

Curriculum Vitae for Joshua D. Rhodes

May 2019

Joshua D. Rhodes, Ph.D.
Senior Energy System Modeler & Analyst
[Vibrant Clean Energy](#)

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Professional Experience

- *Senior Energy System Modeler & Analyst*, Vibrant Clean Energy, 2019-present
- *Lecturer*, Mechanical Engineering, UT Austin, 2018–2019
- *Research Associate*, Energy Institute, UT Austin, 2017–2019
- *Research Associate*, Webber Energy Group, UT Austin, 2017–2019
- *Postdoctoral Research Fellow*, Energy Institute, UT Austin, 2014–2017
- *Postdoctoral Research Fellow*, Webber Energy Group, UT Austin, 2014–2017
- Graduate Research Assistant, Civil/Mechanical Engineering, UT Austin, 2009–2014
- Graduate Research Assistant, Mathematics, Texas A&M, 2006–2008

Education

- PhD, Civil Engineering, 2014, UT Austin (Advisor: Michael E. Webber, PhD)
- MSc, Architectural Engineering, 2011, UT Austin
- MSc, Computational Mathematics, 2008, Texas A&M University
- BSc, Mathematics, 2006, Stephen F. Austin State University
- BSc, Economics, 2006, Stephen F. Austin State University

Peer-Reviewed Journal Articles

22. Johnson, S.C., D. Papageorgiou, D. Mallapragada, **J. D. Rhodes**, M. E. Webber, “Evaluating Rotational Inertia as a Component of Grid Reliability with High Penetrations of Variable Renewable Energy,” *Submitted to Energy*.
21. Vitter, J. S., Jr., **J. D. Rhodes**, N. W. Behlin, M. E. Webber, “A Spatial Tool for Economic and Environmental Analysis of Water-related Residential Appliance Retrofits,” *In prep*.
20. **Rhodes J. D.** et al., “Spatio-economic analysis of residential energy efficiency Retrofits,” *In prep*.
19. Johnson, S.C., D. Papageorgiou, D. Mallapragada, **J. D. Rhodes**, M. E. Webber, “Grid Stability Evaluated with Improved ERCOT Grid Modeling,” *Submitted to Applied Energy*.
18. Deetjen, T.A., H. Martin, **J.D. Rhodes**, and M.E. Webber, “Modeling the optimal mix and location of wind and solar with transmission and carbon pricing considerations,” *Renewable Energy* 120 pp. 35–50 (2018).
17. Nagasawa, K., **J. D. Rhodes**, and M. E. Webber, “Assessment of primary energy consumption, carbon dioxide emissions, and peak electric load for a residential fuel cell

using empirical natural gas and electricity use,” *Energy and Buildings*, 178 pp. 242-253 (2018).

