DAVID L. MCCOLLUM

Principal Technical Leader ◈ Electric Power Research Institute
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EXPERTISE & RESEARCH INTERESTS

- Energy-economic modeling and scenarios to inform state, national, and global policy
- Integrated assessment of global change and its human drivers and impacts
- Multi-criteria analysis combined with scenario development
- Transportation technology and policy
- End-use electrification and electricity sector technology and policy
- Climate change, air pollution, energy security, natural resource use
- Investments and financing for energy, climate, and sustainable development
- Consumer behavior and preferences for energy technology adoption and utilization

PROFESSIONAL EXPERIENCE

Principal Technical Leader, *Electric Power Research Institute*, Palo Alto, California, USA, 2/2019-Present

Research Fellow in Energy and Environment, *Howard H. Baker Jr. Center for Public Policy, University of Tennessee*, Knoxville, Tennessee, USA, 1/2016-Present

Senior Research Scholar, *International Institute for Applied Systems Analysis*, Laxenburg, Austria, 2/2011-1/2019 (and *Young Scientists Summer Program Fellow*, 6-9/2009)

Graduate Research Assistant, *University of California, Davis, Institute of Transportation Studies*, Davis, California, USA, 9/2005-3/2011

Research Aide, *Argonne National Laboratory*, Washington, DC, USA, 9-12/2007

Assistant Language Teacher, *Japan Exchange and Teaching Program*, Sendai, Japan, 7/2004-7/2005

Research Intern, *National Renewable Energy Laboratory*, Golden, CO, USA, 6-8/2003

EDUCATION

University of California, Davis, Davis, CA, USA

Ph.D., Transportation Technology & Policy (2011)

M.S., Agricultural & Resource Economics (2008)

M.S., Transportation Technology & Policy (2007)

The University of Tennessee (UT), Knoxville, TN, USA

B.S., Chemical Engineering, Chemistry minor (2004), *summa cum laude and University Honors Scholar*

Ajou University, Suwon, South Korea (study abroad, 2002)

PEER-REVIEWED PUBLICATIONS

Zhou, W., **D. McCollum**, O. Fricko, M. Gidden, D. Huppmann, V. Krey, and K. Riahi, 2019. "A comparison of low carbon investment needs between China and Europe in stringent climate policy scenarios," *Environmental Research Letters*. doi:10.1088/1748-9326/ab0dd8.

Parkinson, S., V. Krey, D. Huppmann, T. Kahil, **D. McCollum**, O. Fricko, E. Byers, M.J. Gidden, B. Mayor, and Z. Khan, 2019. "Balancing clean water-climate change mitigation tradeoffs," *Environmental Research Letters* 14 (1): e014009. doi:10.1088/1748-9326/aaf2a3.

van den Berg, N.J., H.L. van Soest, A.F. Hof, M.G.J. den Elzen, D.P. van Vuuren, W. Chen, L. Drouet, J. Emmerling, S. Fujimori, N. Höhne, A.C. Kõberle, **D. McCollum**, R. Schaeffer, S. Shekhar, S.S. Vishwanathan, Z. Vrontisi, and K. Blok, 2019. "Implications of various effort-sharing approaches for national carbon budgets and emission pathways," *Climatic Change*, doi:10.1007/s10584-019-02368-y.

Edelenbosch, O.Y., **D.L. McCollum**, H. Pettifor, C. Wilson, and D.P. van Vuuren, 2018. "Interactions between social learning and technological learning in electric vehicle futures," *Environmental Research Letters* 13 (12): e124004, doi:10.1088/1748-9326/aae948.

Weber, C, **D.L. McCollum**, J. Edmonds, P. Faria, A. Pyanet, J. Rogelj, M. Tavoni, J. Thoma, and E. Kriegler, 2018. "Mitigation scenarios must cater to new users," *Nature Climate Change* 8 (10), 845-848.

McCollum, D.L., C. Wilson, M. Bevione, S. Carrara, O.Y. Edelenbosch, J. Emmerling, C. Guivarch, P. Karkatsoulis, I. Keppo, V. Krey, Z. Lin, E. Ó Broin, L. Paroussos, H. Pettifor, K. Ramea, K. Riahi, F. Sano, B.S. Rodriguez, and D.P. van Vuuren, 2018. "Interaction of consumer preferences and climate policies in the global transition to low-carbon vehicles," *Nature Energy* Vol. 3, 664–673.

Rogelj, J., D. Shindell, K. Jiang, S. Fifita, P. Forster, V. Ginzburg, C. Handa, H. Kheshgi, et al., 2018. "Chapter 2: Mitigation pathways compatible with 1.5°C in the context of

sustainable development," In: *Global Warming of 1.5 °C an IPCC special report on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change*. Intergovernmental Panel on Climate Change.

TWI2050 - The World in 2050, 2018. "Transformations to Achieve the Sustainable Development Goals," Report prepared by The World in 2050 initiative. IIASA Report. International Institute for Applied Systems Analysis (IIASA). Laxenburg, Austria

Nilsson, M., E. Chisholm, D. Griggs, P. Howden-Chapman, **D. McCollum**, P. Messerli, B. Neumann, A.-S. Stevance, M. Visbeck, and M. Stafford-Smith, 2018. "Mapping interactions between the sustainable development goals: lessons learned and ways forward," *Sustainability Science* 13 (6), 1489-1503.

McCollum, D.L., W. Zhou, C. Bertram, H.-S. de Boer, V. Bosetti, S. Busch, J. Després, L. Drouet, J. Emmerling, M. Fay, O. Fricko, S. Fujimori, M. Gidden, M. Harmsen, D. Huppmann, G. Iyer, V. Krey, E. Kriegler, C. Nicolas, S. Pachauri, S. Parkinson, M. Poblete-Cazenave, P. Rafaj, N. Rao, J. Rozenberg, A. Schmitz, W. Schoepp, D. van Vuuren, and K. Riahi, 2018. "Energy investment needs for fulfilling the Paris Agreement and achieving the Sustainable Development Goals," *Nature Energy*, Vol. 3, 589-599.

