Publications That Cite AVERT

Updated September 8, 2020

Publication type	AVERT region	Date published	Summary	URL	Citation	Organization or author affiliation
Report	Southeast (AVERT 2.3 regions)	December 2016	This publication analyzes the emission impacts of increasing electric vehicle usage in North and South Carolina. It considers the net result of avoided gasoline consumption along with added emissions from electric power generation. The authors use AVERT to simulate the added emissions from the increased load due to electric vehicle charging. They find that the reduced tailpipe emissions from the adoption of electric vehicles would offset NOx emissions from increased electricity use, but would not offset the increased emissions of SO2 and CO2 across the AVERT Southeast region.	https://www.advancedenergy.org/wp-content/uploads/2016/12/EV_to_Air-Quality-003.pdf	North Carolina Department of Environmental Quality and South Carolina Energy Office. 2016. Electric vehicles and air quality.	Advanced Energy
Report	Great Lakes/Mid-Atlantic (AVERT 2.3 regions)	June 2017	This report analyzes the potential impacts of the adoption of an opt-out policy for utility-scale energy efficiency programs in Ohio. Such a policy would allow large customers to choose not to participate in or help to fund energy efficiency programs. The authors use AVERT to assess the air pollution effects, estimating the increase in SO2, NOx, and CO2 emissions under scenarios in which opt-outs reduce energy efficiency savings by 20%, 35%, and 45%.	https://www.sciencedirect.com/science/article/pii/S1040619017302440	Baatz, B., G. Relf, and M. Kelly. 2017. Large customer opt-out: An Ohio example.	American Council for an Energy-Efficient Economy
Report	National	February 2018	This study analyzes the health impacts of a hypothetical 15% flat reduction in electricity consumption nationwide. The authors used AVERT to estimate the emission reductions that would result from this scenario, finding annual emission reductions of 11% for PM2.5, 18% for NOx, 23% for SO2, and 14% for CO2. Next, they used COBRA to model health impacts. The publication ranks the states and cities where AVERT indicates change will have the largest positive impact on public health.	https://www.psr.org/wp-content/uploads/2018/04/renewables-report.compressed.pdf	Hayes, S., and C. Kubes. 2018. Saving energy, saving lives.	American Council for an Energy-Efficient Economy

Publication type	AVERT region	Date published	Summary	URL	Citation	Organization or author affiliation
Report	National	April 2014	This report evaluates the effects of implementing four energy saving policies (an energy efficiency savings target, national model building codes, combined heat and power systems, and efficiency standards for products/equipment) on reducing emissions from the power sector. They find that nationwide implementation would result in a 26% reduction in CO2 emissions and a 25% decrease in power demand by 2030, relative to 2012. The authors used AVERT to generate these results, and they explain how AVERT analyzes hourly changes in demand based on historical data to project future emissions.	http://climateandenergy.org/resources/ACEEE111droleofefficiency.pdf	Hayes, S., G. Herndon, J.P. Barrett, J. Mauer, M. Molina, M. Neubauer, ... and L. Ungar. 2014. Change is in the air: How states can harness energy efficiency to strengthen the economy and reduce pollution. American Council for an Energy-Efficient Economy. ACEEE: Washington, DC.	American Council for an Energy-Efficient Economy
Webpage	National	No date	This study used AVERT to estimate nationwide SO2, NOx, and CO2 emission reductions from existing and planned wind energy capacity. A subesequent study is now available, in which the authors report that the electricity generated by wind in 2017 displaced approximately 188,000 metric tons of SO2 and over 122,000 tons of NOx, representing more than $8 billion in avoided health costs	https://www.awea.org/wind-101/benefits-of-wind/environmental-benefits	American Wind Energy Association. n.d. Wind energy reducing greenhouse gas emissions.	American Wind Energy Association