16. A.S. Stillwell, A.M. Mroue, **J.D. Rhodes**, M.A. Cook, J.B. Sperling, T. Hussey, D. Burnett, and M.E. Webber, “Water for Energy: Systems Integration and Analysis to Address Resource Challenges,” *Current Sustainable/Renewable Energy Reports*, September 2017, Volume 4, Issue 3, pp 90–98.
15. Deetjen, T.A., **J. D. Rhodes**, and M. E. Webber, “The impacts of wind and solar on grid flexibility requirements in the Electric Reliability Council of Texas,” *Energy* 123, 637-654
14. Hurtado, L.A., **J.D. Rhodes**, P.H. Nguyen, I.G. Kamphuis, and M.E. Webber, “Quantifying demand flexibility based on the structural thermal storage and comfort management of non-residential buildings: A comparison between hot and cold climate zones,” *Applied Energy* 195 (2017), 1047-1054
13. **Rhodes, J.D.** et al., “A geographically resolved method to estimate leveled power plant costs with environmental externalities,” *Energy Policy* 102 (2017), 491-499
12. Upshaw, C.R., **J. D. Rhodes**, and M. E. Webber, “Modeling electric load and water consumption impacts from an integrated thermal energy and rainwater storage system for residential buildings in Texas,” *Applied Energy* 186 (2017), 492-508
11. Deetjen, T.A., J. B. Garrison, **J. D. Rhodes**, M. E. Webber, “Solar PV integration cost variation due to array orientation and geographic location in ERCOT,” *Applied Energy* 180 (2016), 607-616
10. **Rhodes, J.D.**, N. I. B., C. R. Upshaw, M. F. Blackhurst, and M. E. Webber, “Residential energy retrofits in a cooling climate,” *Journal of Building Engineering* 6 (2016), 112-118
9. Upshaw, C.R., **J. D. Rhodes**, and M. E. Webber, “Modeling peak load reduction and energy consumption for an integrated thermal energy and rainwater storage system for residential air conditioning systems in Austin, Texas,” *Energy and Buildings* 97 (2016), 21-32
8. **Rhodes, J.D.**, W. Gorman, C. R. Upshaw, and M. E. Webber, “Using BEopt (EnergyPlus) with energy audits and surveys to predict actual residential energy usage,” *Energy and Buildings* 86 (2014), 808-816
7. **Rhodes, J.D.**, W. J. Cole, C. R. Upshaw, T. F. Edgar, M. E. Webber, “Clustering analysis of residential electricity demand profiles,” *Energy* 135 (2014) 461--471

6. **Rhodes, J.D.**, C. R. Upshaw, C. Holcomb, M. E. Webber, “A multi-objective assessment of the effect of solar placement on energy production and system economics,” *Solar Energy* 108 (2014) 28--40
5. Cole, W.J., **J. D. Rhodes**, W. Gorman, T. F. Edgar, M. E. Webber, “Community-scale residential air conditioning control for effective grid management,” *Applied Energy* 130 (2014) 428--436
4. Perez, Krystian X., W. J. Cole, **J. D. Rhodes**, A. Ondeck, M. Baldea, T. F. Edgar, and M. E. Webber, “Nonintrusive disaggregation of residential air-conditioning loads from sub-hourly smart meter data,” *Energy and Buildings* 81 (2014) 316--325
3. **Rhodes, J. D.**, et al., “Experimental and Data Collection Methods for a Large-Scale Smart Grid Deployment: Methods and First Results,” *Energy* 65 (2014) 462--471
2. Cole, W., **J. D. Rhodes**, K. Powel, T. F. Edgar, “Turbine Inlet Cooling with Thermal Energy Storage,” *International Journal of Energy Research* 38 (2) (2013) 151--161
1. **Rhodes, J. D.**, B. Stephens, M. E. Webber, “Using energy audits to investigate the impacts of common air-conditioning design and installation issues on peak power demand and energy consumption in Austin, Texas,” *Energy and Buildings* 43 (2011) 3271--3278

Peer-Reviewed Conference Proceedings

8. A. Bandyopadhyay, **J.D. Rhodes**, J.P. Conger and M.E. Webber “How solar and storage can reduce coincident peak loads and payments: a case study in Austin, TX” *ASME 2018 International Mechanical Engineering Congress & Exposition*, November 9--15, 2018, Pittsburgh, PA, USA.
7. C.R. Upshaw, **J.D. Rhodes** and M.E. Webber, “Modeling Peak Electric Load Reduction and Change in Energy Consumption for an Integrated Thermal Energy and Rainwater Storage System Coupled With a Hydronic Residential Air Conditioning System in Texas,” *The 3rd Sustainable Thermal Energy Management International Conference (SusTEM 2015)*, July 7--8, 2015, Newcastle upon Tyne, UK.
6. C.R. Upshaw, **J.D. Rhodes** and M.E. Webber, “Estimating Water Savings from an Auxiliary Water Collection System, as Part of an Integrated Thermal Energy and Water Storage System for Residential Buildings,” *2015 ASHRAE Winter Conference*, Chicago, IL, January 24--28, 2015.
5. W.J. Cole, K.X. Perez, **J.D. Rhodes**, M.E. Webber, M. Baldea, and T.F. Edgar, “Community Scale Air Conditioning Control for High Penetration of Rooftop Photovoltaics,” *2014 American Control Conference, IEEE Control Systems Society*, Portland, Oregon, June 4, 2014.