Grubler, A., C. Wilson, N. Bento, B. Boza-Kiss, V. Krey, **D.L. McCollum**, N.D. Rao, K. Riahi, J. Rogelj, S. De Stercke, J. Cullen, S. Frank, O. Fricko, F. Guo, M. Gidden, P. Havlík, D. Huppmann, G. Kiesewetter, P. Rafaj, W. Schoepp, and H. Valin, 2018. "A Low Energy Demand Scenario for Meeting the 1.5°C Target and Sustainable Development Goals without Negative Emission Technologies," *Nature Energy*, Vol. 3, 515-527.

McCollum, D.L., L. Gomez Echeverri, S. Busch, S. Pachauri, S. Parkinson, J. Rogelj, V. Krey, J. Minx, M. Nilsson, A.S. Stevance, and K. Riahi, 2018. "Connecting the Sustainable Development Goals by their energy inter-linkages," *Environmental Research Letters*, Vol. 1, Number 3.

Jewell, J., **D. McCollum**, J. Emmerling, C. Bertram, D.E.H.J. Gernaat, V. Krey, L. Paroussos, L. Berger, K. Fragkiadakis, I. Keppo, N.S. Failali, M. Tavoni, D. van Vuuren, V. Vinichenko, and K. Riahi, 2018. "Limited emission reductions from fuel subsidy removal except in energy exporting regions," *Nature*, 554: 229-233.

McCollum, D., L. Gomez Echeverri, K. Riahi, and S. Parkinson, 2017. "SDG7: Ensure Access to Affordable, Reliable, Sustainable and Modern Energy for All", In: *A guide to SDG interactions: from science to implementation*. Eds. Griggs, D.J., M. Nilsson, A.S. Stevance, and **D. McCollum**, pp. 127-173 International Council for Science, Paris. doi: 10.24948/2017.01.

McCollum, D.L., C. Wilson, H. Pettifor, K. Ramea, V. Krey, K. Riahi, C. Bertram, Z. Lin, Z., O.Y. Edelenbosch, and S. Fujisawa, 2017, "Improving the behavioral realism of global integrated assessment models: An application to consumers' vehicle choices," *Transportation Research Part D: Transport and Environment* 55: 322-342.

van Vuuren D.P., O.Y. Edelenbosch, **D. McCollum**, and K. Riahi, 2017. "A special issue on model-based long-term transport scenarios: Model comparison and new methodological developments to improve energy and climate policy analysis," *Transportation Research Part D: Transport and Environment* 55: 277-280.

Edelenbosch, O.Y., D.P. van Vuuren, C. Bertram, S. Carrara, J. Emmerling, H. Daly, A. Kitous, **D.L. McCollum**, and N. Saadi Failali, 2017. "Transport fuel demand responses to fuel price and income projections: Comparison of integrated assessment models," *Transportation Research Part D: Transport and Environment* 55: 310-321.

Yeh, S., G.S. Mishra, L. Fulton, P. Kyle, **D.L. McCollum**, J. Miller, P. Cazzola, and J. Teter, 2017. "Detailed assessment of global transport-energy models' structures and projections," *Transportation Research Part D: Transport and Environment* 55: 294-309.

Edelenbosch, O.Y., **D.L. McCollum**, D.P. van Vuuren, C. Bertram, S. Carrara, H. Daly, S. Fujimori, A. Kitous, P. Kyle, E. Ó Broin, P. Karkatsoulis , and F. Sano, 2017. "Decomposing passenger transport futures: comparing results of global integrated assessment models," *Transportation Research Part D: Transport and Environment* 55: 281-293.

Pettifor, H., C. Wilson, **D.L. McCollum**, and O.Y. Edelenbosch, 2017. "Modelling social influence and cultural variation in global low-carbon vehicle transitions", *Global Environmental Change* 47: 76-87.

Gambhir, A., L. Drouet, **D. McCollum**, T. Napp, D. Bernie, A. Hawkes, O. Fricko, P. Havlik, K. Riahi, V. Bosetti, and Jason Lowe, 2017. "Assessing the Feasibility of Global Long-Term Mitigation Scenarios", *Energies* 10 (1): e89.

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McCollum, D.L., J. Jewell, V. Krey, M. Bazilian, M. Fay, and K. Riahi, 2016, "Quantifying uncertainties influencing the long-term impacts of oil prices on energy markets and carbon emissions," *Nature Energy*, Vol. 1, Issue 6, Article number: 16077.

Jewell, J., V. Vinichenko, **D. McCollum**, N. Bauer, K. Riahi, T. Aboumahboub, O. Fricko, M. Harmsen, T. Kober, V. Krey, G. Marangoni, M. Tavoni, D.P. van Vuuren, B. van der Zwaan, and A. Cherp, 2016, "Comparison and interactions between the long-term pursuit of

energy independence and climate policies," *Nature Energy*, Vol. 1, Issue 6, Article number: 16073.

Cameron, C., S. Pachauri, N. Rao, **D. McCollum**, J. Rogelj, and K. Riahi, 2016, "Policy tradeoffs between climate mitigation and clean cook stove access in South Asia," *Nature Energy*, Vol. 1, Issue 1, Article number: 15010.

Smith, P., S.J. Davis, F. Creutzig, S. Fuss, J. Minx, B. Gabrielle, E. Kato, R.B. Jackson, A. Cowie, E. Kriegler, D.P. van Vuuren, J. Rogelj, P. Ciais, J. Milne, J.G. Canadell, **D. McCollum**, G. Peters, R. Andrew, V. Krey, G. Shrestha, P. Friedlingstein, T. Gasser, A. Grübler, W.K. Heidug, M. Jonas, C.D. Jones, F. Kraxner, E. Littleton, J. Lowe, J. Roberto Moreira, N. Nakicenovic, M. Obersteiner, A. Patwardhan, M. Rogner, E. Rubin, A. Sharifi, A. Torvanger, Y. Yamagata, J. Edmonds, and C. Yongsung, 2016, "Biophysical and economic limits to negative CO2 emissions," *Nature Climate Change*, Vol. 6, Issue 1, 42-50.

von Stechow, C., J.C. Minx, K. Riahi, J. Jewell, **D. McCollum**, M.W. Callaghan, C. Bertram, G. Luderer, and G. Baiocchi, 2016, "2°C and SDGs: united they stand, divided they fall?," *Environmental Research Letters*, Vol. 11, Issue 3, 034022.

