Matthew J. Gidden, Ph.D.

CONTACT Laimgrubengasse 17/7 *Mobile:* +43 (0)6 676 175 3442

INFORMATION Vienna, 1060 E-mail: matthew.gidden@gmail.com

Austria Website: mattgidden.com

Github: gidden

CITIZENSHIP USA

RESEARCH INTERESTS Energy systems, sustainable development, energy policy, integrated assessment modelings, cientific computation, nuclear fuel cycle analysis, advanced nuclear reactors, nuclear nonproliferation

EDUCATION

PH.D., Nuclear Engineering, University of Wisconsin - Madison March 2015

- An Agent-Based Modeling Framework and Application for the Generic Nuclear Fuel Cycle
- Advisor: Professor Paul P.H. Wilson

MASTERS, Nuclear Engineering, University of Wisconsin - Madison
B.S., Nuclear Engineering, Texas A&M University

December 2011
May 2009

- Summa cum Laude, With Honors in Engineering
- Minor in Mathematics

RESEARCH EXPERIENCE

International Institute for Applied Systems Analysis, Energy Group, Laxenburg, AUSTRIA Oct 2015 – Present

Research Scholar

Develop and use MESSAGEix, a global Integrated Assessment Model, to perform large-scale comprehensive Land-Energy-Water Nexus analyses; develop common tools and procedures used by the global IAM community; perform GIS-based spatial modeling and analysis.

University of Wisconsin, NE Dept., Madison, WI

Apr – Oct 2015

Postdoctoral Researcher

Investigated novel methods for modeling recycle fuel fabrication in NFC simulations.

University of Wisconsin, NE Dept., Madison, WI

Aug 2010 – Mar 2015

Graduate Research Assistant

Aug 2009 - Jan 2010

Developed and extended the Cyclus NFC simulator to model generic nuclear fuel cycles.

AREVA, Paris, FRANCE

Feb - Jul 2010

Research Intern (Stagiaire), Core Design Group

Simulated and analyzed a boron dilution accident in multiple reactor configurations using MCNP.

Pacific Northwest National Lab, Richland, WA

Jun - Aug 2009

Research Assistant

Analyzed a design of an automated verification unit for canisters of enriched UF₆ using MCNP.

TN International (AREVA), Montigny-le-Bretonneux, FRANCE

Jun - Aug 2008

Research Intern, Materials Group

Analyzed material suitability for nuclear cask shock absorber via dynamic compression testing.

Oak Ridge National Lab, Oak Ridge, TN

Jun - Aug 2007

Research Assistant

Jun - Aug 2006

Tested the collimation of radiation portal monitors for use with the U.S. Megaports Initiative.

HONORS & AWARDS	2 nd Place in Energy Policy, Innovations in Fuel Cycle Research Winner, The Why Files Cool Science Image Contest Nuclear Energy University Program Graduate Research Fellowship American Nuclear Society Graduate Scholarship Nuclear Regulatory Commission Undergraduate Scholarship President's Endowed Scholarship, Texas A&M University Stinson Scholarship, Texas A&M University	2014 2014 2010 - 2013 2013 2008 - 2009 2005 - 2009 2005 - 2009
PROFESSIONAL ORGANIZATIONS & SERVICE	Elsevier Energy Forum, Member European Geosciences Union, Member Institute for Operations Research and Management Science, Member American Nuclear Society, Member Communications Committee, Member Public Policy Committee, Member Special Advisory Committee on Nuclear Nonproliferation, Member Student Sections Committee, Member Local Sections Committee, Member Nuclear Nonproliferation Special Committee, Member ANS Student Conference, Co-Chair Institute of Nuclear Materials Management, Member Alpha Nu Sigma, Member Nuclear Engineering Student Delegation, Delegate Chair Vice Chair American Nuclear Society, Texas A&M Chapter, Member Vice President	2018 – Present 2017 – Present 2016 – Present 2014 – Present 2006 – Present 2013 – Present 2013 – Present 2012 – 2016 2010 – 2016 2010 – 2012 2008 2008 – Present 2011 – 2013 2013 2012 2005 – 2009 2006 – 2007
TEACHING EXPERIENCE	European Geoscience Union General Assembly 2017 , Vienna, Austria Working with big, multi-dimensional geoscientific datasets in Python: a tut xarray	April 27, 2017 orial introduction to
	Open Energy Modeling Workshop , Frankfurt, Germany Introduction to Scientific Programming in Python	April 19 – 21, 2017
	African Institute for Mathematical Sciences (AIMS) Structured Master's in Mathematical Sciences, Cape Town, South Africa Scientific Computation with Python	
	University of Wisconsin Advanced Computing Initiative, Madison, WI Software Carpentry: Version Control with Git	Aug 26 – 27, 2015
	University of Wisconsin Advanced Computing Initiative, Madison, WI Software Carpentry: Version Control	Jan 13 – 16, 2015
	University of Wisconsin Advanced Computing Initiative, Madison, WI Software Carpentry: Version Control and Unit Testing	Aug 25 – 26, 2014
	University of Wisconsin Advanced Computing Initiative, Madison, WI Software Carpentry: Version Control	Aug 28 – 29, 2013