4. C.R. Upshaw, **J.D. Rhodes** and M.E. Webber, “Modeling a Combined Energy-Water Storage System for Residential Homes and Analyzing Water Storage Tank Size,” *ASME 2013 International Mechanical Engineering Congress & Exposition*, November 13–21, 2013, San Diego, CA, USA.
3. K. Nagasawa, C.R. Upshaw, **J.D. Rhodes**, C. Holcomb and M.E. Webber, “Data Management for a Large-Scale Smart Grid Demonstration Project in Austin, Texas,” *Proceedings of the ASME 6th International Conference on Energy Sustainability*, July 23–26, 2012, San Diego, CA, USA.
2. **J.D. Rhodes**, K. Nagasawa, C.R. Upshaw, and M.E. Webber, “The Role of Small Distributed Natural Gas Fuel Cell Technologies in the Smart Energy Grid,” *Proceedings of the ASME 6th International Conference on Energy Sustainability*, July 23–26, 2012, San Diego, CA, USA.
1. **J.D. Rhodes**, B. Stephens, and M.E. Webber, “Energy Audit Analysis of Residential Air Conditioning Systems In Austin, Texas,” *ASHRAE 2012 Winter Conference*, January 21–25, 2012, Chicago, IL, USA.

Non-Refereed Conference Papers, Posters and Presentations

5. **J.D. Rhodes** and M.E. Webber, “Spatio-economic analysis of residential energy efficiency retrofits,” *American Geophysical Union Fall 2018 Meeting*, December 12, 2018, Washington DC, USA.
4. **J.D. Rhodes**, W.J. Cole, C.R. Upshaw, T.F. Edgar, and M.E. Webber, “Analysis Of Temporal Seasonal Residential Demand Profiles,” *ASME 2013 International Mechanical Engineering Congress & Exposition*, November 13–21, 2013, San Diego, CA, USA.
3. **J.D. Rhodes**, K. Nagasawa, C.R. Upshaw, and M.E. Webber, “Residential solar PV installation optimization and lessons learned,” *ASME 2012 International Mechanical Engineering Congress & Exposition*, November 9–15, 2012, Houston, TX, USA.
2. **J.D. Rhodes** and M.E. Webber, “Smart Grid in Texas, What’s Happening?” 2012 *ASHRAE Annual Conference*, San Antonio, TX, June 27, 2012
1. **J.D. Rhodes** and M.E. Webber, “Smart Grid, Smart Water: Real-Time Water Use Data From a Community in Austin, Texas,” *ASME 2011 International Mechanical Engineering Congress & Exposition*, November 11–17, 2011, Denver, CO, USA.

Select Technical Reports and White Papers

2. J. Coleman, S. Bragg-Sitton, E. Dufek, S.C. Johnson, **J.D. Rhodes**, F.T. Davidson, and M.E. Webber, “An Evaluation of Energy Storage Options for Nuclear Power,”

INL/EXT17-42420, Prepared with the Idaho National Laboratory for the U.S. Department of Energy Office of Nuclear Energy Under DOE Idaho Operations Office Contract DE-AC07-05ID14517, June 2017.

1. F.C. Beach, **J.D. Rhodes**, K.T. Sanders, M.E. Webber, “An Analysis of the Potential for Expanded Use of Natural Gas in the U.S. Residential Sector,” UT Austin, March 18, 2013.

Feature Articles, Op-Eds, Columns and Technical Commentary

Rhodes is a Forbes Contributor and an AXIOS Expert Voice, he has authored or co-authored dozens of columns including op-eds, technical commentary and feature articles for notable outlets such as Forbes, Axios, Fortune, Scientific American, The Houston Chronicle, Chatham House and the Dallas Morning News. A select list of those columns is included here.