Creutzig, F., P. Jochem, O.Y. Edelenbosch, L. Mattauch, D.P. van Vuuren, **D. McCollum**, and J. Minx, 2015, "Transport: A roadblock to climate change mitigation?," *Science*, Vol. 350, Issue 6263, 911-912.

von Stechow, C., **D. McCollum**, K. Riahi, J.C. Minx, E. Kriegler, D.P. van Vuuren, J. Jewell, C. Robledo-Abad, E. Hertwich, M. Tavoni, S. Mirasgedis, O. Lah, J. Roy, Y. Mulugetta, N.K. Dubash, J. Bollen, D. ürge-Vorsatz, and O. Edenhofer, 2015, "Integrating Global Climate Change Mitigation Goals with Other Sustainability Objectives: A Synthesis," *Annual Review of Environment and Resources*, Vol. 40, 363-394.

van Sluisveld, M.A.E., J.H.M. Harmsen, N. Bauer, **D.L. McCollum**, K. Riahi, M. Tavoni, D.P. van Vuuren, C. Wilson, and B. van der Zwaan, 2015, "Comparing future patterns of energy system change in 2 °C scenarios with historically observed rates of change," *Global Environmental Change*, Vol. 35, 436-449.

Lucas, P., J. Nielsen, K. Calvin, **D.L. McCollum**, G. Marangoni, J. Strefler, B.C.C. van der Zwaan, and D.P. van Vuuren, 2015, "Future energy system challenges for Africa: Insights from Integrated Assessment Models," *Energy Policy*, Vol. 86, 705-717.

Kriegler, E., K. Riahi, N. Bauer, V.J. Schwanitz, N. Petermann, V. Bosetti, A. Marcucci, S. Otto, L. Paroussos, S. Rao-Skirbekk, T. Arroyo Currás, S. Ashina, J. Bollen, J. Eom, M. Hamdi-Cherif, T. Longden, A. Kitous, A. Méjean, F. Sano, M. Schaeffer, K. Wada, P. Capros, D.P. van Vuuren, O. Edenhofer, C. Bertram, R. Bibas, J. Edmonds, N. Johnson, V. Krey, G. Luderer, **D. McCollum**, and K. Jiang, 2015, "A short note on integrated assessment modeling approaches: Rejoinder to the review of 'Making or breaking climate targets —

The AMPERE study on staged accession scenarios for climate policy'," *Technological Forecasting and Social Change*, Vol. 99, 273-276.

Lehtveer, M., M. Makowski, F. Hedenus, **D. McCollum**, M. Strubegger, 2015, "Multi-criteria analysis of nuclear power in the global energy system: Assessing trade-offs between simultaneously attainable economic, environmental and social goals," *Energy Strategy Reviews*, Vol. 8, 45-55.

Rogelj, J., A. Reisinger, **D.L. McCollum**, R. Knutti, K. Riahi, and M. Meinshausen, 2015, "Mitigation choices impact carbon budget size compatible with low temperature goals," *Environmental Research Letters*, Vol. 10, 075003.

Tavoni, M., E. Kriegler, K. Riahi, D.P. van Vuuren, T. Aboumahboub, A. Bowen, K. Calvin, E. Campiglio, T. Kober, J. Jewell, G. Luderer, G. Marangoni, **D. McCollum**, M. van Sluisveld, A. Zimmer, and B. van der Zwaan, 2015, "Post-2020 climate agreements in the major economies assessed in the light of global models," *Nature Climate Change*, Vol. 5, 119-126.

Yang, C., S. Yeh, S. Zakerinia, K. Ramea, and **D. McCollum**, 2015, "Achieving California's 80% greenhouse gas reduction target in 2050: Technology, policy and scenario analysis using CA-TIMES energy economic systems model," *Energy Policy*, Vol. 77, 118-130.

Riahi, K., E. Kriegler, N. Johnson, C. Bertram, M. den Elzen, J. Eom, M. Schaeffer, J. Edmonds, M. Isaac, V. Krey, T. Longden, G. Luderer, A. Méjean, **D.L. McCollum**, S. Mima, H. Turton, D.P. van Vuuren, K. Wada, V. Bosetti, P. Capros, P. Criqui, M. Hamdi-Cherif, M. Kainuma, and O. Edenhofer, 2015, "Locked into Copenhagen pledges - Implications of short-term emission targets for the cost and feasibility of long-term climate goals," *Technological Forecasting and Social Change*, Vol. 90, Part A, 8-23

Bauer, N., V. Bosetti, M. Hamdi-Cherif, A. Kitous, **D. McCollum**, A. Méjean, S. Rao, H. Turton, L. Paroussos, S. Ashina, K. Calvin, K. Wada, and D. van Vuuren, 2015, "CO_2 emission mitigation and fossil fuel markets: Dynamic and international aspects of climate policies," *Technological Forecasting and Social Change*, Vol. 90, Part A, 243-246.

Johnson, N., V. Krey, **D.L. McCollum**, S. Rao, K. Riahi, and J. Rogelj, 2015, "Stranded on a Low-Carbon Planet: Implications of Climate Policy for the Phase-out of Coal-based Power Plants," *Technological Forecasting and Social Change*, Vol. 90, Part A, 89-102.

UNEP, 2014, "The Emissions Gap Report 2014," United Nations Environment Programme, Nairobi, ISBN: 978-92-807-3413-3.

Clarke, L., K. Jiang, K. Akimoto, M. Babiker, G. Blanford, K. Fisher-Vanden, J-C Hourcade, V. Krey, E. Kriegler, A. Löschel, **D. McCollum**, S. Paltsev, S. Rose, P.R. Shukla, M. Tavoni, B. van der Zwaan, and D.P. van Vuuren, 2014, "Chapter 6 - Assessing transformation

pathways", In *Climate Change 2014: Mitigation of Climate Change. IPCC Working Group III Contribution to AR5*.

Rogelj, J., S. Rao, **D.L. McCollum**, S. Pachauri, Z. Klimont, V. Krey, and K. Riahi, 2014, "Air-pollution emission ranges consistent with the representative concentration pathways," *Nature Climate Change*, Vol. 4, 446-450.