Software Carpentry: Version Control and Unit Testing

University of Wisconsin Advanced Computing Initiative, Madison, WI Apr 29 – 30, 2013

COMPUTATIONAL SKILLS

I have deep and broad software development skills and experience. I help maintain and manage a number of open source scientific software packages including MESSAGEix, pyam, aneris, Cyclus, and PyNE.

EXPERT (5+ YEARS EXPERIENCE)

Languages C++/C, Python Optimization pyomo, GAMS **Build Systems** CMake, Make, Autoconf/Automake Version Control Git **Tools** LATEX, Doxygen, Jekyll, JSON, Sphinx, XML **Database Formats** SQL, HDF5, NetCDF GoogleTest, PyTest, Nose Test Frameworks **NE** Applications MCNP, Origen Other Applications Jupyter (Notebooks, Slides, etc.)

FAMILIAR

LanguagesR, Java, FORTRAN, Visual Basic, PerlVersion ControlMercurial, SubversionOther ApplicationsMatlab, Mathead, Mathematica, Maple

JOURNAL PUBLICATIONS

- [1] Gidden, M. J. Fujimori, S. Berg, M. Klein, D. Smith, S. J. Vuuren, D. P. Riahi, K., "Global emissions pathways under different socioeconomic scenarios for use in cmip6: A dataset of harmonized emissions trajectories through the end of the century," Geoscientific Model Development Discussions, 2018
- [2] Fiedler, S. Stevens, B. **Gidden, M.** Smith, S. J. Riahi, K. Vuuren, D. v., "First forcing estimates from the future CMIP6 scenarios of anthropogenic aerosol optical properties and an associated Twomey effect," *Geoscientific Model Development Discussions*, pp. 1–26, Oct. 2018, ISSN: 1991-959X. DOI: https://doi.org/10.5194/gmd-2018-244. [Online]. Available: https://www.geosci-model-dev-discuss.net/gmd-2018-244/
- [3] Parkinson, S. Krey, V. Huppmann, D. Kahil, T. McCollum, D. Fricko, O. Byers, E. Gidden, M. Mayor, B. Khan, Z. Raptis, C. Rao, N. Johnson, N. Wada, Y. Djilali, N, Riahi, K., "Balancing clean water-climate change mitigation trade-offs," *Environmental Research Letters (in press)*, 2018
- [4] Huppmann, D. **Gidden, M. J.** Fricko, O. Kolp, P. Orthofer, C. Pimmer, M. Vinca, A. Krey, V., "The messageix integrated assessment model and the ix modeling platform (ixmp)," *Environmental Modelling & Software (in press)*, 2018
- [5] Rao, N. D. Sauer, P. Gidden, M. Riahi, K., "Income inequality projections for the Shared Socioeconomic Pathways (SSPs)," *Futures*, Aug. 2018, ISSN: 0016-3287. DOI: 10.1016/j.futures.2018.07.001. [Online]. Available: http://www.sciencedirect.com/ science/article/pii/S001632871730349X
- [6] Bauer, N. Rose, S. K. Fujimori, S. Vuuren, D. P. Weyant, J. Wise, M. Cui, Y. Daioglou, V. Gidden, M. J. Kato, E., "Global energy sector emission reductions and bioenergy use: Overview of the bioenergy demand phase of the emf-33 model comparison," *Climatic Change*, pp. 1–16, 2018
- [7] McCollum, D. L. Zhou, W. Bertram, C. Boer, H.-S. Bosetti, V. Busch, S. Després, J. Drouet, L. Emmerling, J. Fay, M. Fricko, O. Fujimori, S. Gidden, M. Harmsen, M. Huppmann, D. Iyer, G. Krey, V. Kriegler, E. Nicolas, C. Pachauri, S. Parkinson,