44. **J.D. Rhodes**, “Texas Perspectives: State legislation unfairly targeting wind, solar initiatives” April 6, 2019, *Waco Tribune-Herald*
43. **J.D. Rhodes**, “Possible PG&E bankruptcy could spell trouble for California renewables” January 22, 2019, *Axios*
42. **J.D. Rhodes**, “The People Want EVs, But Who Will Sell Them To Us?” January 4, 2019, *Forbes*
41. F. Todd Davidson, **J.D. Rhodes**, K. Nagasawa and Dave Tuttle “Switching to electric vehicles could save the US billions, but timing is everything” December 4, 2018, *The Conversation*
40. **J.D. Rhodes**, “Despite the blue wave, the U.S. failed to pass its first carbon tax” November 12, 2018, *Axios*
39. **J.D. Rhodes**, “Why Republican Leaders Love Renewable Energy” September 25, 2018, *Forbes*
38. **J.D. Rhodes**, “New EPA rule unlikely to stem the tide against coal” August 23, 2018, *Axios*
37. **J.D. Rhodes**, “What Does 100% Renewable Energy Really Mean?” August 21, 2018, *Forbes*
36. **J.D. Rhodes**, “Let’s get real about the myths surrounding “100% renewable” energy” August 13, 2018, *UT Energy Institute News*
35. **J.D. Rhodes**, “Trump’s coal bunker mentality” August 3, 2018, *Chatham House*

34. **J.D. Rhodes**, “Are High Oil Prices Starting To Hurt Wind Power?” August 1, 2018, *Forbes*
33. **J.D. Rhodes**, “Texas meets grid challenge during record-breaking energy demand” July 20, 2018, *Axios*
32. **J.D. Rhodes**, “Texas Electric Grid Sets New System-Wide All-Time Peak Demand Record, Twice” July 19, 2018, *Forbes*
31. **J.D. Rhodes**, “Intervention could save nuclear power, but coal is dead” June 9, 2018, *Axios*
30. **J.D. Rhodes**, “Latest DOE Subsidies Are The Equivalent Of Opioids For The Coal Industry” June 4, 2018, *Forbes*
29. **J.D. Rhodes**, “Texas' electricity market will see a make-or-break test this summer” May 17, 2018, *Axios*
28. **J.D. Rhodes**, “No, Wind And Solar Do Not Inherently Increase Electricity Prices” April 30, 2018, *Forbes*
27. **J.D. Rhodes**, “How Clean Coal Could Make A Tidy Profit” April 19, 2018, *Forbes*
26. **J.D. Rhodes**, “Texas Perspectives: State’s energy grid benefits from new, cost-efficient mix,” April 10, 2018, (reprinted in the *Waco Tribune-Herald*)
25. **J.D. Rhodes**, “The New Federal Carbon Credits Might Bring Back Some Coal,” March 9, 2018, *Forbes*
24. **J.D. Rhodes**, “The Ethanol Debate Matters, But Is Unlikely To Change,” February 25, 2018, *Forbes*
23. **J.D. Rhodes**, “Energy Storage Is Coming, But Big Price Declines Still Needed,” February 18, 2018, *Forbes*
22. **J.D. Rhodes**, “Trump's Solar Tariffs Go Into Effect Today. So What?,” February 7, 2018, *Forbes*
21. **J.D. Rhodes**, “The state of the US solar industry: 5 questions answered,” January 25, 2018, *The Conversation* (reprinted in *PBS, Salon, and EcoWatch*)
20. **J.D. Rhodes**, “Solar Tariff Is A Direct Hit To Fastest-Growing Job In U.S.,” January 23, 2018, *Forbes*
19. **J.D. Rhodes**, “The Home Heating Debate Heats Up As Temperatures Plunge In Texas,” January 19, 2018, *Forbes*

