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Fact Sheet

POWER SECTOR OPPORTUNITIES FOR REDUCING CARBON DIOXIDE EMISSIONS: MISSOURI

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WHAT WILL CO_2 STANDARDS MEAN FOR MISSOURI?

President Obama announced a national climate plan in June 2013, and directed the U.S. Environmental Protection Agency (EPA) to set carbon pollution standards for the power sector. EPA issued proposed standards for existing power plants on June 2, 2014, and after they are finalized in June 2015, states will implement their own plans for achieving those reductions. In this fact sheet, WRI examines tools Missouri can use to reduce power plant emissions and comply with EPA's proposed standards.

HOW MISSOURI CAN REDUCE POWER SECTOR EMISSIONS

Carbon dioxide emissions from Missouri's power sector were 3 percent below 2005 levels in 2012, the most recent year for which we have energy data for Missouri. According to reference case projections based on the Energy Information Administration's (EIA) Annual Energy Outlook 2012 (AEO 2012), emissions are expected to increase to 3 percent above 2012 levels by 2020 and 12 percent above 2012 levels by 2030, due primarily to a projected increase in electricity generation (Figure 1). However, the state's emission rate—a measure of the carbon-intensity of its electricity generation—is expected to remain roughly constant over the same time period.

This reference case includes the state's existing renewable energy standard (RES). However, we adjust the reference case to assume that, in order to help

Box 1 | What's Ahead for the Power Sector?

The power sector is the leading source of carbon dioxide (CO_2) emissions in the United States, but also offers some of the most cost-effective opportunities to reduce those emissions. Despite recent decreases in power sector emissions—due to the recession, increasing competition from renewable energy and the low price of natural gas—current projections show that, absent policy action, emissions will increase in the coming decades.[1]

New Power Plants: On September 20, 2013, EPA proposed CO_2 emissions standards for new power plants.[2] These standards will provide a backstop ensuring new power plants produce significantly lower CO_2 emissions per megawatt-hour of power generation than the average existing coal plant, requiring coal plants to achieve emission rates of 1,000 – 1,100 pounds of CO_2 per megawatt-hour (lbs. per MWh), large natural gas plants to achieve 1,000 lbs. per MWh, and smaller natural gas plants to achieve 1,100 lbs. per MWh.[3] However, because new coal plants are unlikely to be built even in the absence of the standards—due to relatively low natural gas prices, among other factors[4]—it is unlikely that the new power plant standards will have a significant impact on near-term CO_2 emissions.

Existing Power Plants: EPA has proposed standards that make use of the flexibility granted by the Clean Air Act.[5] After the standards are finalized in June 2015, states will need to develop implementation plans. Under the terms of the proposal, states could take advantage of several different measures that would lower the carbon intensity of its power generation mix—such as fuel switching, dispatch of existing low-carbon power plants, increased generation by renewable sources, and energy efficiency, among other options.

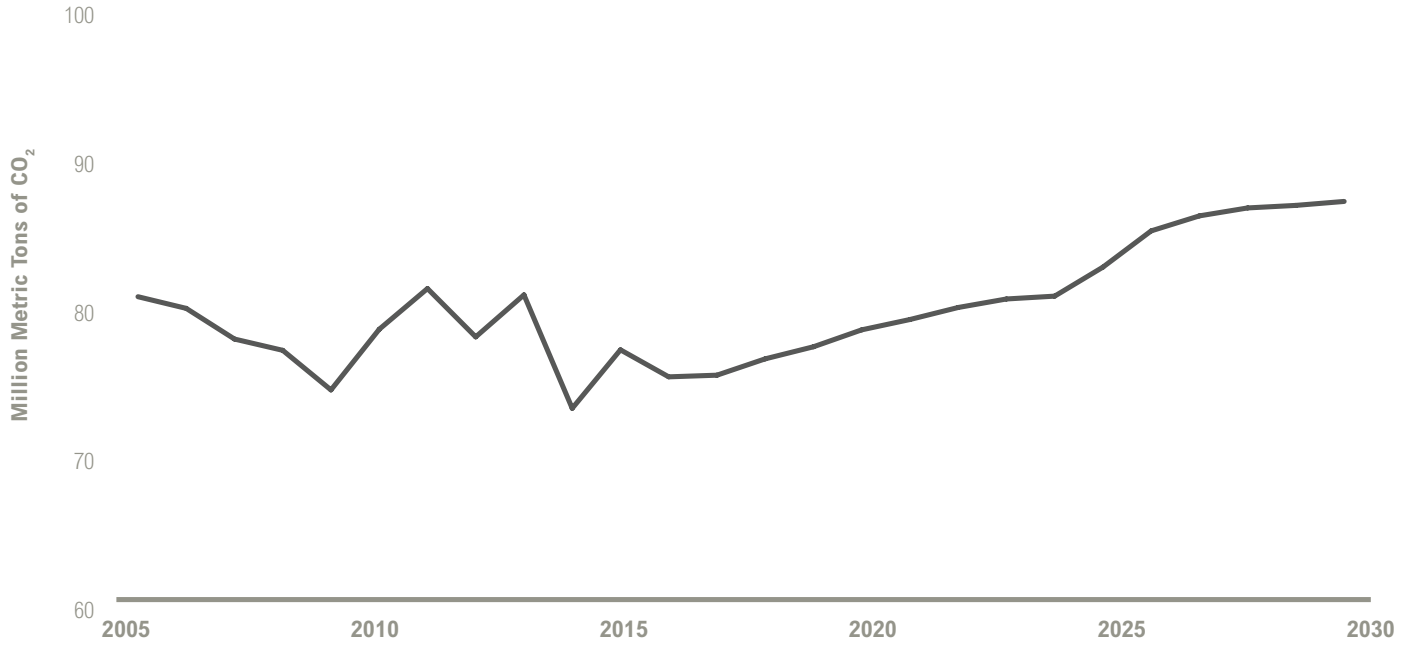
comply with new CO_2 standards, all new renewable energy generation for compliance with the RES occurs in-state as opposed to purchasing renewable energy credits generated out of state.[6] Since Missouri's energy efficiency goals are not binding, we assume they are not captured in the AEO2012 reference case.