McCollum, D.L., N. Bauer, K. Calvin, A. Kitous, and K. Riahi, 2014, "Fossil resource and energy security dynamics in conventional and carbon-constrained worlds," *Climatic Change*, Vol. 123, Issue 3, 413-426.

McCollum, D.L., V. Krey, P. Kolp, Y. Nagai, and K. Riahi, 2014, "Transport electrification: a key element for energy system transformation and climate stabilization," *Climatic Change*, Vol. 123, Issue 3, 651-664.

McCollum, D.L., Y. Nagai, K. Riahi, G. Marangoni, K. Calvin, R. Pietzcker, J. van Vliet, and B. van der Zwaan, 2013, "Energy investments under climate policy: a comparison of global models," *Climate Change Economics*, Vol. 4, Issue 4.

Tavoni, M., E. Kriegler, T. Aboumahboub, K. Calvin, G. De Maere, J. Jewell, T. Kober, P. Lucas, G. Luderer, **D. McCollum**, G. Marangoni, K. Riahi, and D. van Vuuren, 2013, "The distribution of the major economies' effort in the Durban platform scenarios," *Climate Change Economics*, Vol. 4, Issue 4.

Calvin, K., M. Wise, D. Klein, **D. McCollum**, M. Tavoni, B. van der Zwaan, and D.P. van Vuuren, 2013, "A multi-model analysis of the regional and sectoral roles of bioenergy in near- and long-term CO_2 emissions reduction," *Climate Change Economics*, Vol. 4, Issue 4.

Jewell, J., A. Cherp, V. Vinichenko, N. Bauer, T. Kober, **D. McCollum**, D.P. van Vuuren, and B. van der Zwaan, 2013, "Energy security of China, India, the E.U. and the U.S. under long-term scenarios: Results from six IAMs," *Climate Change Economics*, Vol. 4, Issue 4.

van der Zwaan, B.C.C., H. Rösler, T. Kober, T. Aboumahboub, K.V. Calvin, D.E.H.J. Gernaat, G. Marangoni, and **D. McCollum**, 2013, "A Cross-Model Comparison of Global Long-Term Technology Diffusion under a 2˚C Climate Change Control Target," *Climate Change Economics*, Vol. 4, Issue 4.

McCollum, D.L., V. Krey, K. Riahi, P. Kolp, A. Grubler, M. Makowski, and N. Nakicenovic, 2013, "Climate policies can help resolve energy security and air pollution challenges," *Climatic Change*, Vol. 119, Issue 2, 479-494.

Rogelj, J., **D.L. McCollum**, and K. Riahi, 2013, "The UN's 'Sustainable Energy for All' initiative is compatible with a warming limit of 2 °C," *Nature Climate Change*, Vol. 3, 545-551.

Rogelj, J., **D.L. McCollum**, A. Reisinger, M. Meinshausen, and K. Riahi, 2013, "Probabilistic cost estimates for climate change mitigation," *Nature*, Vol. 1, Issue 493, 79-83.

Rogelj, J., **D.L. McCollum**, B.C. O'Neill, and K. Riahi, 2013, "2020 emissions levels required to limit warming to below 2°C," *Nature Climate Change*, Vol. 3, 405-412.

Riahi, K., F. Dentener, D. Gielen, A. Grubler, J. Jewell, Z. Klimont, V. Krey, **D. McCollum**, S. Pachauri, S. Rao, B. van Ruijven, D.P. van Vuuren, and C. Wilson, 2012, "Chapter 17 - Energy Pathways for Sustainable Development," *Global Energy Assessment - Toward a Sustainable Future*, Cambridge University Press, Cambridge, UK and New York, NY, USA and the International Institute for Applied Systems Analysis, Laxenburg, Austria, 1203-1306, ISBN: 9780521182935.

McCollum, D.L., V. Krey, and K. Riahi, 2012, "Beyond Rio: Sustainable energy scenarios for the 21st century," *Natural Resources Forum*, Vol. 36, Issue 4, 215-230.

van Vliet, O., V. Krey, **D.L. McCollum**, S. Pachauri, Y. Nagai, S. Rao, and K. Riahi, 2012, "Synergies in the Asian energy system: Climate change, energy security, energy access and air pollution," *Energy Economics*, Volume 34, Supplement 3, S470–S480.

McCollum, D.L., C. Yang, S. Yeh, and J. Ogden, 2012, "Deep greenhouse gas reduction scenarios for California - Strategic implications from the CA-TIMES energy-economic systems model," *Energy Strategy Reviews*, Vol. 1, Issue 1, 19-32.

McCollum, D.L., V. Krey, and K. Riahi, 2011, "An integrated approach to energy sustainability," *Nature Climate Change*, Vol. 1, 428-429.

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McCollum, D., and C. Yang, 2009, "Achieving deep reductions in US transport greenhouse gas emissions: Scenario analysis and policy implications," *Energy Policy*, Vol. 37, Issue 12, 5580-5596.

Yang, C., **D. McCollum**, R. McCarthy, and W. Leighty, 2009, "Meeting an 80% Reduction in Greenhouse Gas Emissions from Transportation by 2050: A Case Study in California, USA," *Transportation Research Part D: Transport and Environment*, Vol. 14, Issue 3, 147-156.

McCollum, D., and J. Ogden, 2008, "Future Impacts of Coal Distribution Constraints on Coal Cost," *Transportation Research Part E: Logistics and Transportation Review*, Vol. 45, Issue 3, 460-471.

BOOK CHAPTERS & TECHNICAL REPORTS

CSIRO, 2015, "Australian National Outlook 2015: Living standards, resource use, environmental performance and economic activity, 1970-2050," Commonwealth Scientific and Industrial Research Organization. (Expert Reviewer)

Council of Canadian Academies, 2015, "Technology and Policy Options for a Low-Emission Energy System in Canada," The Expert Panel on Energy Use and Climate Change. (Expert Reviewer)

Gambhir, A., T. Napp, A. Hawkes, **D. McCollum**, O. Fricko, P. Havlik, K. Riahi, L. Drouet, V. Bosetti, D. Bernie, and J. Lowe, 2015, "Assessing the challenges of global long-term mitigation scenarios", Report for the AVOID 2 programme, funded by UK DECC.