18. **J.D. Rhodes**, “Perry Says NOPR; FERC Says Nope (To Propping Up Coal),” January 8, 2018 *Forbes*
17. **J.D. Rhodes**, “Final GOP Tax Bill More Confusing, But Not Terrible For Wind And Solar,” December 22, 2017, *Forbes*
16. **J.D. Rhodes** and M.E. Webber, “Commentary: The Solution to America's Energy Waste Problem,” December 18, 2017, *Fortune*
15. **J.D. Rhodes**, “With Tax Bill, GOP Wages War On Wind And Solar,” December 14, 2018, *Forbes*
14. **J.D. Rhodes**, “The obscure federal agency that soon could raise your electric bill: 5 questions answered on FERC,” December 4, 2017, *The Conversation (reprinted in Salon and EcoWatch)*
13. **J.D. Rhodes**, “Q&A: Do coal plant closures spell disaster for the power grid?” November 10, 2017, *Houston Chronicle*
12. **J.D. Rhodes**, “Stanford Scientist Sues Critics Of His 100% Green Energy Dogma,” November 7, 2017, *Forbes*
11. **J.D. Rhodes**, “Texas could soon get more electricity from wind than coal,” October 27, 2017, *Dallas Morning News*
10. **J.D. Rhodes**, “Energy wonks have a meltdown over the US going 100 percent renewable. Why?,” June 22, 2017, *The Conversation (reprinted in the International Business Times and The Inertia)*
9. **J.D. Rhodes**, “How Trump Can Reduce Carbon Emissions Without the Paris Agreement,” June 6, 2017, *Fortune*
8. **J.D. Rhodes**, F.T. Davidson, M.E. Webber, T. Davidson, “Are solar and wind really killing coal, nuclear and grid reliability?” May 11, 2017, *The Conversation (reprinted in Renewable Energy World, DeSmogBlog, and The Electrochemical Society Blog)*
7. **J.D. Rhodes**, “The old, dirty, creaky US electric grid would cost \$5 trillion to replace. Where should infrastructure spending go?,” March 16, 2017, *The Conversation (reprinted in Bussiness Insider, Newsweek and The Atlantics’ CityLab)*
6. **J.D. Rhodes**, “When will rooftop solar be cheaper than the grid? Here’s a map” March 31, 2016, *The Conversation (reprinted in U.S. News and World Report, Renewable Energy World, and The Raw Story)*

5. **J.D. Rhodes**, “So What Direction Should Solar Panels Face?,” October 21, 2014, *Scientific American*
4. **J.D. Rhodes**, T.F. Edgar, R.D. Duncan, M.E. Webber, “The Unattractive Side of The Smart Grid: Big Data and Energy Audits,” September 2013, *UN Energy Initiative*
3. **J.D. Rhodes**, and C.R. Upshaw, “A sexy smart grid vs. humble energy audits and efficiency retrofits,” October 3, 2013, *Scientific American*
2. **J.D. Rhodes** and B. Stevens, “House Calls - Finding energy inefficiencies using residential energy audits,” September 26, 2011, *Scientific American*
1. **J.D. Rhodes** and B. Stevens, “Tighten up your house, but not too much.,” August 9, 2011, *Scientific American*

Keynotes, Plenary Lectures and Invited Talks

Dr. Rhodes has given dozens of lectures, keynotes, panels and invited talks. He has spoken all over the U.S. and internationally.

40. “Major Energy Trends,” *Independent Energy Human Resources Association*, October 4, 2018, New Orleans, LA
39. “Non-Wire Alternatives: Technology Focus Discussion,” *Gulf Coast Power Association*, October 2, 2018, Austin, TX
38. “Teaching STEAM with TACC,” *2018 TACC Symposium for Texas Researchers*, September 20, 2018, Austin, TX
37. “Wind Power in Texas,” *TPR: The Source*, September 10, 2018, San Antonio, TX
36. “Capacity expansion in U.S. Electricity Markets,” *La Asociación Colombiana de Generadores de Energía Eléctrica*, September 4, 2018, Bogotá, Columbia
35. “All Energy Forum,” *American Nuclear Society*, June 19, 2018, Pittsburgh, PA
34. “How Solar, Wind and Storage are Getting Bigger in Texas,” *Solar Power Texas*, June 5, 2018, Austin, TX
33. “The Full Cost of Electricity & Energy Infrastructure of the Future,” *Energy-Water-Environment Sustainability Seminar Series at the University of Illinois at Urbana-Champaign*, April 9, 2018, Urbana, IL
32. “Where is the US Energy Sector Headed?” *University of Oklahoma Law School 2018 One J Symposium*, April 6, 2018, Norman, OK

