Apt, J.; Bonner, M.; Bunting, C.; Gode, J.; Jaeger, C.C.; Keith, D.W.; McCoy, S.T.; Haszeldine, R.S.; Pollak, M.F.; Reiner, D.M.; Rubin, E.S.; Torvanger, A.; Ulardic, C.; Vajjhala, S.P.; Victor, D.G.; Wright, I.W., Regulating the Geological Sequestration of Carbon Dioxide. *Environmental Science & Technology* **2008**, 42(8): 2718–2722.

Conference Proceedings

7. McCoy, S.T.; Bertsch, J.; Growitsch, C; Lorenczik, S; Nagl, S; Volk, D; Finkenrath, M.; Davison, J, Role of CCS in power systems with high levels of renewables penetration. Forthcoming in *Energy Procedia*.
8. Garrett, J.; McCoy, S.T., Carbon capture and storage and the London Protocol: recent efforts to enable trans-boundary CO₂ transfer. Forthcoming in *Energy Procedia*.
9. McCoy, S.T.; Pollak, M.F.; Jaramillo, P., Geologic sequestration through EOR: policy and regulatory considerations for greenhouse gas accounting. *Energy Procedia* **2011**, 4, 5794-5801.
10. Pollak, M.F.; McCoy, S.T., Monitoring for greenhouse gas accounting at geologic sequestration sites: technical and policy considerations. *Energy Procedia* **2011**, 4, 5917-5924
11. McCoy, S. T.; Rubin, E.S., Variability and uncertainty in the cost of saline formation storage. *Energy Procedia* **2009**, 1, (1), 4151-4158.
12. McCoy, S. T.; Rubin E.S., The effect of high oil prices on EOR project economics. *Energy Procedia* **2009**, 1, (1), 4143-4150.
13. Rubin, E.S.; Morgan, M.G.; McCoy, S.T.; Apt, J., Regulatory and Policy Needs for Geological Sequestration of Carbon Dioxide. In *Proceedings of the Sixth Annual Conference on Carbon Capture and Sequestration*, Pittsburgh, PA, 2007.
14. McCoy, S.T.; Rubin, E.S., A model of CO₂-flood enhanced oil recovery with applications to oil price influence on CO₂ storage costs. In *Proceedings of the Eighth Greenhouse Gas Control Technologies Conference (GHGT-8)*, Trondheim, Norway, 2006.
15. McCoy, S.T.; Rubin, E.S., Models of CO₂ Transport and Storage Costs and Their Importance in CCS Cost Estimates. In *Proceedings of the Fourth Annual Conference on Carbon Capture and Sequestration*, Alexandria, VA, 2005.

Books and Book Chapters

1. Burnard, K.; McCoy, S. T., Fossil Fuels and Carbon Capture and Storage. In *Energy for Development: Resources, Technologies, Environment*, Toth, F. L., Ed. Springer: Dordrecht, 2012.
2. Morgan, M.G.; McCoy, S.T.; Apt, J.; Dworkin, M.; Fischbeck, P.S.; Gerard, D.; Gregg, K.A.; Gresham, R.L.; Hagan, C.R.; Kreis, D.; Nordhaus, R.R.; Pitlick M.F.; Pollak, M.F.; Reiss, J.L.; Rubin, E.S.; Twaite, K.; Wilson, E.J., *Carbon Capture and Sequestration: Removing the Legal and Regulatory Barriers*. RFF Press: New York, 2012.

Policy Briefings

1. CCSReg Project, 2010: *Policy Brief: Carbon Dioxide Accounting in Carbon Capture and Sequestration*. Carnegie Mellon University: Pittsburgh, PA; http://www.ccsreg.org/pdf/GHG%20Accounting%20Policy%20Brief_01042010.pdf
2. CCSReg Project, 2009: *Policy Brief: Learning and Adaptation in Regulation of Geologic Sequestration*. Carnegie Mellon University: Pittsburgh, PA; http://www.ccsreg.org/pdf/LearningAdaptation_08282009.pdf.
3. CCSReg Project, 2009: *Carbon Capture and Sequestration: Framing the Issues for Regulation*. Carnegie Mellon University: Pittsburgh, PA; http://www.ccsreg.org/pdf/CCSReg_3_9.pdf.

Teaching Experience

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| 2012 | <p><i>CCS Overview for IEA Energy Training Week</i>
International Energy Agency, Paris, France.</p> <p>Developed and co-taught a module for IEA Energy Training Week 2013 that provided an overview of CCS technology and the regulatory and policy needs for deployment.</p> |
| 2010 | <p><i>Course on Energy Management and Policy</i>
Department of Engineering and Public Policy, Carnegie Mellon University, Pittsburgh, PA.</p> <p>Co-taught a graduate level course that reviewed energy technologies and metrics for energy systems analysis with Prof. I. Azevedo, Department of Engineering & Public Policy.</p> |
| 2008 | <p><i>Executive Education Guest Lectures</i>
Executive Program Office, Carnegie Mellon University, Pittsburgh, PA.</p> <p>Developed and taught a series of guest lectures on carbon management in the electricity sector for mid-level managers of the Korean Electric Power Company (KEPCO).</p> |
| 2005 | <p><i>EPP Project Course</i>
Department of Engineering & Public Policy, Carnegie Mellon University, Pittsburgh, PA.</p> <p>Managed two undergraduate student groups in the Fall 2005 Engineering & Public Policy Project Class on spyware.</p> |

Funded Research Proposals

1. McCoy, S.T. (PI), M.J. Small, Refining Small-Scale Estimates of Geological Sequestration Resource Using Site-Specific Estimates of Sequestration Capacity—A Pennsylvania Case Study. **US Department of Energy, National Energy Technology Laboratory (NETL)**, January–November 2011, \$124,000.