Rao, N.D., **D. McCollum**, N.K. Dubash, R. Khosla, 2015, "Development and Climate Policy Synergies: Insights from Global Modeling Studies," Centre for Policy Research, India, and International Institute for Applied Systems Analysis, Austria.

Grubler, A. and S. Fuss, with contributions from **D. McCollum**, V. Krey, K. Riahi, 2014, In *Energy Technology Innovation: Learning from Historical Successes and Failures, Learning from Historical Successes and Failures*, Cambridge University Press, Cambridge, UK / New York, USA, pp. 89-104, ISBN: 9781107023222.

Riahi, K., **McCollum, D.**, and V. Krey, 2012, "The Next Energy Transition: Transformative Pathways, Choices and Opportunities," International Institute for Applied Systems Analysis, Laxenburg, Austria.

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Yeh, S., and **D.L. McCollum**, 2011, "Optimizing the transportation climate mitigation wedge," in *Sustainable Transportation Energy Pathways: A Research Summary for Decision Makers*, J. Ogden and L. Anderson (eds), The Regents of the University of California, Davis, CA, USA, 234-247, ISBN: 9781466317239.

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PH.D. DISSERTATION & MASTER'S THESIS

McCollum, D.L., 2011, "Achieving Long-term Energy, Transport and Climate Objectives: Multi-dimensional Scenario Analysis and Modeling Within a Systems Level Framework," Ph.D. Dissertation, University of California, Davis, USA, ISBN: 9781124665986.

McCollum, D., 2007, "Future Impacts of Coal Distribution Constraints on Coal Cost," Institute of Transportation Studies, University of California, Davis, Master's Thesis, UCD-ITS-RR-07-26, http://pubs.its.ucdavis.edu/.

INVITED TALKS, LECTURES, WORKSHOPS, PANELS & ADVISORY POSITIONS

2018 United Nations Climate Change Conference, 24th Conference of the Parties (COP24) to the United Nations Framework Convention on Climate Change (UNFCCC), Katowice, Poland, 12/2018, Presentation: "Energy investment needs for fulfilling the Paris Agreement and achieving the Sustainable Development Goals"

2 degrees investing initiative Workshop on Implementing Art. 2.1c of the Paris Agreement and the Recommendations of the EU High-Level Expert Group on Sustainable Finance: A Policy Agenda for 2018 and Beyond, *Kitzbühel, Austria, 3/2018*, Presentation: "Understanding 'climate scenarios' in practice"

Task Force for Climate-Related Financial Disclosures (TCFD) and Bank of England (BoE) Conference on Climate Scenarios, Financial Risk and Strategic Planning, *London, United Kingdom, 10/2017*, Presentation: "Transport scenarios: the who, what, why, and how"

7th International Conference on Sustainability Science (ICSS), *Stockholm, Sweden, 8/2017*, Presentation: "Sustainable Development Goals: energy interactions"

Whole Systems Energy Modelling (wholeSEM) Consortium Annual Conference, *London, UK, 7/2017*, Summary presentation after chairing a focus group on 'How consistently will government energy policies be maintained for?'

United Nations High-Level Political Forum on Sustainable Development (HLPF), *New York, New York, USA, 7/2017*, Presentations: "A Guide to SDG Interactions: from Science to Implementation" and "Sustainable Development Goals: energy interactions"

International Transport Forum's 2017 Summit, *Leipzig, Germany, 5/2017*, Presentation: "Reflections on the Progress of the OECD/ITF's Decarbonising Transport Initiative", Panel discussion

International Workshop on End-Use Energy Modeling, *Seoul, South Korea, 3/2017*, Presentation: "Overview of the MESSAGE-Transport Model"

Implications of Paris Research and Workshop Series, *Trondheim, Norway, 3/2017*, Presentation: "Transport's Role in the Decarbonization Process"

University of Tennessee, Howard H. Baker Jr. Center for Public Policy, *Knoxville, TN, USA, 1/2017*, Presentation: "Alternative Fuel Vehicles and the Future of the Global Energy System", Public lecture

Georgia Institute of Technology, *Atlanta, Georgia, USA, 1/2017*, Presentation: "Improving the behavioral realism of global integrated assessment models: assessing the impact on electric vehicle deployment"

Whole Systems Energy Modelling (wholeSEM) Consortium Annual Conference, *Cambridge University*, *UK*, *7/2016*, Presentation: "Quantifying uncertainties influencing the long-term impacts of oil prices on energy markets and carbon emissions"

Hadera EnergyTech Conference, *Tel Aviv*, *Israel*, *4/2016*, Presentation: "Sustainable energy scenarios for the 21st century: the role of systems analysis"

Tel Aviv University, *Tel Aviv*, *Israel*, *4/2016*, Presentation: "International research collaborations to develop the tools of systems analysis"

University of East Anglia, Tyndall Centre, *Norwich, United Kingdom, 2/2016*, Presentation: "Sustainable energy scenarios for the 21st century: the role of systems analysis", Lecture given in departmental seminar series

UK DECC workshop on the co-benefits and possible adverse side effects of mitigation, *London, United Kingdom, 2/2016*, Department of Energy & Climate Change, Expert contributor

Oak Ridge National Laboratory, *Oak Ridge*, *Tennessee, USA*, *1/2016*, Presentation: "Improving the behavioral realism of global integrated assessment models: an application to consumers' vehicle choices"

IIASA Systems Analysis Conference 2015, *Laxenburg, Austria, 11/2015*, "Harnessing systems-analytical tools to develop sustainable energy scenarios for the 21st century", Presentation and panel discussion (URL: https://sa2015.iiasa.ac.at/sessions/devising-integrated-solutions/)

Systems analysis practices for the future in a Nordic country and IIASA context - an evaluation of possibilities in a multi-generational outlook, *Laxenburg, Austria, 11/2015*,

"Harnessing systems-analytical tools to develop sustainable energy scenarios for the 21st century", Lecture given in a Ph.D. course

University of Natural Resources and Life Sciences (BOKU), *Vienna, Austria, 7/2015*, Alternative Economic & Monetary Systems Summer School, Presentation: "The global energy system: its transformation and implications for the future"

Whole Systems Energy Modelling (wholeSEM) Consortium Annual Conference, *Cambridge University*, *UK*, *7/2015*, Presentation: "Improving the behavioral realism of global integrated assessment models: an application to consumers' vehicle choices"