31. "A geographically resolved method to estimate levelized power plant costs with environmental externalities," *ExxonMobil*, December 5, 2017, Austin, TX
30. "The Full Cost of Electricity," *United States Association for Energy Economics*, November 14, 2017, Houston, TX
29. "Energy Infrastructure of the Future," *IEEE SusTech 2017 Keynote*, November 13, 2017, Phoenix, AZ
28. "The Energy Infrastructure of the Future" *ERCOT Seminar*, October 20, 2017, Taylor, TX
27. "Texas Energy Analysis and Suite of Tools," *Solar Power Texas*, June 9, 2017, Austin, TX
26. "Renewable Energy: Hydro, Wind, and Solar Power" *Lakeway Men's Breakfast Club*, February 8, 2017, Lakeway, TX
25. "The Energy Infrastructure of the Future and The Full Cost of Electricity," *ENGIE North America Board Meeting*, December 13, 2016, Houston, TX
24. "The Energy Infrastructure of the Future and The Full Cost of Electricity," *Smart Electric Power Alliance Board Meeting*, December 12, 2016, Austin, TX
23. "A geographically resolved method to estimate levelized power plant costs with environmental externalities," *Environmental Defense Fund - Texas*, November 1, 2016, Austin, TX
22. "A geographically resolved method to estimate levelized power plant costs with environmental externalities," *Hunt Oil Company*, October 28, 2016, Houston, TX
21. "A geographically resolved method to estimate levelized power plant costs with environmental externalities" *ExxonMobil*, August 30, 2016, Austin, TX
20. "A geographically resolved method to estimate levelized power plant costs with environmental externalities," *General Electric*, August 24, 2016, Austin, TX
19. "A geographically resolved method to estimate levelized power plant costs with environmental externalities," *ERCOT*, August 19, 2016, Taylor, TX
18. "A geographically resolved method to estimate levelized power plant costs with environmental externalities," *Idaho National Lab*, July 13, 2016, Idaho Falls, ID

17. "A geographically resolved method to estimate levelized power plant costs with environmental externalities" *Harvard Electricity Policy Group*, June 2-3, 2016, Cambridge, MA
16. "Failure," *Commencement Speech, Cushing High School*, May 30, 2016, Cushing, TX
15. "The energy-waste nexus" *Advanced Waste Management: Environmental and Economic Benefits, HARC*, May 25, 2016, Houston, TX
14. "Energy impacts of Austin's residential buildings," *Austin Center for Architecture*, April 7, 2016
13. "Communications and data in smart cities," *UT Energy Week*, February 17, 2016, Austin, TX
12. "Communications and data in smart cities," *UT Energy Journalism Workshop*, January 8, 2016, Austin, TX
11. "Communications and Data in Smart Cities" *ISGAN Smart Grid Workshop*, September 14-15, 2015, Lecco, Italy
10. "So what direction should solar panels face?," *Austin Energy Green Building Seminar Series*, August 11, 2015, Austin, TX
9. "The Energy-Water Nexus" *UT Quest Seminar Series*, March 26, 2015, Austin, TX
8. "Clean Energy Innovation" *Green Mountain Energy LEED Platinum Celebration*, December 19, 2013, Austin, TX
7. "A multi-objective assessment of the effect of solar placement on energy production and system economics," *IEEE Power and Energy Society*, April 1, 2014, Austin, TX
6. "On Optimal Solar Placement," *Pecan Street Industry Advisory Council Annual Meeting*, October 22, 2013, Austin, TX
5. "New Global Models: Real-Time and Local" *SXSW Eco 2013*, October 7-9, 2013, Austin, TX
4. "Data-Driven Results from the Pecan Street Smart Grid Demonstration Project" *UT Energy Symposium*, March 21, 2013, Austin, TX
3. "Energy and the Environment," *St. Stephens D-Term Annual Presentation*, October 4, 2012, Austin, TX
2. "How 'Big Data' Fits Into the Smart Grid Evolution" *SXSW Eco 2012*, October 3-5, 2012, Austin, TX