White paper	National	May 2014	This white paper lays out the environmental benefits of wind energy, using AVERT to calculate state-by-state emission reductions attributed to wind energy in 2013. The analysis concludes that the 167.7 million MWh of wind energy produced in 2013 resulted in 126.8 million tons of CO2 reduction. This paper also details the benefits of wind energy for specific states and regions.	http://awea.files.cms-plus.com/FileDownloads/pdfs/AWEA_Clean_Air_Benefits_WhitePaper%20Final.pdf	American Wind Energy Association. 2014. The clean air benefits of wind energy.	American Wind Energy Association
Published paper	National	December 2017	This article analyzes the impact of increasing residential insulation on energy consumption and corresponding life-cycle emissions by estimating payback periods for CO2, NOx, and SO2 emissions, as well as emissions associated with insulation manufacturing and transportation. The study uses AVERT to estimate the emission reductions that would result from marginal changes in electricity demand and generation.	https://link.springer.com/article/10.1007/s11367-017-1412-x	Levy, J.I., M.K. Woo, R.D. Tebbens, and Y. Nishioka. 2017. Emission payback periods for increased residential insulation using marginal electricity modeling: A life cycle approach. The International Journal of Life Cycle Assessment.	Boston University

Publication type	AVERT region	Date published	Summary	URL	Citation	Organization or author affiliation
Published paper	National	March 2016	This paper describes a study that used AVERT to simulate emission reduction impacts of increased residential insulation. The authors assess the SO2, NOx, and CO2 emission reductions from electric generating units (EGUs) to find that increasing insulation for all single-family homes in the United States in 2013 would have led to annual reductions of 80 million tons of CO2 from EGUs and other co-benefits, such as preventing 320 premature deaths associated with criteria pollutant emissions.	http://iopscience.iop.org/article/10.1088/1748-9326/11/3/034017/pdf	Levy, J.I., M.K. Woo, S.L. Penn, M. Omary, Y. Tambouret, C.S. Kim, and S. Arunachalam. 2016. Carbon reductions and health co-benefits from U.S. residential energy efficiency measures. Environmental Research Letters 11(3): 034017.	Boston University
Published paper	National	February 2016	In this paper, the authors use AVERT to estimate energy savings and emission reductions associated with increasing residential insulation for 665,000 homes built in the United States in 2013. The results show that the increased insulation would result in reductions of 180 GWh of electricity and 840 million SCF of natural gas per year, among other results, leading to annual emission reductions of 470,000 tons of CO2, 1,100,000 pounds of SO2, and 770,000 pounds of NOx.	http://www.sciencedirect.com/science/article/pii/S0360132315301712	Levy, J.I., M.K. Woo, and Y. Tambouret. 2016. Energy savings and emissions reductions associated with increased insulation for new homes in the United States. Building and Environment 9: 72-79.	Boston University
Published paper	Northeast (AVERT 2.3 regions)	March 2020	This paper compares the costs for installing weatherization retrofits, such as air sealing and insulation, both with and without adequate ventilation. The paper quantifies costs associated with decreased electricity use, decreased natural gas use, and health impacts due to changes in indoor and outdoor air quality. The authors use AVERT to estimate the change in emissions of NOx, SO2, and PM2.5 from EGUs in the Northeast region in the summer, winter, and annually under the scenarios considered. They find that the monetized value of resident-level health impacts is of a much higher magnitude than the value of population-level health impacts and energy impacts.	https://www.sciencedirect.com/science/article/abs/pii/S03601323 1930719X	Underhill, L.J., C.W. Milando, J.I. Levy, W.S. Dols, S.K. Lee, and M.P. Fabiana. 2020. Simulation of indoor and outdoor air quality and health impacts following installation of energy-efficient retrofits in a multifamily housing unit. Building and Environment 170. DOI: 10.1016/j.buildenv.2019.106507	Boston University