Advising

1. Primary advisor for R. Lee Gresham, J.D., Ph.D. Dissertation title: "Geologic CO₂ Sequestration and Subsurface Property Rights: A Legal and Economic Analysis." Carnegie Mellon University, 2008–2010.
2. Ph.D. Committee member for Olga H. Popova, Dissertation subject: Uncertainty analysis of carbon dioxide storage resource estimates in saline aquifers. Carnegie Mellon University, 2009–Present.
3. Ph.D. Committee member for Rubenka Bandyopadhyay. Dissertation subject: to be determined. Duke University, 2013–Present.

Selected Presentations

Invited Presentations – Developed and delivered by Sean McCoy (unless otherwise noted)

1. "Regulating CCS: why, how, and what?" GHGT-11 Student Mentoring Programme, 18 November 2012, Kyoto, Japan.
2. "IEA CCS Work Program and recent analysis." Alberta Energy, CCS Branch, September 2012, Edmonton, Alberta.
3. "South Africa in the international energy context." CCS in South Africa: Towards a lower carbon economy – prospects and challenges, September 2012, Cape Town, South Africa.
4. "The role of CCS in meeting the 2DS emissions reduction targets." Energy Technology Perspectives 2012 Webinar (presented in collaboration with Dr. Markus Wråke), June 2012.
5. "CCS activities that may benefit from standardization." ISO Technical Committee 265: Carbon dioxide capture, transport and geologic storage, June 2012, Rueil-Malmaison, France.
6. "Incentive Policy Mechanisms and Strategy for CCS – Current Practice and Future Options." CCS in Mexico: Policy Strategy Options, IEA-SENER Joint Workshop (developed in collaboration with Dr. Wolf Heidug), March 2012, Mexico City.
7. "The role of CO₂-EOR in on-going and future IEA analysis." IEA – OPEC CO₂-EOR Kuwait Workshop, February 2012, Kuwait City, Kuwait.
8. "CCS Technology Roadmaps: Potential and Future Challenges." 6th Trondheim Conference on CO₂ Capture, Transport, and Storage, June 2011 Trondheim, Norway.
9. "Long-Term Liability for Geological Sequestration: the Problem, U.S. State Reactions, and a Potential Federal Solution." IEA International CCS Regulatory Network, March 2011, Paris, France.
10. "Removing the Regulatory and Legal Barriers to Carbon Capture and Sequestration in the United States: Technical Considerations and Areas for Future Research." Lawrence Livermore National Laboratory, December 2010, Livermore, CA.
11. "Results in Brief from the CCS Regulatory Project." Carnegie Mellon Electricity Industry Center Advisory Board, October 2010, Pittsburgh, PA.
12. "Removing Legal and Regulatory Barriers to Large-Scale Deployment of CCS." National Council on Electricity Policy Webinar on Carbon Capture and Storage: Technological and Regulatory Considerations, June 2010.

13. "State Legislative and Regulatory Actions: Review, Motivation, and Effects on Geologic Sequestration of Carbon Dioxide." California Blue Ribbon Panel on CCS, April 2010, Sacramento, CA.
14. "Recommendations for Comprehensive Regulation of Geologic Sequestration and Governing Access to and Use of Pore Space." Coal Utilization Research Council (CURC) Congressional Briefing, February 2010, Washington, DC.
15. "Removing the Legal and Regulatory Barriers to Large-Scale Deployment of CCS." National Association of Utility Regulators, February 2010, Washington, DC.
16. "A Progress Report on the CCSReg Project." Congressional Research Service (presented in collaboration with CCSReg Project members), October 2009, Washington, DC.
17. "Research on Carbon Capture and Sequestration Technology." Carnegie Institute of Technology Dean's Council, Pittsburgh, PA, October 2009:
18. "Regulatory Barriers to Large-Scale Deployment of CCS in the US Electricity Sector." International Resource Industries & Sustainability Center (IRIS)-Institute for Sustainability Energy, Environment, and Economy (ISEEE) Knowledge Forum on CCS Risk Management, September 2009, Calgary, Alberta.
19. "Enabling Pipeline Transport of CO₂ for Large-Scale CCS Deployment." 2nd Annual Platts Conference on Carbon Capture and Sequestration, September 2009, Washington, DC.
20. "Getting to Large-Scale Deployment: The Interplay of Regulation and Economics." Research Experience in Carbon Sequestration, July 2009, Albuquerque, NM.
21. "Carbon Capture and Sequestration in the United States: Getting to Large-Scale Deployment." University of Calgary, Energy and Environmental Systems Group, July 2009, Calgary, Alberta.
22. "CCSReg Project: Addressing the Legal and Regulatory Gaps." 8th Annual Conference on CCS, May 2009, Pittsburgh, PA.
23. "CO₂ Transport by Pipeline: Cost and Regulatory Issues at Large Scales." National Energy Technology Laboratory, January 2009, Pittsburgh, PA.
24. "The Effect of High Oil Prices on EOR Project Economics." The Pennsylvania State University, Department of Energy and Mineral Engineering, November 2008, State College, PA.
25. "Modelling Cost and Performance of Deep Geologic Sequestration." Electric Power Research Institute (EPRI) Advisory Council, April 2007, Pittsburgh, PA.
26. "Carbon Capture and Storage in Electricity Generation." Northern California Power Authority, September 2006, Napa, CA.
27. "Technical and Economic Assessment of Transport and Storage of CO₂ in Geological Formations for Power Plant Greenhouse Gas Control." Carnegie Mellon Electricity Industry Center Research Advisory Council, November 2005, Pittsburgh, PA.
28. IEAGHG CO₂ Capture Network, Vancouver, BC, August 2004: "Cost Appraisals of CO₂ Capture and Storage Using the IECM Modelling Software."