1. "Energy Audit Study of Homes in Austin, TX. and The Pecan Street Smart Grid Project" *Austin Energy Green Building Luncheon*, January 18, 2012, Austin, TX

Selected Projects

Dr. Rhodes has been involved with multiple research projects including as the principal investigator for projects funded by organizations and companies such as the Alfred P. Sloan Foundation and ExxonMobil.

Solar Roadways, 2018

Led a team that assessed the suitability of all 47k miles of U.S. interstate roadways for right-of-way solar projects and designed an online tool to be used by policy makers to inform them on suitable sites. I was integral in writing the proposal and managing the project. This project was funded by the Ray C. Anderson Foundation.

Impacts of renewables in ERCOT (PI*, IS*), 2018

This project estimated the impacts on water use, emissions, and wholesale electricity market prices from renewable (wind and solar) generation in ERCOT. It sought to quantify the amount of money saved by utilizing renewables in the ERCOT grid. This consulting project was funded by the Wind Solar Alliance.

The Influence of Information Technology on the Energy Mix in Texas (PI, IS), 2018

This analysis examined the impacts of information technologies (IT) on carbon emissions and electricity price in electricity markets. Specifically, the report focused on the role IT played in enabling the Electric Reliability Council of Texas' (ERCOT) transition to a nodal market, the subsequent impacts on the penetration of renewable energy, and the resulting effects on carbon emissions and electricity prices. This consulting project was funded by Dell Inc.

The Energy Infrastructure of the Future, 2017 – Present

Gathering, storing, and analyzing information regarding the energy infrastructure of the US. This work intends to inform infrastructure investments by creating interactive decision support tools that provide an extensive look at how future energy services are provided and energy resources are produced, moved, and consumed throughout the United States. This project has multiple funders.

Modeling Electrical Grids under Various Renewables Penetration and Storage Scenarios (PI), 2016 – Present

This project assess the impact grid-scale energy storage on overall grid stability and regional power markets by utilizing an inertia-constrained unit commitment and economic dispatch model that includes representations of individual generators. This project also seeks to predict

* PI indicates that I was/am the principal investigator for this project.

* IS indicates that this project was a consulting project through IdeaSmiths LLC. Some consulting projects are not public documents and thus are not listed here.

wholesale electricity and ancillary services prices with high penetrations of energy storage. This project was funded by ExxonMobil.

ERCOT duck curve analysis (PI), 2015 – Present

This project seeks to analyze the impacts of high penetrations of wind, solar and storage on costs, emissions, and stability metrics of the electricity grid using ERCOT as a case study. We also assessed the impact of distribution level resources on the larger transmission network and the impact of demand response and energy storage on customer's utility rates. This project was funded by the Electric Reliability Council of Texas.

Full Cost of Electricity, 2015 – 2017

Built, from scratch, a database and visualization of over a dozen types of new power plant costs in all 3,110 counties in the US. We also calculated the effect of various penetrations of technologies into electricity markets, including grid level (large power plant) and distribution level technologies (solar and storage). This project had multiple funders.

Webber Energy Group SWEAT Lab, 2012 – 2017

Built, from scratch, a full solar radiation and weather data measurement laboratory on the roof of a UT-Austin campus building. Redundant (Campbell Scientific and National Instruments) data acquisition systems provide real time data as well as archive to a PostgreSQL database.