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Published paper	Northeast (AVERT 2.3 regions)	March 2020	This paper compares the costs for installing weatherization retrofits, such as air sealing and insulation, both with and without adequate ventilation. The paper quantifies costs associated with decreased electricity use, decreased natural gas use, and health impacts due to changes in indoor and outdoor air quality. The authors use AVERT to estimate the change in emissions of NO_x, SO_2, and $PM_{2.5}$ from EGUs in the Northeast region in the summer, winter, and annually under the scenarios considered. They find that the monetized value of resident-level health impacts is of a much higher magnitude than the value of population-level health impacts and energy impacts.	https://www.sciencedirect.com/science/article/abs/pii/S03601323 1930719X	Underhill, L.J., C.W. Milando, J.I. Levy, W.S. Dols, S.K. Lee, and M.P. Fabiana. 2020. Simulation of indoor and outdoor air quality and health impacts following installation of energy-efficient retrofits in a multifamily housing unit. Building and Environment 170. DOI: 10.1016/j.buildenv.2019.106507	Boston University
Report	Great Lakes/Mid-Atlantic, Upper Midwest (AVERT 2.3 regions)	May 2017	This publication is an appendix to a report by Focus on Energy that summarizes the economic development impacts of energy efficiency and renewable energy programs in Wisconsin. The authors use AVERT to calculate avoided emissions resulting from Focus on Energy programs, combining this information with the cost of carbon set by the Public Service Commission of Wisconsin to calculate monetized emission reduction benefits on the order of $100 million per year.	https://www.focusonenergy.com/sites/default/files/Wisconsin%20Focus%20on%20Energy%20CY%202016%20Appendices.pdf	Public Service Commission of Wisconsin. 2017. Focus on Energy: Calendar year 2016 evaluation report: Appendices.	Cadmus
Webpage	Great Lakes/Mid-Atlantic (AVERT 2.3 regions)	No date	This publication discusses the benefits of increasing renewable energy in Maryland as part of a campaign to expand the state's RPS policy. The authors use AVERT and COBRA to assess the effects of reaching the state's renewable goal of 50% by 2030, finding that a reduction of 8.1 million tons of CO2, will lead to the prevention of 290 premature deaths and more than 3,000 asthma attacks annually.	http://chesapeakeclimate.org/maryland/clean-energy/	Chesapeake Climate Action Network. Forward with 50% renewable electricity.	Chesapeake Climate Action Network

Publication type	AVERT region	Date published	Summary	URL	Citation	Organization or author affiliation
Fact sheet	Northeast (AVERT 2.3 regions)	September 2017	This publication from the Connecticut Green Bank explains the methods this organization uses to assess their programs' effectiveness in improving air quality, specifically reducing emissions of CO2, NOx, and SO2. The report uses AVERT to measure the emission impacts of adding 60 MW of solar PV, wind energy, and energy efficiency savings.	http://www.ctgreenbank.com/wp-content/uploads/2017/10/CGB-Eval-IMPACT-091917-B.pdf	Connecticut Green Bank. 2017. Evaluation framework: Societal performance.	Connecticut Green Bank
Blog post	Northeast (AVERT 2.3 regions)	February 2017	This blog post provides information about communities designated as Clean Energy Communities by the New York State Energy Research and Development Authority (NYSERDA), which signifies that they are taking actions to save energy and money while reducing greenhouse gas emissions. The authors mention a NYSERDA report that uses AVERT to estimate a 254,000 metric ton reduction in greenhouse gas emissions that would result from retrofitting 1.4 million street lights with LEDs—one of several energy-saving measures being considered.	http://courtneystrong.com/2017/02/mid-hudson-region-sweeps-clean-energy-communities-first-designations-ulster-county-city-kingston-village-dobbs-ferry-town-new-castle-recognized-commitment-cut/	Strong, C. 2017. Mid-Hudson region sweeps Clean Energy Communities "first" designations.	Courtney Strong Inc.