WRI analysis shows that Missouri has many opportunities to reduce carbon pollution from its power sector. Missouri can reduce power sector CO_2 emissions to 33 percent below 2012 levels in 2020 and 49 percent below 2012 levels in 2030.[7] In doing so, it can decrease its emission rate by 21 percent below 2012 levels in 2020. By 2030, Missouri can reduce its emission rate 31 percent below 2012 levels, which would meet EPA's proposed standards for existing power plants in the state.[8] Missouri can make significant progress toward these targets by meeting its existing clean energy goals and taking advantage of available infrastructure. By expanding its energy efficiency and renewable energy goals, Missouri can close the gap that remains and even exceed EPA's proposed standards (Figure 2).

Missouri can meet about 70 percent of EPA's emission rate target for the state between 2020 and 2030 with the following measures:

- **Meeting energy efficiency targets.** Missouri's Energy Efficiency Investment Act calls for the state's investor-owned utilities to capture all cost-effective energy efficiency opportunities, and establishes a voluntary target of nearly 10 percent cumulative savings of electricity sales by 2020. Meeting this goal can help the state lower its emission rate.
- **Meeting renewable energy targets.** Missouri's Renewable Energy Standard (RES) requires 15 percent of the electricity sold by its investor-owned utilities to come from renewable sources by 2021. Meeting the RES through new in-state generation can help the state lower its emission rate.
- **Using more gas.** Missouri's most efficient natural gas plants—combined cycle (NGCC) units—generated much less electricity than they were capable of producing in 2012. Fully utilizing existing combined cycle natural gas capacity can help the state meet its emission target.
- **Increasing existing coal plant efficiency by 2.5 percent.** Existing coal plants could save energy by upgrading their equipment and making other operational improvements.

Figure 1 | **Business-as-Usual Greenhouse Gas Emissions from Missouri's Power Sector**



- **Using more combined heat and power (CHP).** Missouri can build more CHP systems—which use waste heat to generate electricity more efficiently than the average power plant—at sites like universities, hospitals, and manufacturing facilities.

Missouri can close the gap that remains, and even exceed its proposed target, by:

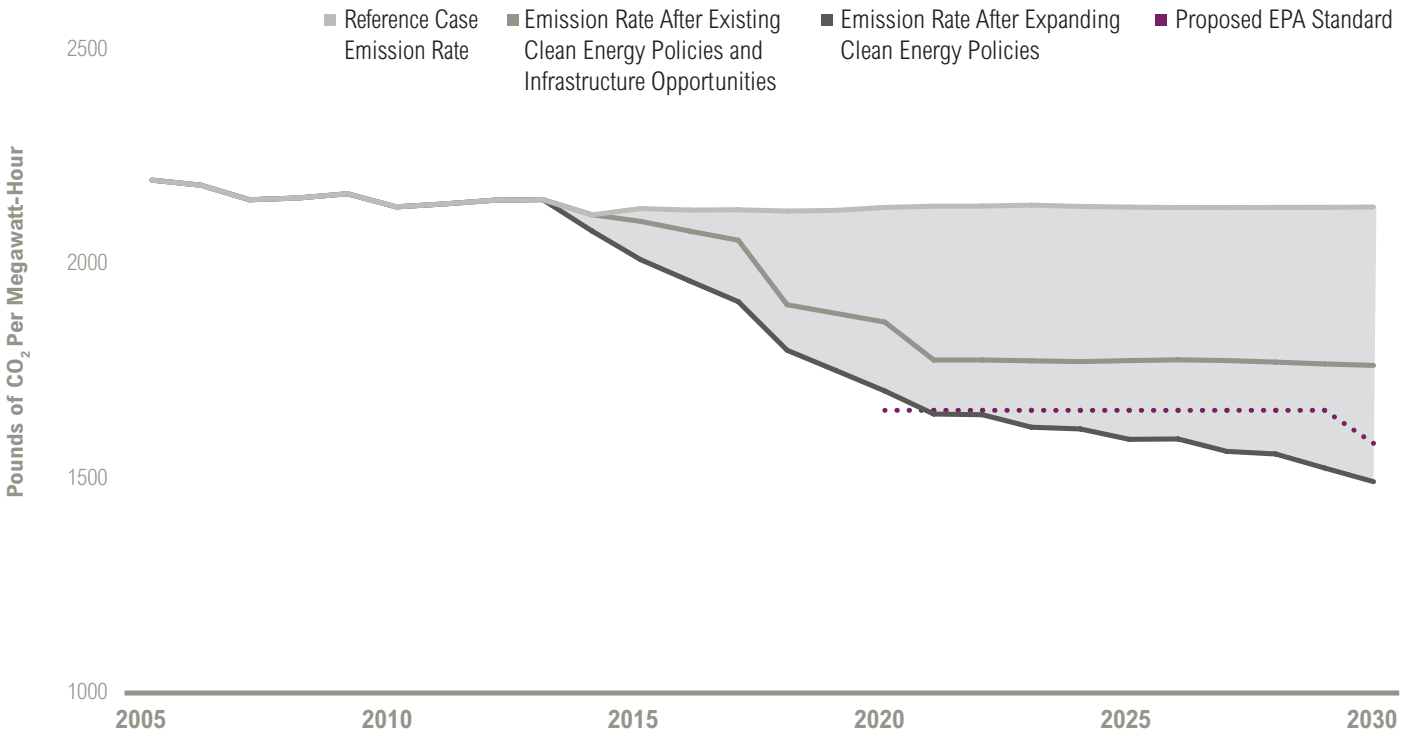
- Increasing its energy efficiency goal to 2 percent of sales from 2015 onward.
- Requiring all utilities, not just investor-owned utilities, to meet the current RES (15 percent by 2021) and continuing to increase renewable generation to 20 percent of total generation by 2030.

OPPORTUNITIES IN DETAIL

Existing and Expanded Energy Efficiency Goals. Missouri's Energy Efficiency Investment Act (MEEIA) sets a voluntary goal for the state's investor-owned utilities to capture all cost-effective energy efficiency opportunities. MEEIA also established voluntary energy efficiency savings goals of 0.3 percent of sales in 2012, ramping up to 0.9 percent in 2015 and 1.7 percent in 2019, for cumulative savings of nearly 10 percent of electricity sales by 2020.[9] Most utilities now offer energy-saving programs to their customers including technical assistance, energy audits, rebates, and other financial incentives. Meeting this goal would help Missouri reduce its power sector emission rate and save money for consumers.[10] Ameren Missouri, the state's largest utility, estimated that electricity savings of 10 percent in 2020 and 11 percent in 2030 would deliver $1.7 billion in net benefits through 2030.[11]

But even greater state-wide savings could be possible with additional measures. Ameren's study found that cost-effective energy efficiency measures could reduce electricity consumption in its service area by 14 percent in 2020 and 17 percent in 2030. The American Council for an Energy-Efficient Economy (ACEEE) estimated that implementing a suite of new efficiency initiatives, including utility programs and building codes, could reduce state electricity consumption by 17 percent and natural gas use by 13 percent in 2025 compared to business-as-usual. Together, these measures would save Missouri's consumers $6.1 billion in lower energy bills and have the potential to create over 8,500 new jobs.[12] The electricity savings estimated in this study in 2020 are in line with what we project in our expanded policies scenario. Expanding efficiency goals to all utilities and increasing the targets to 2 percent of sales from 2015 going forward could help Missouri meet its emission rate target.[13]

Figure 1 | **Missouri Carbon Dioxide Reduction Opportunities for Power Sector Compliance Under the Clean Air Act**



Note: EPA has proposed a national emission standard for existing power plants, with state-specific targets based on each state's emission reduction opportunities. This figure depicts EPA's interim (2020-2029) and final (2030) emissions targets for Missouri (1,621 and 1,544 lbs. per MWh, respectively). While our estimates are generally comparable with EPA's standards, the underlying methodologies differ slightly. See endnote 8 for additional explanation.