- S. Poblete-Cazenave, M. Rafaj, P. Rao, N. Rozenberg, J. Schmitz, A. Schoepp, W. Vuuren, D. Riahi, K., "Energy investment needs for fulfilling the paris agreement and achieving the sustainable development goals," *Nature Energy*, 2018, ISSN: 2058-7546. DOI: 10.1038/s41560-018-0179-z. [Online]. Available: https://doi.org/10.1038/s41560-018-0179-z
- [8] Grubler, A. Wilson, C. Bento, N. Boza-Kiss, B. Krey, V. McCollum, D. L. Rao, N. D. Riahi, K. Rogelj, J. De Stercke, S. Cullen, J. Frank, S. Fricko, O. Guo, F. Gidden, M. Havlík, P. Huppmann, D. Kiesewetter, G. Rafaj, P. Schoepp, W. Valin, H., "A low energy demand scenario for meeting the 1.5° C target and sustainable development goals without negative emission technologies," *Nature Energy*, vol. 3, no. 6, pp. 515–527, 2018, ISSN: 2058-7546. DOI: 10.1038/s41560-018-0172-6. [Online]. Available: https://doi.org/10.1038/s41560-018-0172-6
- [9] Byers, E. A. Gidden, M. Leclère, D. Burek, P. Ebi, K. L. Greve, P. Grey, D. Havlik, P. Hillers, A. Johnson, N. Kahil, T. Krey, V. Langan, S. Nakicenovic, N. Novak, R. Obersteiner, M. Pachauri, S. Palazzo, A. M. Parkinson, S. Rao, N. D. Rogelj, J. Riahi, K. Satoh, Y. Wada, Y. Willaarts, B., "Global exposure and vulnerability to multi-sector development and climate change hotspots," *Environmental Research Letters*, 2018. [Online]. Available: http://iopscience.iop.org/10.1088/1748-9326/aabf45
- [10] Liu, L. Parkinson, S. **Gidden, M.** Byers, E. Satoh, Y. Riahi, K. Forman, B., "Quantifying the potential for reservoirs to secure future surface water yields in the world's largest river basins," *Environmental Research Letters*, vol. 13, no. 4, p. 044 026, 2018. [Online]. Available: http://stacks.iop.org/1748-9326/13/i=4/a=044026
- [11] **Gidden, M. J.** Fujimori, S. Berg, M. Klein, D. Smith, S. J. Vuuren, D. P. Riahi, K., "A methodology and implementation of automated emissions harmonization for use in integrated assessment models," *Environmental Modelling & Software*, vol. 105, pp. 187 –200, 2018, ISSN: 1364-8152. DOI: https://doi.org/10.1016/j.envsoft.2018. 04.002. [Online]. Available: https://www.sciencedirect.com/science/article/pii/S1364815217307867
- [12] Pfenninger, S. Hirth, L. Schlecht, I. Schmid, E. Wiese, F. Brown, T. Davis, C. Gidden, M. Heinrichs, H. Heuberger, C. Hilpert, S. Krien, U. Matke, C. Nebel, A. Morrison, R. Müller, B. Pleßmann, G. Reeg, M. Richstein, J. C. Shivakumar, A. Staffell, I. Tröndle, T. Wingenbach, C., "Opening the black box of energy modelling: Strategies and lessons learned," *Energy Strategy Reviews*, ISSN: 2211-467X. DOI: 10.1016/j.esr. 2017.12.002. [Online]. Available: https://www.sciencedirect.com/science/article/pii/S2211467X17300809
- [13] **Gidden, M. J.** Wilson, P. P., "A methodology for determining the dynamic exchange of resources in nuclear fuel cycle simulation," *Nuclear Engineering and Design*, pp. –, 2016, ISSN: 0029-5493. DOI: http://dx.doi.org/10.1016/j.nucengdes.2016. 10.029. [Online]. Available: http://www.sciencedirect.com/science/article/pii/S0029549316304101
- [14] Huff, K. D. **Gidden, M. J.** Carlsen, R. W. Flanagan, R. R. McGarry, M. B. Opotowsky, A. C. Schneider, E. A. Scopatz, A. M. Wilson, P. P., "Fundamental concepts in the cyclus nuclear fuel cycle simulation framework," *Advances in Engineering Software*, vol. 94, pp. 46 –59, 2016, ISSN: 0965-9978. DOI: http://dx.doi.org/10.1016/j.advengsoft.2016.01.014. [Online]. Available: http://www.sciencedirect.com/science/article/pii/S0965997816300229
- [15] Pearce, T. M. Williams, J. J. Kruzel, S. P. **Gidden, M. J.** Williams, J. C., "Dynamic control of extracellular environment in in vitro neural recording systems," *Neural Systems*