Integrated Assessment Modeling to inform climate change policy: UK capabilities, challenges and opportunities, *London, UK, 12/2013*, Expert advisory workshop organized by the UK's Natural Environment Research Council (NERC)

OMV Headquarters, *Vienna, Austria, 9/2013*, "Multi-objective analysis of energy security, air pollution, and climate challenges", Presentation and group discussion

University of Tennessee, Howard H. Baker Jr. Center for Public Policy, *Knoxville, TN, USA, 7/2013*, "Energy Pathways for Sustainable Development: Insights from the Global Energy Assessment", Public lecture

European Forum Alpbach, Political Symposium, *Alpbach, Austria, 8/2013*, "Dealing with the Complexities of Development: Why are Integrated Approaches Essential?", Lecture to students and hands-on tutorial of IIASA ENE-MCA policy software

Vienna Energy Forum, *Vienna, Austria, 5/2013*, "Analytical Tools for Energy Policy Making and Planning", Presentation and panel discussion

Negative Emissions and the Carbon Cycle, *Laxenburg, Austria, 4/2013*, "Bioenergy with CCS: How and Where?", Joint presentation with Volker Krey, Expert workshop organized by the Global Carbon Project and IIASA

Worlds Within Reach: From Science to Policy, *Vienna, Austria, 10/2012*, "Identifying Energy Policy Synergies and Interlinkages through Systems Analysis", Presentation and panel discussion (URLs: http://youtu.be/16iXAIQsHsE; http://youtu.be/c6ZTyTGSO50)

Yale University, *New Haven, CT, USA, 12/2012*, "Multi-objective analysis of energy and climate challenges", Lecture to a graduate/undergraduate course on Energy Systems Analysis

University of California, Davis, *Davis, CA, USA, 11/2012*, "Toward energy system transformation and long-term climate stabilization: key uncertainties and their implications", Presentation and panel discussion at the NextSTEPS Symposium

SCIENTIFIC CONFERENCES & MEETINGS

International Energy Workshop, *Gothenburg, Sweden, 6/2018*, Presentation: "Energy investment needs for fulfilling the Paris Agreement and achieving the Sustainable Development Goals"

Integrated Assessment Modeling Consortium Annual Meeting, *Recife*, *Brazil, 12/2017*, Plenary presentation: "Energy investment needs for fulfilling the Paris Agreement and achieving the Sustainable Development Goals"

International Transport Energy Modeling Consortium (iTEM), 3rd Annual Meeting, *Paris, France, 10/2017*, Presentation: "'Improving the behavioral realism of global integrated assessment models: assessing the impact on electric vehicle deployment"

International Transport Energy Modeling Consortium (iTEM), 2nd Annual Meeting, *Gothenburg, Sweden, 10/2016*, Presentation: "Quantifying uncertainties influencing the long-term impacts of oil prices on energy markets and carbon emissions"

International Energy Workshop, *Cork, Ireland, 6/2016*, Presentation: "Quantifying uncertainties influencing the long-term impacts of oil prices on energy markets and carbon emissions"

Our Common Future Under Climate Change, *Paris*, *France*, *7/2015*, Presentation: "The future role of fossil energy in the global energy mix: recent insights from integrated assessment models"

Integrated Assessment Modeling Consortium Annual Meeting, *Potsdam*, *Germany, 11/2015*, Poster: "Oil prices and their impact on global carbon dioxide emissions"

International BE4 Workshop: Including Behaviour in Energy/Engineering/Economy/Environment Models, *University College London*, *UK*, *4/2015*, Presentation: "Breaking down non-cost barriers to technology adoption is critical for the transport-energy transformation"

Integrated Assessment Modeling Consortium Annual Meeting, *College Park*, *Maryland*, *USA, 11/2014*, Presentation: "Energy investments under climate policy: a comparison of global models"

Integrated Assessment Modeling Consortium Annual Meeting, *Tsukuba, Japan, 10/2013*, Presentation: "Climate policies can help resolve energy security and air pollution challenges"

International Energy Workshop, *Paris, France, 6/2013*, Presentation: "Investments, offsets, and incentives: an analysis of the 2 °C target and what it takes to achieve it"

International Conference on Energy Process Engineering: Transition to Renewable Energy Systems, *Frankfurt am Main, Germany, 6/2013*, Presentation: "Transport electrification: a key element for energy system transformation and climate stabilization"

Global Energy Transformation Pathways and Policy Tools, *Yerevan, Armenia, 6/2012*, Presentation: "The Global Energy Assessment Pathways: Achieving the Next Energy Transformation", Policymakers workshop sponsored by the United Nations, Global Environment Facility, IIASA, and The Republic of Armenia

Global Energy Transformation Pathways and Policy Tools, *New Delhi, India, 5/2012*, Presentation: "Policy synergies between climate change, air pollution and health, and energy security", Policymakers workshop sponsored by the United Nations, Global Environment Facility, IIASA, and The Energy and Resources Institute

Planet Under Pressure, *London, UK, 3/2012*, Presentation: "Policies to Protect the Global Climate Offer an Effective Entry Point for Achieving Society's Multiple Objectives for Energy Sustainability", Session on 'Health and security benefits of a low-carbon economy'

International Energy Workshop, *Stockholm, Sweden, 6/2010*, Presentation: "Modeling Optimal Transition Pathways to a Low Carbon Economy in California: Impacts of Advanced Vehicles and Fuels on the Energy System"

International Energy Workshop, *Stockholm, Sweden, 6/2010*, Presentation: "Multi-criteria analysis of competing energy objectives: evaluating the trade-offs between near-term energy security and air pollution goals and mid- to long-term climate targets"

GRANT FUNDING AWARDED & PRINCIPAL INVESTIGATOR ROLES

COMMIT Project, *2018-20*, "Climate policy assessment and mitigation modeling to integrate national and global transition pathways", Collaboration between multiple research institutions throughout the world (~€140,000)

U.S. Environmental Protection Agency, Office of Transportation and Air Quality Project, *2016-18*, "Understanding the energy and emissions leakage effects of US biofuels policies", Collaboration between IIASA, RTI International, and U.S. EPA-OTAQ (€80,000)