Existing and Expanded Renewable Standards. Missouri's Renewable Energy Standard requires 15 percent of the electricity sold by its investor-owned utilities to come from renewable sources by 2021. The state requires solar resources to comprise 2 percent of each year's obligation. In-state resources are worth 25 percent more than out-of-state resources for compliance purposes.[14,15] Meeting the RES through new in-state generation can help reduce Missouri's power sector emission rate.[16]

While renewable energy in Missouri only comprised 2 percent of total generation in 2012, renewable capacity has been on the rise in recent years, growing 70 percent between 2007 and 2012. Missouri has the potential to keep more of its spending in state—and even export electricity to other states—by continuing to develop its renewable industry. The American Wind Energy Association estimated that as of 2011, Missouri's wind industry generated $2.6 million in annual property tax payments and over $1 million in land lease payments.[17] A study by the University of Missouri, St Louis estimated that the state's renewable standard could create up to nearly 30,000 jobs by 2021, creating over $1 billion in new income to state residents, depending on where renewable power required to meet the standard is built and produced.[18] According to the Natural Resources Defense Council, the average 269-acre farm in Missouri could bring in $18,000 to $24,000 in land lease payments by hosting 3-4 wind turbines.[19] Deployment of 25 moderately sized wind farms (100 MW) could generate $15 million in property tax revenue to the state and $75 million per year in economic benefits.[20] Under the state's net metering rule, customers who install small-scale renewable energy systems (up to 100 kilowatt capacity) can receive credit on their electricity bills for the electricity generation that otherwise would have come from the grid.[21] Applying the RES to all utilities and continuing to increase the standard past 2021 to 20 percent by 2030 could help Missouri reach its emission rate target.[22]

Increasing CHP at Commercial and Industrial Facilities. According to ICF International, Missouri has significant technical potential for CHP, with the potential to add around 2.6 GW of new CHP for a total technical potential of 2.8 GW.[23] As of July 2013, Missouri had only 236 MW of installed CHP capacity, about 8 percent of its technical

potential.[24] Missouri has the opportunity to take additional steps to encourage additional CHP deployment.[25] Capturing 25 percent of the remaining technical potential for CHP can help the state reach its emission rate target.[26]

Utilizing Slack Natural Gas Capacity. According to EIA data, the capacity factor of Missouri's existing combined cycle natural gas fleet was only 31 percent in 2012—meaning that these plants generated much less electricity than they are capable of producing.[27] Increasing the capacity factor of these existing units to 75 percent can help the state reach its emission rate target.[28,29,30] (See Box 3 for additional information on Missouri's power sector.)

Increasing Efficiency at Existing Coal Plants. According to the National Energy Technology Laboratory (NETL) and researchers at Lehigh University, it is likely that the existing U.S. coal fleet could achieve a 5 percent increase in efficiency on average.[31] For purposes of this analysis, we conservatively assume that Missouri's coal fleet would achieve a 2.5 percent increase in efficiency, half of these potential levels. While there are high upfront costs associated with refurbishing existing coal units, the resulting increase in unit efficiency will lead to annual fuel savings.[32] Existing coal plants can increase efficiency through refurbishment and improved operation and maintenance practices, though the actual efficiency potential depends on plant age and other physical limitations.[33,34] Another option to reduce the emission intensity of a coal plant is co-firing with natural gas using the igniters that are already built into many existing pulverized coal boilers.[35] These actions can help Missouri meet its emission rate target.[36]

OUTLOOK FOR MISSOURI

Missouri has already put measures in place that will reduce the emission intensity of its power sector. The state can achieve greater reductions by building off of its progress to date. By taking advantage of available infrastructure and expanding its clean energy policies going forward, Missouri can place itself in a strong position to comply with EPA's standards for existing power plants.