and Rehabilitation Engineering, IEEE Transactions on, vol. 13, no. 2, pp. 207–212, 2005

FORTHCOMING **PUBLICATIONS**

- [16] Gidden, M. J. Rao, N. D. Parkinson, S. C. Riahi, K., "Spatially explicit urban and rural poverty estimates under different global socioeconomic futures," Nature Scientific Data (in preparation),
- [17] Zhou, W. McCollum, D. L. Gidden, M. J., "Decarbonization pathways for china consistent with well below 2 °c," Global Energy Interconnection (in review),
- [18] Daioglou, V. Rose, S. Gidden, M. J., "Bioenergy technologies in long-run climate change mitigation: Results from the emf33 study," Climatic Change (in review),
- [19] Kriegler, E. Gidden, M. J. Riahi, K., "Taking stock of climate policies: Evaluation of national policies in the context of the paris agreement climate goals," Nature Climate Change (in review),
- [20] Krey, V. Gidden, M. J. Riahi, K., "Implications of the paris agreement for achieving the sustainable development goals," Nature Climate Change (in review),

PRESENTATIONS

- INVITED TALKS & [21] Gidden, M., Overview and timeline of scenariomip contributions to crescendo, CRESCENDO General Assembly, Paris, France, Sep. 2018
 - [22] Gidden, M., Messageix: Cutting edge research and challenges, Centre National de la Recherche Scientifique (CNRS) Summer School: Integrated Assessment Modeling, Jun. 2018
 - [23] Gidden, M., Insights from scenarios targeting the paris agreement, United Nations Climate Change Conference (COP23), EU Pavilion, Bonn, Germany, Nov. 2017
 - [24] Gidden, M., Developing future socioeconomic and greenhouse gas emission scenarios, United Nations Climate Change Conference (COP23), UK Pavilion, Bonn, Germany, Nov. 2017
 - [25] Gidden, M., Emissions pathways for climate modeling: harmonizing the ssps to cmip6 historical data, CRESCENDO General Assembly, Paris, France, Sep. 2017
 - [26] Gidden, M., Exploring nuclear fuel cycle simulation using htcondor, HTCondor Week, Madison, WI, May 2015

REFEREED **PROCEEDINGS**

- [27] Gidden, M. Wilson, P., "Dynamic resource exchange with coinor-cbc in cyclus, a nuclear fuel cycle simulator," in Operations Research and Computing: Algorithms and Software for Analytics, Richland, VA, United States, Jan. 2015
- [28] Gidden, M. Carlsen, R. Opotowsky, A. Rakhimov, O. Scopatz, A. Wilson, P., "Agentbased dynamic resource exchange in cyclus," in Proceedings of PHYSOR, Kyoto, Japan, Sep. 2014
- [29] Gidden, M. Wilson, P., "An agent-based framework for fuel cycle simulation with recycling," in Proceedings of GLOBAL, Salt Lake City, UT, United States, Sep. 2013