Report	Three regions (AVERT 2.3 regions)	December 2014	This report presents EPRI's assessment of AVERT and provides a detailed comparison of analytical results generated by AVERT, EPRI's EE-CO2 tool, and EPA's eGRID for several end-use EE projects implemented in different geographic regions of the country.	http://www.epri.com/abstracts/Pages/ProductAbstract.aspx?ProductId=000000003002004606	Electric Power Research Institute. 2014. A comparative assessment of the U.S. EPA's Avoided Emissions and geneRation Tool (AVERT): Estimating emissions and energy displacement associated with end-use energy efficiency.	Electric Power Research Institute
White paper	National	July 2017	This paper reviews and analyzes successful residential retrofit energy efficiency programs nationwide to identify the models and strategies that made them effective. Using AVERT and other tools, the authors calculate emission reductions attributable to direct install retrofits, HVAC replacement and early retirement, and comprehensive whole-home retrofits.	http://escholarship.org/uc/item/18d545f1	Grevatt, J., et al. 2017. Keys to the house: Unlocking residential savings with program models for home energy upgrades.	Energy Futures Group

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Report	Texas (AVERT 2.3 regions)	July 2016	This report provides an update from Northeast Texas Air Care on their participation in EPA's Ozone Advance Program, including information about current emission levels and measures and programs that are being implemented or considered to further reduce emissions. The report uses AVERT to estimate NOx emission reductions from one municipality's energy efficiency program: the City of Tyler's ongoing Energy Management and Modernization Program. Estimates include a reduction of NOx by 0.4 tons per year.	https://www.epa.gov/sites/production/files/2016-07/documents/2016_update.pdf	Kemball-Cook, S., and G. Yarwood. 2016. Northeast Texas Air Care Ozone Advance action plan 2016 update.	ENVIRON International Corporation
Published paper	National	October 2019	This paper compares the benefits ($) per MWh across the 10 AVERT regions and for three renewable energy (RE) resources: wind energy, utility solar PV, and rooftop solar PV. The authors use AVERT to calculate the emission reductions associated with increasing capacity of each of the three renewable resources by 100, 300, 400, 500, 1,000, 1,500, 2,000, 2,500, and 3,000 MW in each region. For each scenario, they used EASIUR and a $11.2 million value of statistical life to estimate the monetized health benefits of reduced emissions of SO2, NOx, and PM2.5 and used a $41.80/short ton CO2 social cost of carbon to estimate monetized benefits of reduced emissions of CO2. They find that benefits per MWh vary more between regions than they do between RE types, reflecting differences in primary fuel types of EGUs displaced, emissions displaced, and benefits per emission reduction.	https://iopscience.iop.org/article/10.1088/1748-9326/ab49bc/pdf	Buonocore, J.J., E.J. Hughes, D.R. Michanowicz, J. Heo, J.G. Allen, and A. Williams. 2019. Climate and health benefits of increasing renewable energy deployment in the United States. Environmental Research Letters 14(11). DOI: 10.1088/1748-9326/ab49bc	Harvard University

Publication type	AVERT region	Date published	Summary	URL	Citation	Organization or author affiliation
Published paper	National	October 2019	This paper compares the benefits ($) per MWh across the 10 AVERT regions and for three renewable energy (RE) resources: wind energy, utility solar PV, and rooftop solar PV. The authors use AVERT to calculate the emission reductions associated with increasing capacity of each of the three renewable resources by 100, 300, 400, 500, 1,000, 1,500, 2,000, 2,500, and 3,000 MW in each region. For each scenario, they used EASIUR and a $11.2 million value of statistical life to estimate the monetized health benefits of reduced emissions of SO_2, NO_x, and $PM_{2.5}$ and used a $41.80/short ton CO_2 social cost of carbon to estimate monetized benefits of reduced emissions of CO_2. They find that benefits per MWh vary more between regions than they do between RE types, reflecting differences in primary fuel types of EGUs displaced, emissions displaced, and benefits per emission reduction.	https://iopscience.iop.org/article/10.1088/1748-9326/ab49bc/pdf	Buonocore, J.J., E.J. Hughes, D.R. Michanowicz, J. Heo, J.G. Allen, and A. Williams. 2019. Climate and health benefits of increasing renewable energy deployment in the United States. Environmental Research Letters 14(11). DOI: 10.1088/1748-9326/ab49bc	Harvard University
Comment letter	Great Lakes/Mid-Atlantic (AVERT 2.3 regions)	June 2014	This publication from the Hoosier Environmental Council contains recommendations for energy efficiency and demand-side management in the state of Indiana. The authors use AVERT to demonstrate the SO2, NOx, and CO2 emission reductions of implementing a 1.5% annual energy savings target and a combination of four energy efficiency policy options.	http://www.in.gov/iurc/files/Hoosier_Environmental_Council.pdf	Kharbanda, J., and R.K. Johnson. 2014. Comments of the Hoosier Environmental Council with technical assistance from ACEEE regarding IURC energy efficiency and demand-side management recommendations.	Hoosier Environmental Council, Inc.