Conference Presentations

29. McCoy, S.T. (Speaker), "Thoughts on large scale renewables deployment and CCS in the electricity sector." 11th International Conference on Greenhouse Gas Control Technologies, 18-22 November 2012, Kyoto, Japan.
30. McCoy, S.T. (Speaker), "Role of CCS in power systems with high levels of renewables penetration." 11th International Conference on Greenhouse Gas Control Technologies, 18-22 November 2012, Kyoto, Japan.
31. Garrett, J.; McCoy, S.T. (Speaker), "Carbon capture and storage and the London Protocol: recent efforts to enable trans-boundary CO₂ transfer." 11th International Conference on Greenhouse Gas Control Technologies, 18-22 November 2012, Kyoto, Japan.

32. McCoy, S.T. (Speaker); Pollak, M.F.; Jaramillo, P., "Geologic sequestration through EOR: policy and regulatory considerations for greenhouse gas accounting." 10th International Conference on Greenhouse Gas Control Technologies, 20-23 September 2010, Amsterdam, Netherlands.
33. Pollak, M.F.; McCoy, S.T. (Speaker), "Monitoring for greenhouse gas accounting at geologic sequestration sites: technical and policy considerations." 10th International Conference on Greenhouse Gas Control Technologies, 20-23 September 2010, Amsterdam, Netherlands.
34. McCoy, S. T. (Speaker); Rubin, E.S., Variability and uncertainty in the cost of saline formation storage. 9th International Conference on Greenhouse Gas Control Technologies, 16-20 November 2008, Washington, DC.
35. McCoy, S. T. (Speaker); Rubin E.S., "The effect of high oil prices on EOR project economics." 9th International Conference on Greenhouse Gas Control Technologies, 16-20 November 2008, Washington, DC.
36. McCoy, S.T. (Speaker); Rubin, E.S., A model of CO₂-flood enhanced oil recovery with applications to oil price influence on CO₂ storage costs. 8th International Conference on Greenhouse Gas Control Technologies, 19-22 June 2006, Trondheim, Norway.
37. McCoy, S.T. (Speaker); Rubin, E.S., "Models of CO₂ Transport and Storage Costs and Their Importance in CCS Cost Estimates." 4th Annual Conference on Carbon Capture and Sequestration, 2-5 May 2005, Alexandria, VA.

Awards and Honours

- Sandford Fleming Academic Excellence Award, University of Waterloo, 2003
- Sandford Fleming Foundation Award for Excellence in Design, University of Waterloo, 2003
- National Sciences and Engineering Research Council (NSERC) Undergraduate Student Research Award, University of Waterloo, 2002
- Co-operators Group Limited Award, University of Waterloo, 2001
- M. Chandrashekar Memorial Fellowship for Pacific Rim Exchange Students, University of Waterloo, 2001
- Alberta Government Rutherford Scholarship, University of Waterloo, 1998

Professional Affiliations

- Society of Petroleum Engineers (SPE)
- International Association of Energy Economics (IAEE)

Professional Service

- Member of "CCS Cost Workshop" Organizing Committee (2011-Present)
- Consulting Editor, Greenhouse Gases: Science and Technology (2010-Present)
- Ad-hoc Reviewer, Environmental Science and Technology
- Ad-hoc Reviewer, International Journal of Greenhouse Gas Control Technology
- Ad-hoc Reviewer, Energy Policy
- Committee Member, Geological Storage of Carbon Dioxide Technical Committee, CSA Standards (2010-2012)
- Editor for Special Issue on "CO₂ Management," SPE Economics and Management Journal (2010-2011)
- Session Chair, CO₂ Transport Infrastructure, Ninth Conference on Greenhouse Gas Control Technologies (GHGT-9), Washington, DC, 16-20 November 2008