Conference **PUBLICATIONS**

- [30] Gidden, M. J. Byers, E. Burek, P. Ebi, K. Greve, P. Havlik, P. Johnson, N. Kahil, T. Krey, V. Langan, S. Leclère, D. Obersteiner, M. Palazzo, A. Pachauri, S. Parkinson, S. Rao, N. Rogelj, J. Satoh, Y. Wada, Y. Willaarts, B. Riahi, K., "A global assessment of exposure and vulnerability to energy, water, and land climate change hotspots," in The 37th Edition of International Energy Workshop, Jun. 2018
- [31] Gidden, M. J. et al., "Exposure and vulnerability to energy, water, and land hotspots under different climate futures," in Tenth Integrated Assessment Modelling Consortium Meeting, Dec. 2017

- [32] **Gidden, M. J.** et al., "Emissions pathways for climate modeling: harmonizing the ssps to cmip6 historical data," in *Tenth Integrated Assessment Modelling Consortium Meeting*, Dec. 2017
- [33] **Gidden, M. J.** Huppmann, D., "Diagnostics and analysis of iam results: presenting the pyam-analysis package," in *Tenth Integrated Assessment Modelling Consortium Meeting*, Dec. 2017. [Online]. Available: http://mattgidden.com/presentations/pyamiamc2017
- [34] **Gidden, M. J.** Byers, E. Greve, P. Kahil, T. Parkinson, S. Raptis, C. Rogelj, J. Satoh, Y. Vliet, M. Wada, Y. Krey, V. Langan, S. Riahi, K., "Hydroclimatic risks and uncertainty in the global power sector," in *European Geosciences Union General Assembly*, Vienna, Austria, Apr. 2017
- [35] **Gidden, M. J.** Huppmann, D. Krey, V. Fricko, O. Kolp, P. Riahi, K., "The new MESSAGE $_{ix}$ Modeling Platform," in *Open Energy Modelling Workshop*, Frankfurt, Germany, Apr. 2017
- [36] **Gidden, M. J.** Parkinson, S. C. Rao, N. D. Riahi, K., "Spatial Downscaling of Urban and Rural Income and Inequality for the Shared Socioeconomic Pathways," in *Ninth Annual Meeting of the IAMC 2016*, Beijing, China, Dec. 2016
- [37] **Gidden, M.** Wilson, P., "Dynamic resource exchange performance in cyclus," in *Transactions of the American Nuclear Society*, San Antonio, TX, United States, Jun. 2015
- [38] Carlsen, R. W. Gidden, M. J. Wilson, P. P., "Deployment Optimization with the CY-CLUS Fuel Cycle Simulator," in *Transactions of the American Nuclear Society*, DOI link for code, methods, etc: http://dx.doi.org/10.6084/m9.figshare.1086284, vol. 111, Anaheim, CA, Nov. 2014, pp. 241–244
- [39] Biondo, E. Scopatz, A. **Gidden, M.** Slaybaugh, R. Bates, C. WIlson, P. P., "Quality Assurance within the PyNE Open Source Toolkit," in *Transactions of the American Nuclear Society*, vol. 111, Anaheim, CA, Nov. 2014. [Online]. Available: https://github.com/pyne/ans-winter-2014-vnv
- [40] **Gidden, M.** Wilson, P. Scopatz, A., "Developing standardized, open benchmarks and a corresponding specification language for the simulation of dynamic fuel cycles," in *Proceedings of the 2013 ANS Summer Conference*, Atlanta, GA, United States, Jun. 2013
- [41] **Gidden, M.** Wilson, P. Huff, K. Carlsen, R., "Once-through benchmarks with cyclus, a modular, open-source fuel cycle simulator," in *Proceedings of the 2012 ANS Winter Conference*, San Diego, CA, Nov. 2012
- [42] **Gidden, M.** Wilson, P. Huff, K., "Once-through benchmarks with cyclus," in *ANS Student Conference*, Las Vegas, NV, 2011
- [43] Huff, K. D. Wilson, P. P. **Gidden, M. J.**, "Open Architecture and Modular Paradigm of Cyclus, a Fuel Cycle Simulation Code," in *Transactions of the American Nuclear Society*, vol. 104, 2011, p. 183
- [44] Huff, K. Wilson, P. **Gidden, M.** Elmore, R., *Cyclus : An Open, Modular, Next Generation Fuel Cycle Simulator Platform*, Poster, Mar. 2011
- [45] **Gidden, M.** Livesay, J. York, R. Blessinger, C., "Collimation of radiation portal monitors to reduce the innocent alarm rate (poster)," in *Transactions of the American Nuclear Society*, Washington, DC, Nov. 2007