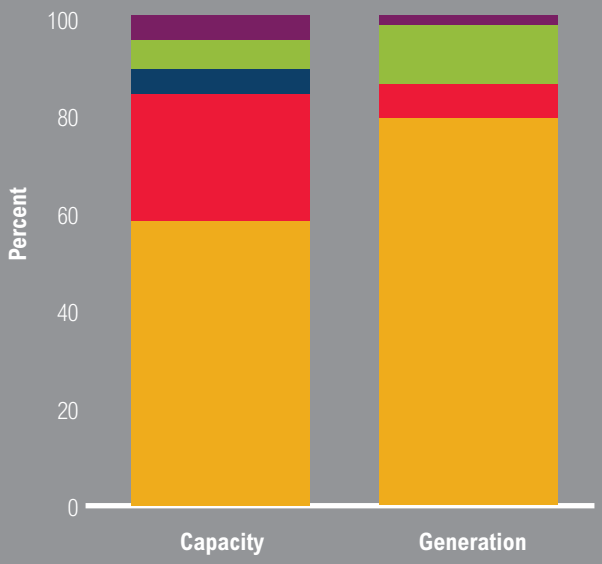
Box 2 | About This Series

In *Can The U.S. Get There From Here?*, WRI identified four key actions the Obama Administration must take in the absence of congressional action in order to meet the U.S. commitment to reducing greenhouse gas (GHG) emissions by 17 percent below 2005 levels by 2020. These actions include setting performance standards for existing power plants, reducing consumption of hydrofluorocarbons, reducing fugitive methane emissions from natural gas systems, and increasing energy efficiency. Of these four actions, the greatest opportunity for reductions comes from the power sector. In his Climate Action Plan, President Obama directed EPA to work expeditiously to finalize carbon dioxide (CO_2) emissions standards for new power plants and adopt standards for existing power plants. As states prepare to comply with these standards, it will be necessary to understand available opportunities for reducing CO_2 emissions from the power sector. This series of fact sheets aims to shed light on these opportunities by illustrating the CO_2 emissions reduction potential from measures in a variety of states. We show how these emissions savings stack up against the reductions that could be required under EPA's proposed standards. This series is based on WRI analysis conducted using publicly available data. See the appendix for additional information on our methodology and modeling assumptions.[37]

Box 3 | Missouri Power Sector Profile

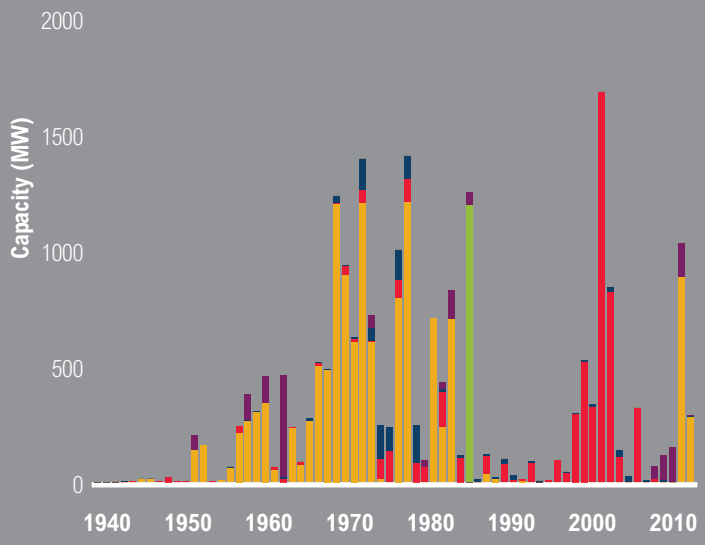
Until the 1980s, most new capacity being built in Missouri was coal-fired. Since then, natural gas has comprised the bulk of new capacity additions.[38] Coal comprised 79 percent of in-state generation in 2012, while nuclear and natural gas sources comprised 12 percent and 7 percent, respectively. In 2012, Missouri contributed 3.5 percent of total U.S. CO_2 emissions in the power sector and 2.3 percent of electricity generation, with a state CO_2 emissions intensity of 2,111 lbs. per MWh (when accounting for 6 percent of the state's nuclear generation and omitting generation from hydropower for consistency with EPA's methodology). While this is significantly higher than the U.S. average (1,634 lbs. per MWh, taking into account 6 percent nuclear and omitting generation from hydropower), our analysis shows that by using existing infrastructure and expanded clean energy policies, Missouri could reduce the carbon intensity of its power sector to 1,666 lbs. per MWh by 2020, and to 1,455 lbs. per MWh by 2030. This would put Missouri in good shape to meet the state's interim (2020-2029) target of 1,621 lbs. per MWh and final target of 1,544 lbs. per MWh in 2030.

Missouri Generation and Generating Capacity by Fuel, 2012



Source: U.S. Energy Information Administration Form EIA-860 and Annual Energy Review

New Electric Generating Capacity Additions by Fuel Type



Source: U.S. Energy Information Administration Form EIA-860, which includes existing electric generating units at plants with at least 1 MW capacity (electric utilities, independent power producers, and combined heat and power plants) that are connected to a power grid. Data represents installed summer capacity.