Published paper	National	August 2015	This article estimates the impact of mechanisms that EPA proposed to regulate carbon emissions from existing sources of noncriteria pollutants—specifically the impact of Building Block 3 of the Clean Power Plan, which sets a target for increasing renewable generation. The authors use AVERT to calculate the emission reductions potential of Building Block 3 for all U.S. states. The authors also provide a detailed description of AVERT's methodology, assumptions, limitations, and how they used AVERT to conduct their analysis.	http://www.sciencedirect.com/science/article/pii/S1040619015001608	Ohler, A.M., and C.L. Ta. 2015. Modeling impacts from EPA's Clean Power Plan and Building Block 3 for renewable energy. The Electricity Journal 28(7): 72-82.	Illinois State University in Normal

Publication type	AVERT region	Date published	Summary	URL	Citation	Organization or author affiliation
Book excerpt	National	October 2019	This book chapter addresses pros and cons of wind energy, including reductions to emissions from fossil fuel power plants. The author uses AVERT to calculate the emissions avoided due to electricity generated by wind turbines in 2015 and finds that wind was responsible for 132,000,000 metric tons of avoided CO2 emissions, 176,000 metric tons of avoided SO2 emissions, and 106,000 metric tons of avoided NOx emissions.	https://link.springer.com/chapter/10.1007/978-3-319-75134-4_6	Rao, K.R. 2019. Conservation and efficiency issues in wind energy for power generation. Springer, Cham.	KRRao Consulting
Report	National	May 2016	This study assessed the emissions and water use effects of the U.S. Department of Energy's SunShot Initiative to make solar electricity cost-competitive. The authors modeled solar capacity installed by the end of 2014; used AVERT to estimate emission reductions; and estimated the impact on water withdrawal and consumption based on displaced fossil generation as projected by AVERT. This study included rooftop and utility-scale PV as well as concentrated solar power, which the authors entered into AVERT based on individual plants' hourly generation profiles. The authors used EPA's COBRA tool to calculate corresponding health benefits.	http://eta-publications.lbl.gov/sites/default/files/65628.pdf	Wiser, R., T. Mai, D. Millstein, J. Macknick, A. Carpenter, S. Cohen, W. Cole, B. Frew, and G. Heath. 2016. On the path to SunShot: The environmental and public health benefits of achieving high penetrations of solar energy in the United States. Lawrence Berkeley National Laboratory and National Renewable Energy Laboratory.	Lawrence Berkeley National Laboratory
Report	National	January 2016	This detailed report and corresponding summary article analyze the historical impacts of aggregated state renewable portfolio standard (RPS) policies, focusing on greenhouse gas emissions, air pollution, and water pollution, with attention also to employment impacts, wholesale electricity market price suppression, and natural gas price suppression. Using AVERT, the authors concluded that new renewable sources used for RPS compliance in 2013 resulted in a 3.6% reduction in total fossil fuel-fired generation.	http://climate-xchange.org/wp-content/uploads/2015/11/Renewable-Energy-Standards-Study.pdf; http://www.sciencedirect.com/science/article/pii/S0301421516303408	Wiser, R., G. Barbose, J. Heeter, T. Mai, L. Bird, M. Bolinger, ... and A. Mills. 2016. A retrospective analysis of the benefits and impacts of U.S. renewable portfolio standards.	Lawrence Berkeley National Laboratory

Publication type	AVERT region	Date published	Summary	URL	Citation	Organization or author affiliation
Published paper	National	August 2017	This article quantifies the monetary benefits of wind and solar energy in the United States from 2007 to 2015. The authors used AVERT to estimate displaced emissions from historical solar and wind power generation, then applied a suite of cost/benefit approaches to find that between 2007 and 2015, wind and solar nationwide displaced enough emissions of CO2, NOx, SO2, and PM2.5 to provide billions of dollars in health- and climate-related benefits. The authors also discuss the economic incentives for these renewable technologies and the impact of cap-and-trade programs on emission benefits.	https://www.nature.com/articles/nenergy2017134.epdf?author_access_token=uYr0473RE7N8qJCivi6eKNRgN0jAjWel9jnR3ZoTv0O9NQQavv-jglBpgJVQy91sl6ZpWXil0zPIZ8H2tvWaSoZi9rrMjTx9l2FLIqAykV00GsKxOpkwjZM1RpGmND_BuVZCRc2dDL42qJnMAq4DGw%3D%3D	Millstein, D., et al. 2017. The climate and air-quality benefits of wind and solar power in the United States.	Lawrence Berkeley National Laboratory