OTHER PUBLICATIONS

- [46] Wilson, P. P. H. Scopatz, A. **Gidden, M.** Carlsen, R. Mouginot, B. Flanagan, R., *Market-Based and System-Wide Fuel Cycle Optimization*. 2017. [Online]. Available: http://www.osti.gov/scitech/servlets/purl/1363866
- [47] Krey, V. Havlik, P. Fricko, O. Zilliacus, J. Gidden, M. Strubegger, M. Kartasasmita, G. Ermolieva, T. Forsell, N. Gusti, M. Johnson, N. Kindermann, G. Kolp, P. McCollum, D. L. Pachauri, S. Rao, S. Rogelj, J. Valin, H. Obersteiner, M. Riahi, K., "MESSAGE-GLOBIOM 1.0 Documentation," International Institute for Applied Systems Analysis (IIASA), Tech. Rep., 2016. [Online]. Available: http://data.ene.iiasa.ac.at/message-globiom/
- [48] **Gidden, M. J.**, "An Agent-Based Modeling Framework and Application for the Generic Nuclear Fuel Cycle," Thesis, University of Wisconsin, Madison, WI, United States, Mar. 2015
- [49] **Gidden, M.**, "An agent-based modeling framework and application for the generic nuclear fuel cycle," Prelim, University of Wisconsin, Madison, Sep. 2013. [Online]. Available: http://dx.doi.org/10.6084/m9.figshare.1132596

SOFTWARE

- [50] Gidden, M. Huppmann, D., "Pyam: Analysis and visualization of assessment models," 2018. DOI: 10.5281/zenodo.1470489
- [51] **Gidden, M.**, "Aneris: Harmonization for integrated assessment models," 2017. DOI: 10. 5281/zenodo.802832
- [52] Carlsen, R. W. Gidden, M. Huff, K. Opotowsky, A. C. Rakhimov, O. Scopatz, A. M. Welch, Z. Wilson, P., Cyclus v1.0.0, Jun. 2014. [Online]. Available: http://figshare.com/articles/Cyclus v1 0 0/1041745
- [53] Carlsen, R. W. **Gidden, M.** Huff, K. Opotowsky, A. C. Rakhimov, O. Scopatz, A. M. Wilson, P., *Cycamore v1.0.0*, Jun. 2014. [Online]. Available: http://figshare.com/articles/Cycamore v1 0 0/1041829
- [54] **Gidden, M.**, *Cyclopts*, http://mattgidden.com/cyclopts/, Dec. 2014. [Online]. Available: http://mattgidden.com/cyclopts/
- [55] Scopatz, A. **Gidden, M.** Welch, Z., "Polyphemus v0.1," Jun. 2014. [Online]. Available: http://dx.doi.org/10.6084/m9.figshare.1066058
- [56] Scopatz, A. Bates, C. R. Biondo, E. Huff, K. Kiesling, K. Carlsen, R. Davis, A. Gidden, M. Haines, T. Howland, J. Huff, B. Manalo, K. Opotowsky, A. Slaybaugh, R. Relson, E. Romano, P. Shriwise, P. Xia, J. D. Wilson, P. Zachman, J., "Pyne progress report," Nov. 2014. [Online]. Available: http://dx.doi.org/10.6084/m9.figshare.1250143

REFERENCES

Available upon request