BOTH CHARTS USE THE FOLLOWING LEGEND: Coal | Natural Gas | Oil | Other Fossil | Nuclear | Renewable

ENDNOTES

1. According to the Energy Information Administration's 2014 Annual Energy Outlook reference case, U.S. power sector CO_2 emissions will be 13 percent below 2005 levels by 2020 and only 7 percent below 2005 levels by 2035. See: U.S. Department of Energy/Energy Information Administration. 2014. "Energy-Related Carbon Dioxide Emissions by Sector and Source, United States, Reference Case." In U.S. DOE/EIA. Annual Energy Outlook 2014. Washington, D.C.: Government Printing Office. Accessible at: <http://www.eia.gov/forecasts/aeo/>.
2. For more information, see: <http://www2.epa.gov/carbon-pollution-standards/2013-proposed-carbon-pollution-standard-new-power-plants>.
3. For reference, a supercritical pulverized coal unit emits about 1,768 lbs. CO_2 per MWh, while a natural gas combined cycle unit emits about 804 lbs. CO_2 per MWh (National Energy Technology Laboratory, Cost and Performance Baseline for Fossil Energy Plants Volume 1: Bituminous Coal and Natural Gas to Electricity. Exhibit ES-17 CO2 Emissions Normalized by Net Output, Revision 21, September 2013, accessible at: <http://www.netl.doe.gov/energy-analyses/pubs/BitBase_FinRep_Rev2.pdf>).
4. U.S. Department of Energy/Energy Information Administration. 2013. "Electric Generating Capacity, Reference Case." In U.S. DOE/EIA. 2013. Annual Energy Outlook 2013. Washington, D.C.: Government Printing Office. Accessible at: <http://www.eia.gov/forecasts/aeo/>. For more details, see also: <http://www.wri.org/publication/us-electricity-markets-increasingly-favor-alternatives-to-coal> and <http://www.wri.org/sites/default/files/seeingisbelieving_working_paper.pdf>.
5. For more information, see: <http://www2.epa.gov/carbon-pollution-standards/clean-power-plan-proposed-rule>.
6. The AEO2012 models compliance with renewable portfolio standards through a combination of in-state generation and purchases of renewable energy credits (RECs) from out of state. For purposes of this analysis, we assume all new renewable electricity generated after 2012 (the most recent year for which we have data) for compliance with the RES occurs in-state to help comply with new CO_2 standards, and adjust the reference case accordingly. Under this assumption, any contracts for out-of-state renewable energy remain in place through 2030, so that only new renewable energy capacity is built in-state.
7. On November 6, 2014, EPA released guidance on translating a rate-based goal to a mass-based equivalent. Because EPA recognizes that there are numerous ways to complete this translation, and because EPA would need to approve any methodology the state uses, we did not include a mass-based conversion in our analysis; See: http://www2.epa.gov/carbon-pollution-standards/fact-sheet-clean-power-plan-technical-support-document.
8. EPA's target for Missouri is an emission rate (a measure of the carbon intensity of the state's electricity generation) of 1,621 lbs. per MWh between 2020-2029, a reduction of 23 percent below its 2012 emission rate of 2,111 lbs. per MWh (calculated applying 6 percent of nuclear generation and omitting generation from existing hydropower for consistency with EPA's methodology). EPA's final targets require an emission rate of 1,544 pounds per Megawatt-hour by 2030, a reduction of 27 percent below Missouri's 2012 emission rate. While our estimates are generally comparable with EPA's standards, the methodologies differ slightly. For example, EPA uses emissions factors based on the eGRID database to estimate CO_2 emissions from generation and nameplate capacity to estimate potential generation from natural gas combined cycle units. We base our emissions factors off of state-specific emissions and generation data from EIA and use summer capacity in our natural gas combined cycle estimates. While we include the net emissions benefit of avoided electricity due to combined heat and power (CHP) use (similar to EPA), we do not add the useful thermal output in the denominator.
9. Senate Bill No. 376. 2009. Accessible at: < http://www.senate.mo.gov/09info/pdf-bill/tat/sb376.pdf>.
10. Meeting these efficiency goals could reduce Missouri's power sector CO_2 emissions by 9 percent below 2012 levels in 2020.
11. Demand Side Management Market Potential Study, Ameren Missouri, 2010. Accessible at: <http://www.ameren.com/sites/aue/Environment/Renewables/Pages/AmerenMissouriIRP.aspx>.
12. Missouri's Energy Efficiency Potential: Opportunities for Economic Growth and Energy Sustainability. American Council for an Energy-Efficient Economy, August 2011. Accessible at: <http://ded.mo.gov/energy/docs/aceestudy.pdf>.
13. Expanding efficiency goals to all utilities and increasing the targets to 2 percent of sales starting in 2015 would reduce Missouri's power sector CO_2 emissions by 14 percent below 2012 levels in 2020.
14. In the legislation, each kilowatt-hour of renewable energy generated in Missouri is treated as 1.25 kilowatt-hours for compliance purposes. However, for modeling purposes, we count each kilowatt-hour toward the RES without modification.
15. Amendment to Chapter 393 of the Revised Statutes of Missouri, Relating to Renewable Energy, version 4, 2008-031. Accessible at: <http://www.sos.mo.gov/elections/2008petitions/2008-031.asp>.
16. Meeting the RES through new in-state generation would reduce power sector CO_2 emissions by 4 percent in 2020 below 2012 levels.
17. American Wind Energy Association. 2012. Wind Energy Facts: Missouri. Accessible at: <http://awea.rd.net/MediaCenter/pressrelease.aspx?ItemNumber=4766>.
18. University of Missouri, St Louis. 2008. Clean Jobs, New Prosperity: Economic Impact Study of Proposition C. The Missouri Clean Energy Initiative. Accessible at: <http://pprc.umsl.edu/pprc.umsl.edu/data/PropCEconomicImpactFullReport.pdf>.
19. Natural Resources Defense Council. Renewable Energy For America. Accessible at: <http://www.nrdc.org/energy/renewables/missouri.asp>.
20. Natural Resources Defense Council. 2010. A Clean Energy Economy for Missouri: Analysis of the Rural Development Potential of Renewable Resources. Accessible at: <https://www.nrdc.org/energy/cleanmo/files/cleanmo.pdf>.
21. If customers produce more electricity than they consume in a month, they receive credit for the surplus generation on their next monthly bill, but they cannot receive payment for any remaining surplus at the end of the year. For more details, see: < http://www.sos.mo.gov/adrules/csr/current/4csr/4c240-20.pdf>.
22. Applying the RES to all utilities and continuing to increase the standard past 2021 to 20 percent by 2030 would cut power sector CO_2 emissions by 9 percent below 2012 levels in 2020 and 15 percent below 2012 levels in 2030.
23. ICF International. 2009. Effect of a 30 Percent Investment Tax Credit on the Economic Market Potential for Combined Heat and Power. Accessible at: <http://www.localpower.org/WADE_USCHPA_ITC_Report.pdf>.
24. ICF CHP database. Accessible at: < http://www.eea-inc.com/chpdata/>.
25. In 2014, Missouri ranked 45th on ACEEE's State Energy Efficiency Scorecard based on its adoption of measures to encourage deployment of CHP systems. Measures the state could take to support CHP include net metering, interconnection standards, financial incentives, financing options, technical support and guidance, and other supportive programs and policies. For more information, see: <http://www.aceee.org/sites/default/files/publications/researchreports/u1408.pdf>
26. Capturing 25 percent of the remaining technical potential for CHP would reduce emissions by 2 percent below 2012 levels in 2020.