Eco-Spill Project, *2016-17*, "Accounting for behavioral spillovers in the global adoption of sustainable technologies and lifestyles: toward next-generation scenario modeling", Collaboration between IIASA, University of East Anglia, and Oak Ridge National Laboratory (€60,000)

ADVANCE Project, *2013-16*, Work Package 3, Task 3.1 on "Improving the representation of demand-side heterogeneity in global integrated assessment models", Collaboration between multiple research institutions throughout the world (~€400,000)

ALPS Project, *2016-17*, "New Approaches for Modeling Energy End-use Technology Adoption and Behavior in IAM Frameworks", Collaboration between IIASA and RITE, (¥16 million, or ~€140,000)

LDV Project, *2015-16*, "Exploring possible LDV-Transition pathways to achieve long-term GHG and petroleum targets", Collaboration between IIASA and Toyota Central R&D Labs, Inc. (€18,500)

ALPS Project, *2015-16*, "New Approaches for Modeling Energy End-use Technology Adoption and Behavior in IAM Frameworks", Collaboration between IIASA and RITE, (¥13 million, or ~€100,000)

MAJOR RESEARCH & INTERDISCIPLINARY ACTIVITIES

Intergovernmental Panel on Climate Change Special Report on 1.5 °C, *Contributing Author (Chapter 2: Mitigation pathways compatible with 1.5°C in the context of sustainable development), 11/2012-11/2014,* Co-coordinated material on energy investment needs for deep decarbonization pathways

Multi-stakeholder International Research Activities, *IIASA, 2/2011-1/2019*, Played leading roles in collaborative, international projects with the Stanford Energy Modeling Forum, European Commission (AMPERE, LIMITS, ADVANCE, CD-LINKS, COMMIT), United Nations Organizations, Global Environment Facility, Asian Development Bank, U.S. Environmental Protection Agency

United Nations Environment Programme Finance Initiative (UNEP-FI), *2017-18,* Worked with leading international banks to promote use of energy and emissions scenarios for informing risk valuation; motivated by the Task Force on Climate-related Financial Disclosures.

International Council for Science (ICSU), *2016-17,* Led a team of energy experts to draft a chapter on energy-related Sustainable Development Goal interactions, and coordinated the overall report as member of the editorial team.

United Nations Environment Programme (UNEP), The Emissions Gap Report 2014, *Lead Author (Chapter 2: What emission levels will comply with temperature limits?), 5-12/2014,* Led the analysis of business-as-usual emissions scenarios.

Intergovernmental Panel on Climate Change Fifth Assessment Report (WG III), *Lead Author (Chapter 6: Assessing Transformation Pathways) & Contributing Author (Chapter 12:*

Human Settlements, Infrastructure and Spatial Planning), 11/2012-11/2014, Co-coordinated material on co-benefits and risks of climate change mitigation, linking mitigation to other sustainable development concerns (air quality, energy security, land and water use, biodiversity, energy access, and employment)

Global Energy Assessment, *Lead Author (Chapter 17: Energy Pathways for Sustainable Development)*, *6/2009-6/2012*, Studied the relationship between energy security, climate change and air pollution policies using an integrated assessment model and multi-criteria analysis techniques

CA-TIMES: California Energy Modeling for Policy Analysis, *UC-Davis/California Air Resources Board, 1/2008-3/2011*, Developed an energy-engineering-economic-environmental (4E) model to understand energy transitions

Greenhouse Gases from Aviation and Marine Transport: Mitigation Potential and Policies, *Pew Center on Global Climate Change, 1/2009-7/2009*, Consulting project culminating in a technical report used for policy making

Achieving Deep Reductions in US Transport Greenhouse Gas Emissions, *UC-Davis, 8/2008-12/2008*, Conducted a long-term scenario analysis exploring the potential for deep (50-80%) GHG reductions from the US transport sector

80-in-50 Study: Reducing California's Transport Sector GHG Emissions 80% by 2050, *UC-Davis, 1/2008-11/2008*, Studied the transportation options for meeting California's long-term greenhouse gas emissions reduction goals

Multi-Path Transportation Futures Study, *Argonne National Laboratory, 9/2007-12/2007*, Characterized transport fuel production options in terms of costs, emissions, and water use

Future Impacts of Coal Distribution Constraints on Coal Cost, *UC-Davis/U.S. DOT, 4/2006-12/2007*, Analyzed the impact of increased coal demand on the U.S. railroad network

Models for Carbon Dioxide Transport and Underground Storage, *UC-Davis, 9/2005-10/2006*, Investigated techno-economic models for CO_2 compression, pipeline transport, and geological storage

Investigation of Advanced Diesel Engines with WAVE and ADVISOR, *National Renewable Energy Laboratory, 6/2003-8/2003*, Modeled vehicle/engine performance and emissions

INTERVIEWS, OUTREACH, & MEDIA (REPRESENTATIVE)

Carbon Brief, *6/18/2018*, "Clean energy investment 'must be 50% higher' to limit warming to 1.5C", URL: https://www.carbonbrief.org/clean-energy-investment-must-be-50-per-cent-high-limit-warming-one-point-five

World Economic Forum, *6/13/2017*, "This is the UN's secret plan to save the world", URL: https://www.weforum.org/agenda/2017/06/science-is-helping-save-the-world-one-sdg-at-a-time/

Carbon Brief, *6/13/2016*, "Low oil prices could 'hamper' action on climate change, say scientists", URL: https://www.carbonbrief.org/low-oil-prices-could-hamper-action-on-climate-change-say-scientists

Süddeutsche Zeitung, *11/20/2015*, "Wer Klimaschutz ernst nimmt, muss Autos abrüsten", URL: http://tiny.cc/jrrq6x

ORF FM4 Reality Check, *11/12/2014*, Radio program on "US-China Joint Announcement on Climate Change and Clean Energy Cooperation", URL: http://fm4.orf.at/stories/1749342/

International Business Times, *11/12/2014*, "US-China Carbon Deal to Prevent Interstellar Apocalypse", URL: http://tinyurl.com/leq78nn

Scientific American, *2/25/2013*, "U.N. Sustainable Energy Effort Could Keep Warming Below 2 Degrees Celsius", URL: http://tinyurl.com/bz8wju5

ORF FM4 Reality Check, *1/30/2013*, Radio program on "Politics and climate", URL: http://fm4.orf.at/stories/1711885/