Published paper	Northeast, Great Lakes/Mid-Atlantic, Southeast (AVERT 2.3 regions)	April 2018	This study analyzes the economic value of offshore wind within electricity markets along the U.S. east coast. The authors use AVERT to estimate emissions reductions associated with offshore wind. They also model the reduction in natural gas prices resulting from displaced gas-fired generation suppressing natural gas demand.	https://www.energy.gov/sites/prod/files/2018/04/f50/offshore_erl_lbnl_format_final.pdf	Mills, A.D., D. Millstein, S. Jeong, L. Lavin, R. Wiser, and M. Bolinger. 2018. Estimating the value of offshore wind along the United States' eastern coast.	Lawrence Berkeley National Laboratory
Report	National	March 2020	This U.S. DOE-sponsored report reviews methods for quantifying non-energy impacts of energy efficiency programs, with emphasis on transferability of methods used in various states. The authors estimated health benefits per kWh (BPK) of project/programs/policies by running scenarios in AVERT, then using AVERT outputs as inputs into EPA's COBRA tool.	https://www.osti.gov/biblio/1631673	Sutter, M., J. Mitchell-Jackson, S.R. Schiller, L. Schwartz, and I. Hoffman. 2020. Applying non-energy impacts from other jurisdictions in cost-benefit analyses of energy efficiency programs: Resources for states for utility customer-funded programs.	Lawrence Berkeley National Laboratory
Student master's project	Southeast (AVERT 2.3 regions)	July 2016	This master's thesis analyzes the effects of adding 1,644 MW of solar PV to the electrical grid in North Carolina. The study concludes that adding this much PV would lead to 2,337,400 MWh of fossil-fueled generation being displaced, thereby decreasing emissions for CO2, NOx, and SO2 by 3.2%, 3.5%, and 3.9%, respectively.	https://repository.lib.ncsu.edu/bitstream/handle/1840.20/33249/etd.pdf?sequence=1&isAllowed=y	Turner, J.E.. 2016. The effect of adding solar photovoltaic electricity generators to the Duke Energy service area in North Carolina on the emissions of fossil fueled generators.	North Carolina State University

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Published paper	National	July 2016	This article describes the Emissions Quantification Tool (EQT), a publicly accessible web calculator developed by the Pacific Northwest National Laboratory (PNNL). This screening tool estimates the emissions impacts of a variety of "smart grid" technologies and project types. The EQT uses the AVERT algorithm, and the article explains how AVERT has been integrated, details AVERT's capabilities, and explains its methodology.	https://ieeexplore.ieee.org/abstract/document/7741364/	Studarus, K., T. Hardy, B. Thayer, and R. Pratt. 2016. Quantifying the emissions impacts of smart grid projects with a publically available web calculator. 2016 IEEE Power and Energy Society General Meeting (PESGM).	Pacific Northwest National Laboratory
Published paper	California, Southwest, Great Lakes/Mid-Atlantic, and Southeast (AVERT 2.3 regions)	February 2018	This study used the PNNL's EQT along with prototypical distribution feeders to explore the CO2, SO2, and NOx impacts of energy storage deployed with solar PV, where the energy storage system is operated to minimize load variation assuming hourly dispatch. The authors used 2015 AVERT data for the California, Southwest, Great Lakes/Mid-Atlantic, and Southeast regions to estimate emissions implications of PV and energy storage installations at varying levels of penetration.	http://ieeexplore.ieee.org/abstract/document/8274550/?reload=true	Barrett, E., B. Thayer, K. Studarus, and S. Pal. 2017. The varied impacts of energy storage and photovoltaics on fossil fuel emissions. 2017 IEEE Power and Energy Society General Meeting.	Pacific Northwest National Laboratory
News article	National	September 2017	This article summarizes a Sierra Club analysis that estimates the emissions benefits of replacing fossil-fired (predominantly coal) EGUs with renewable sources. The study uses AVERT to estimate the U.S. electric sector emissions reduction that would result from planned and targeted EGU retirements and a tripling of renewable energy installations; it concludes that CO2 emissions would be reduced by at least 500 million metric tons by 2025.	http://www.huffingtonpost.com/entry/analysis-maintaining-pace-of-coal-retirements-faster_us_59bc2625e4b0390a1564dd3c	Hitt., M.A. 2017. Maintaining pace of coal retirements and faster clean energy growth will yield another half billion tons of carbon reduction.	Sierra Club