Teaching

Dr. Rhodes has developed, from scratch, and taught (multiple times) a very popular data analytics class (using the R language) to graduate engineering students in how to clean, organize, analyze, and store energy data. The class has a strong focus on databases, GIS analysis and machine learning techniques.

Rhodes has also taught Calculus I & II and Fluid Mechanics laboratories sessions as part of his graduate work.

Government Testimony and Briefings

3. "Subsidies in the ERCOT wholesale electricity market" *Texas House State Affairs Committee*, April 2, 2019, Austin, TX
2. "House Committee on Natural Resources Climate Hearing Call," *US House Committee on Natural Resources*, January 11, 2019, Washington DC
1. "The ERCOT Wholesale Electricity Market," *Texas Senate Committee on Business & Commerce*, May 1, 2018, Austin, TX

Patents

2. Algorithm For Optimal Solar Placement, (Patent Awarded in 2019) (J.D. Rhodes, C.R. Upshaw, and M.E. Webber)

1. Reducing Peak Electrical Demand By Air Conditioning Systems And Reducing Water Consumption By Implementing An Integrated Thermal Energy And Rainwater Storage System, (Patent Awarded in 2018) (C.R. Upshaw, J.D. Rhodes, and M.E. Webber)

Entrepreneurship Experience

2. Founding Partner, Davis-Rhodes Ranch, October 2016–present
1. Founding Partner, IdeaSmiths LLC, July 2013–present

Service to the Profession and Board Memberships

- Texas Solar Energy Society Board Member, January 2019 – Present
- Pecan Street Inc. Data Advisory Board Member, April 2018 – Present
- ASHRAE Smart Grid Subcommittee Chair, January 2014 – January 2018

Other Skills

Proficient in:

Machine Learning, R, LaTeX, Big Data, Linux-based supercomputing systems, BEopt, SQL, PostgreSQL, MS Office, Windows, MATLAB, EnergyPlus, OpenStudio, database construction, neural networks, grant writing, speaking, social media savvy, science communication, mountain biking, cyclocross

Familiar with:

PLEXOS, TensorFlow, Python, Java, Adobe Photoshop, Simulink, GAMS, blacksmithing

Bio

Joshua D. Rhodes, Ph.D. is a Senior Energy System Modeler & Analyst at Vibrant Clean Energy in Boulder, CO. His current work is in the area of smart grid and the bulk electricity system, including spatial system-level applications and impacts of energy efficiency, resource planning, distributed generation, and storage. He is also interested in policy and the impacts that good policy can have on the efficiency of the micro and macro economy. He is also a regular contributor to Forbes and is an AXIOS Expert Voice. He holds a double bachelors in Mathematics and Economics from Stephen F. Austin State University, a masters in Computational Mathematics from Texas A&M University, a masters in Architectural Engineering from The University of Texas at Austin and a Ph.D. in Civil Engineering from The University of Texas at Austin. He enjoys mountain biking, rock climbing, and a good cup of coffee.

Media Appearances

Dr. Rhodes has made numerous media appearances featuring his analysis and insight in outlets such as *Wall Street Journal*, *New York Times*, *ABC*, *NPR*, *Texas Public Radio*, *Arizona Public Media*, *PBS*, *Science Magazine*, *Vox*, *Grist*, *CityLab*, *Quartz*, *Popular Science*, *Chatham House*, *Houston Chronicle*, *Dallas Morning News*, *MegaWatt Daily*, *E&E Newswire*, *Platts*, *Argus Media*, *Utility Dive*, *Washington Examiner*, *Waco Tribune-Herald*, *FactCheck.Org*, *Austin American Statesman*, *Texas Monthly*, *Salon*, *San Antonio Express News*, *U.S. News and World Report*, *Bloomberg*, *RTO Insider*, *Texas State Radio Network*, *Greentech Media*, *Bulletin of the Atomic Scientists*, *Engineering News Record*, *The Detroit News*, *The Desert Sun*, and the *UT Daily Texan*. Those outlets span most major media, including print, TV, radio, and web.