Climate Progress Blog, *1/6/2013*, "Nature: Limiting Climate Change Will Become Much Harder 'And More Expensive If Action Is Not Taken Soon'", URL: http://tinyurl.com/b52o3pd

The Guardian (U.K.), *12/18/2012*, "At the edge of the carbon cliff", URL: http://tinyurl.com/cj396g2

LEADERSHIP POSITIONS, ADVISORY BOARDS & COMMITTEES

Member, US Committee for IIASA, 2019-Present

Steering Committee Member, National Renewable Energy Laboratory, Transportation Energy and Mobility Pathway Options (TEMPO) model, 2018-Present

Scientific Advisory Committee Member, Science Based Targets Initiative, 2018-Present

Organizing Committee Member, International Transport Energy Modeling Consortium (iTEM), 2013-Present

Advisory Board Member, International Transport Forum (of the OECD), Decarbonising Transport Initiative, 2017-Present

Chair, Subgroup on Regional Harmonization, Data Management Scientific Working Group, Integrated Assessment Modeling Consortium, 2013-16

Member, IIASA's Permanent Committee on Diversity Management and Building a Positive Work Environment at IIASA, 2015-16

Lead organizer, ADVANCE Expert Workshop: Enhancing the State of Transport Modeling in IAMs, 2013

Co-organizer, Integrated Assessment Modeling Consortium Annual Meeting 2013

Co-chair, IIASA 40th Anniversary Conference Day 3 Planning Committee, 2012

Chair, Fossil Resources Subgroup in the Energy Modeling Forum (EMF) 27 Exercise

Member, Selection Committee IIASA-YSSP Peccei/Mikhalevich Scholarships (2012-16)

SYMPOSIA & PROGRAMS

DISCCRS VIII Symposium (Dissertations Initiative for the Advancement of Climate Change Research), *10/2013*, NSF/NASA-supported program to foster interdisciplinary understanding and collegial peer interactions across the range of disciplines associated with the study of climate change; fellowship awarded

IIASA Young Scientists Summer Program 2009, *6/2009-9/2009*, Collaborated with senior research scientists within the context of a fellowship program for international PhD students

UK Energy Research Centre Energy Summer School 2008, *6/2008*, Participated in a one-week course for international PhD students to gain a broader understanding of energy issues

Research Experience in Carbon Sequestration (RECS) Program, *U.S. DOE, 8/2007*, Participated in a two-week course addressing the range of scientific, technical and policy issues associated with CCS

PH.D. STUDENTS SUPERVISED AND THESES ASSESSED

Chandan Bhardwaj, Simon Fraser *University, Canada*, 2018, Research on policies to encourage the adoption of electric vehicles; on Ph.D. thesis proposal committee

Eamonn Mulholland, *University College Cork, Ireland*, 2017, Research on the potential for alternative fuel vehicles in the transport sector; served as an external examiner for Ph.D. thesis defense

Oreane Edelenbosch, *Netherlands Environmental Assessment Agency (PBL), The Netherlands*, 2014-17, Joint research focusing on vehicle choice in transport in energy-economic models; on Ph.D. thesis defense committee

Arnaud Koehl, *Imperial College London, United Kingdom*, 2016, Research on the health co-benefits of transport in different countries; on Ph.D. thesis evaluation committee

Dina Subkhankulova, *University College London, United Kingdom*, 2016, Joint research on the impacts of demand-side management on UK electricity producers

Zhaomiao Guo, *University of California, Davis, USA*, 2015, Joint research focusing on the impact of international strategic interactions on the U.S. domestic transportation fuel mix using game-theoretical approaches

Gillian Foster, *Vienna University of Economics and Business, Austria*, 2015, Joint research focusing on future ethylene demand from natural gas and biomass

Kalai Ramea, *University of California, Davis, USA*, 2013, Joint research to enhance the state-of-the-art of vehicle choice and transport behavior decision-making algorithms in integrated assessment models

Mariliis Lehtveer, *Chalmers University, Sweden*, 2012, Joint research focusing on the role and trade-offs of nuclear power in a low-carbon society

Joeri Rogelj, *ETH-Zurich, Switzerland*, 2011, Joint research culminated in three peer-reviewed publications analyzing long-term energy and greenhouse gas scenarios

HONORS & AWARDS

Post-Graduate

Sustainable Transportation Center Dissertation Fellowship, UC-Davis & US Department of Transportation

Sustainable Transportation Center's Outstanding Student of the Year for 2010

Fulbright Full Research Grant to Germany, U.S. Department of State [*Declined*]

German Academic Exchange Service (DAAD) Dissertation Grant to Germany [*Declined*]

U.S. National Academy of Sciences Fellowship for IIASA's Young Scientists Summer Program (YSSP)

Ernest E. Hill Fellowship (UC-Davis) for studying Carbon-Neutral Alternative Energy Solutions

UC-Davis Bixby International Travel Grant

Achievement Rewards for College Scientists Fellowship (2007-08 & 2009-10)

Dwight David Eisenhower Graduate Transportation Fellowship (USDOT FHWA)

UC-Davis Institute of Transportation Studies Outstanding MS Thesis Award

Chevron Corporation Graduate Research Fellowship

UC Transportation Center First Year Graduate Fellowship

Tau Beta Pi Engineering Honor Society Graduate Fellowship

Undergraduate

University of Tennessee Chemical Engineering Outstanding Senior Award

Tennessee Society of Professional Engineers Scholarship

LANGUAGE SKILLS

English - *fluent (native speaker)*

German – *conversant* (*upper intermediate level)*

COMPUTER SOFTWARE & PROGRAMMING SKILLS (SELECTED)

Microsoft Office (Word, Excel, PowerPoint, Outlook)

Endnote

Adobe Illustrator

Matlab

Python

R

SQL Developer

Github

RELEVANT COURSEWORK (SELECTED)

- Energy, climate, and transport studies (various courses on technology, policy, and modeling)
- Economics (micro-econ., engineering econ., infrastructure econ., development econ., environmental econ., econometrics, financial management, economic demand and market analysis)
- Linear programming and optimization
- Statistics and numerical methods
- Heat and mass transfer, thermodynamics, process control, chemical reactor design, physics