White paper	National	May 2014	This report explains how increasing solar energy usage will provide numerous benefits, including a decrease in carbon emissions, meeting Clean Air Act requirements, improving grid reliability, reducing water consumption, balancing compliance costs, and creating local jobs. The authors use AVERT to calculate the reductions in CO2, NOx, and SO2 emissions resulting from current solar energy deployment levels for all 10 AVERT regions.	https://www.energy.gov/eere/solar/downloads/cutting-carbon-emissions-under-111d-case-expanding-solar-energy-america	Solar Industries Association. 2014. Cutting carbon emissions under 111(d): The case for expanding solar energy in America.	Solar Energy Industries Association

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Report	Northeast (AVERT 2.3 regions)	April 2015	In response to the Act to Support Solar Energy Development in Maine, the authors of this study assess the value of distributed solar energy generation in Maine as well as several implementation options. The authors used AVERT to estimate the displaced SO2, NOx, and CO2 emissions for 2011–2013, which they used to calculate a net social cost.	http://www.ripuc.org/eventsactions/docket/4568-WED-Ex6-MaineSolarReport(11-23-15).pdf	Maine Public Utilities Commission. 2015. Maine distributed solar valuation study.	Sustainable Energy Advantage, LLC
Published paper	National	August 2016	This paper presents the results of an analysis of the short-term effects of time-based electricity tariffs on consumer and retailer costs and CO2 emissions in Ireland. The authors used the PNNL's EQT, which uses the AVERT algorithm, to model the estimated system load of their consumers under flat-rate and experimental pricing schemes. Although AVERT is designed for use in the contiguous 48 states, the authors attempted to apply the same approach to Ireland by using system load data from Ireland along with a scaling factor.	https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2826055	Ata, B., A.S. Duran, and O. Islegen. 2016. An analysis of time-based pricing in electricity supply chains.	University of Chicago
Published paper	Great Lakes/Mid-Atlantic (AVERT 2.3 regions)	May 2018	This paper assesses the optimal siting of wireless charging stations for an electric bus network in terms of life-cycle costs, greenhouse gas emissions, and energy use. The authors used AVERT with the Great Lakes/Mid-Atlantic region to quantify temporal differences in emissions and energy intensities of the electric grid in order to optimize charging siting to minimize emissions.	https://www.sciencedirect.com/science/article/pii/S030626191830789X	Bi, Z., G.A. Keoleian, and T. Ersal. 2018. Wireless charger deployment for an electric bus network: A multi-objective life cycle optimization. Applied Energy 225: 1090-1101.	University of Michigan
Published paper	National	August 2016	This publication assesses various methods for quantifying emissions from electricity loads, including AVERT. The authors describe AVERT and review its functionality, tractability, and appropriate use. In addition, the authors present a case study quantifying CO2 emission factors for electric vehicle charging using 10 different methods, including AVERT.	http://pubs.acs.org/doi/abs/10.1021/acs.est.5b05216?journalCode=esthag	Ryan, N.A., J.X. Johnson, and G.A. Keoleian. 2016. Comparative assessment of models and methods to calculate grid electricity emissions. Environmental Science and Technology 50(17): 8937-8953.	University of Michigan

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Published paper	Great Lakes/Mid-Atlantic, Upper Midwest (AVERT 2.3 regions)	August 2016	This paper presents an analysis of the CO2, NOx, and SO2, emission reductions and corresponding monetary benefits associated with constructing a 300 MW offshore wind farm in Lake Michigan. The authors used AVERT to calculate emission reductions, then used two different approaches to monetize the benefits of these reductions. They present a benefit of $33MWh based on marginal damages of pollution and a benefit of $987/kW based on market prices for pollution allowances. The study compares different locations for the wind farm to examine the impact of siting on generation and corresponding displaced emissions.	http://www.sciencedirect.com/science/article/pii/S0921800916304657	Chiang, A.C., M.R. Moore, J.X. Johnson, and G.A. Keoleian. 2016. Emissions reduction benefits of siting an offshore wind farm: A temporal and spatial analysis of Lake Michigan. Ecological Economics 130: 263-276.	University of Michigan