27. WRI estimates based on data from U.S. Energy Information Administration, EIA-923 Generation and Fuel Data, <http://www.eia.gov/electricity/data/eia923/>; and EIA-860 Annual Electric Generator Data, <http://www.eia.gov/electricity/data/eia860/>.
28. Increasing the capacity factor of the state's NGCC units to 75 percent would cut power sector CO_2 emissions by 6 percent in 2020 compared to 2012 levels.
29. NGCC units are designed to be operated up to 85 percent capacity (see <http://mitei.mit.edu/system/files/NaturalGas_Chapter4_Electricity.pdf>), but actual maximum capacity factors may differ among units. We assume a conservative maximum capacity factor of 75 percent.
30. We did not account for the increases in methane associated with the increased production of natural gas due to a higher demand for the fuel. Going forward, industry should work with EPA to reduce methane leakage rates from natural gas systems. For additional information, see: <http://www.wri.org/publication/clearing-the-air>.
31. Phil DiPetro and Katrina Krulla. 2010. Improving the Efficiency of Coal-Fired Power Plants for Near Term Greenhouse Gas Emissions Reductions. National Energy Technology Laboratory, Office of Systems, Analyses and Planning. DOE/NETL-2010/1411. Accessible at: <http://www.netl.doe.gov/energy-analyses/pubs/ImpCFPPGHGRdctns_0410.pdf>. Chris Nichols, Gregson Vaux, Connie Zaremsky, James Murphy, and Massood Ramezan. 2008. Reducing CO2 Emissions by Improving the Efficiency of the Existing Coal-fired Power Plant Fleet. National Energy Technology Laboratory, Office of Systems, Analyses, and Planning, and Research and Development Solutions, LLC. DOE/NETL-2008/1329. Accessible at: <http://www.netl.doe.gov/energy-analyses/pubs/CFPP%20Efficiency-FINAL.pdf>. "Analyses Show Benefits of Improving Unit Heat Rate as Part of a Carbon Mitigation Strategy." Lehigh Energy Update 28 (1), February 2010. Accessible at: <http://www.lehigh.edu/~inenr/leu/leu_65.pdf>.
32. For example, the National Energy Technology Laboratory found a payback period of less than 4 years for a refurbishment technology that achieves a 2 percent heat rate improvement. For more information, see Benefits of the Big Bend Power Station Project, National Energy Technology Laboratory. Accessible at: <http://www.netl.doe.gov/technologies/coalpower/cctc/ccpi/pubs/tampa.pdf>; and "Analyses Show Benefits of Improving Unit Heat Rate as Part of a Carbon Mitigation Strategy." Lehigh Energy Update 28 (1), February 2010. Accessible at: <http://www.lehigh.edu/~inenr/leu/leu_65.pdf>.
33. Phil DiPetro and Katrina Krulla. 2010. Improving the Efficiency of Coal-Fired Power Plants for Near Term Greenhouse Gas Emissions Reductions. National Energy Technology Laboratory, Office of Systems, Analyses and Planning. DOE/NETL-2010/1411. Accessible at: <http://www.netl.doe.gov/energy-analyses/pubs/ImpCFPPGHGRdctns_0410.pdf>.
34. "Regulating Greenhouse Gas Emissions Under the Clean Air Act." 73 Register §147(2008). Accessible at: <http://www.gpo.gov/fdsys/pkg/FR-2008-07-30/pdf/E8-16432.pdf>.
35. Personal communication with Tomas Carbonell, Environmental Defense Fund, July 12, 2013.
36. A 2.5 percent increase in existing coal plant efficiency would reduce power sector CO_2 emissions by 2 percent below 2012 levels in 2020.
37. World Resources Institute. 2013. Power Sector Opportunities For Reducing Carbon Dioxide Emissions. Appendix A: Detailed Overview of Methods. Washington, DC: World Resources Institute. Accessible at: <http://pdf.wri.org/power_sector_opportunities_for_reducing_carbon_dioxide_emissions_methodology.pdf>.
38. Unless otherwise indicated, we relied upon the U.S. Energy Information Administration Annual Energy Review and Form EIA-860 for data reported in Box 3.
39. World Resources Institute. 2013. Power Sector Opportunities For Reducing Carbon Dioxide Emissions. Appendix A: Detailed Overview of Methods. Washington, DC: World Resources Institute. Accessible at: <http://pdf.wri.org/power_sector_opportunities_for_reducing_carbon_dioxide_emissions_methodology.pdf>.