Published paper	National	November 2017	This article presents a decision algorithm to help users determine the most appropriate method to estimate CO2 emissions from an electricity load. Among the factors considered are region size, temporal resolution, average or marginal approaches, and time scales. AVERT is one of 32 options presented.	http://onlinelibrary.wiley.com/doi/10.1111/jiec.12708/full	Ryan, N.A., J.X. Johnson, G.A. Keoleian, and G.M. Lewis. 2017. Decision support algorithm for evaluating carbon dioxide emissions from electricity generation in the United States. Journal of Industrial Ecology.	University of Michigan
Published paper	National	June 2019	This paper discusses and quantifies the synergies of the concurrent deployment of four technologies (wireless charging, shared mobility services, autonomous driving, and battery electric vehicles), i.e., a wireless charging and shared autonomous battery electric vehicle (W+SABEV) system. The authors use AVERT to calculate average nighttime and daytime electricity emission intensities in kg CO2 equivalent per kWh. They compare a W+SABEV system with a plug-in charging BEV system only and find that the greenhouse gas payback time is five years or less when the ratio of en-route charging time vs. trip time is greater than or equal to 19%.	https://link.springer.com/article/10.1007/s11027-019-09870-9	Bi, Z., M.A. Reiner, G.A. Keoleian, Y. Zhou, M. Wang, and Z. Lin. 2019. Wireless charging and shared autonomous battery electric vehicles (W+SABEV): Synergies that accelerate sustainable mobility and greenhouse gas emission reduction. Mitig. Adapt. Strateg. Glob. Change. DOI: 10.1007/s11027-019-09870-9	University of Michigan

Publication type	AVERT region	Date published	Summary	URL	Citation	Organization or author affiliation
Published paper	Great Lakes/Mid-Atlantic (AVERT 2.3 regions)	September 2018	This paper compares life cycle assessment models that use different levels of temporally resolved data and average and marginal electricity generation mixes. The authors used AVERT data in the models that estimate environmental impacts due to marginal emissions. They demonstrate that using dynamic grid data generates more refined estimates of a building's use-phase environmental impact.	https://pubs.acs.org/doi/abs/10.1021/acs.est.7b06535	Collinge, W.O., H.J. Rickenbacker, A.E. Landis, C.L. Thiel, and M.M. Bilec. 2018. Dynamic life cycle assessments of a conventional green building and a net zero energy building: Exploration of static, dynamic, attributional and consequential electricity grid models. Environmental Science and Technology, in press. DOI: 10.1021/acs.est.7b06535	University of Pittsburgh
Published paper	Northeast, Great Lakes/Mid-Atlantic, Southeast (AVERT 2.3 regions)	November 2017	This paper analyzes air quality and public health impacts from PM2.5 emission reductions as a result of replacing 17% of electricity generation with solar PV across the eastern United States. The authors used AVERT to generate this result and to test emission reduction sensitivity, as they compared emission reductions from years between 2007 and 2015 as well as varying amounts of solar integration.	https://www.sciencedirect.com/science/article/pii/S1352231017308105	David, A., T. Holloway, M. Harkey, A. Rrushaj, G. Brinkman, P. Duran, M. Janssen, and P. Denholm. 2017. Potential air quality benefits from increased solar photovoltaic electricity generation in the Eastern United States. Atmospheric Environment.	University of Wisconsin – Madison
Dissertation	National	2019	This dissertation contains several analyses of the health benefits of displaced electricity generation. The author uses AVERT in two of these analyses, which are also published as independent papers. See the summaries for: - Abel, D.W., T. Holloway, M. Harkey, A. Rrushaj, G. Brinkman, P. Duran, M. Janssen, and P. Denholm. 2017. Potential air quality benefits from increased solar photovoltaic electricity generation in the eastern United States. Atmospheric Environment. - Abel, D.W., T. Holloway, J. Martínez-Santos, M. Tao, C. Kubes, and S. Hayes. 2019. Air quality-related health benefits of energy efficiency in the United States. Environmental Science & Technology. DOI: 10.1021/acs.est.8b06417	https://nelson.wisc.edu/sage/docs/profiles/thesis_2206.pdf	Abel, D.W. 2019. Understanding linkages between the power sector, air quality, and human health (doctoral dissertation).	University of Wisconsin – Madison