POLICY FRAMEWORK AND INTERACTION

This analysis assumes the existing policies and other reduction opportunities listed above are fully implemented. Depending on the combination of measures actually implemented by Missouri, each will have different impacts on the generation mix and resulting emissions. For example, increasing the efficiency of existing coal-fired power plants results in fewer emissions reductions in this analysis than would be the case if it were considered in isolation, because implementation of the RES and an increase in natural gas generation decrease the state's coal-fired generation. The emissions reductions presented in the text are a result of each policy in combination with all other policies. We first applied the existing RES to calculate an adjusted reference case assuming the standard is met through in-state generation. Next, we applied Missouri's existing voluntary energy efficiency goals. Next, we increased CHP capacity and increased utilization of existing natural gas capacity. Last, we increased the efficiency of any remaining coal plants. When considering the expanded policies, we applied the expanded energy efficiency goals and then applied the expanded RES to the resulting adjusted demand. For consistency with EPA's approach, we count 6 percent of the state's nuclear generation (the amount that EPA credited in developing the state's standard) and omit generation from existing hydropower in our calculation of the state's emission rate.

Equally as important is the policy framework, which will define how each of these measures counts toward compliance under EPA's standards. We assumed that the emissions reductions from each measure would count directly toward the standard. State measures may be counted differently when estimating its emission rate for compliance, thus actual compliance levels could potentially be greater or less than what was modeled. See the appendix for additional information on our methodology and modeling assumptions.[39]

ABOUT WRI

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