

A BRIGHT FUTURE

Moving from Coal to Clean Energy in the St. Louis Region





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INTRODUCTION

Across the United States and right here in the Midwest, the energy landscape is changing, and changing rapidly. Clean energy from wind and solar is quickly outpacing dirty coal and even natural gas as low-cost and reliable energy sources. Consequently these cleaner options are becoming the go-to choice for many utilities looking for clean, affordable generation.

Ameren is the largest utility in Missouri, providing electricity to the St. Louis region. While Ameren has made some modest clean energy strides over the last year, our region is still disproportionately dependent on dirty coal. The U.S. produces around 40 percent of our electricity from coal.¹ However, here in St. Louis and across the region, our utility company, Ameren, produces 71 percent of its electricity by burning coal and only one percent from clean, renewable sources such as wind and solar.²

All around us, energy utilities in Missouri and the Midwest, both large and small, are making much bigger strides than Ameren in moving to a clean energy economy that brings both health and economic benefits. This report starts by comparing Ameren's clean energy investment to that of other Missouri and Midwestern utilities, and calls on Ameren to chart a more visionary path. The report goes on to juxtapose the benefits of clean energy as compared to the devastating health, economic, and environmental effects of Ameren's aging coal-fired power plants.

As the largest utility in the state, Ameren has the opportunity to be a leader in weaning Missouri from this unhealthy reliance on coal. As customers of Ameren, we benefit from the everyday conveniences of our contemporary electric world. We all have a responsibility to help usher in this transition by calling upon Ameren to transform our energy sources from outdated dirty coal to modern clean energy that safeguards our health and quality of life for future generations.

KEY FINDINGS

1. Despite being the largest utility in Missouri, Ameren lags behind all other Missouri utilities in wind and solar investments, as a percentage of total generation.
2. Ameren's over-reliance on coal is costing its ratepayers. Upgrades needed to comply with public health safeguards at its coal plants would cost an estimated \$5.5 billion, or \$4,600 per customer.
3. Other utilities are saving customers' money by moving to clean energy. For example, Kansas City Power & Light estimated its investments in wind and energy efficiency will save its customers \$1 billion over 20 years, or \$1,700 per customer. Springfield, Missouri, invested in 200 MW of wind in 2015, stating that the cost of wind energy was 15 percent less than producing electricity at the city's own coal plant.
4. Ameren should embrace clean energy, step up investments in wind, solar and efficiency, and become a leader in Missouri and the Midwest by committing to reach 30 percent–50 percent clean energy by 2030, and ultimately reaching 70 percent–100 percent clean energy by 2050.



AMEREN LAGS BEHIND

ON CLEAN ENERGY AND SHOULD CHOOSE A BRIGHTER FUTURE

This report examines current and future clean energy (wind and solar) capacity for Ameren and seven other utilities. Six are in Missouri: Kansas City Power & Light (KCPL, combined with its affiliate General Missouri Operations, or GMO), Empire District Electric based in Joplin, Associated Electric Cooperatives (AECI) based in Springfield; Independence Power & Light, Columbia Water & Light; and Springfield City Utilities. The seventh utility is MidAmerican Energy, based in neighboring Iowa.

Ameren, Empire and KCPL/GMO are Investor Owned Utilities (IOUs) regulated by the Missouri Public Service Commission (PSC). AECI is a non-profit governed by Missouri's rural electric cooperatives. Columbia, Independence, and Springfield are municipal utilities governed by those cities' elected officials. MidAmerican is an IOU regulated by the Iowa Utilities Board.

Ameren, Empire and KCPL/GMO are required to file regular 20-year Integrated Resource Plans (IRPs) with the PSC. Information on those utilities used in this analysis is taken from those IRPs. Information used in this analysis on the other utilities is taken from publicly available sources, including voluntary resource plans, annual reports, and news reports.

This report only compares investments in wind and solar power. Though they are often deceptively touted as clean or renewable sources, landfill methane, biomass burning, and hydropower bring a plethora of environmental problems.

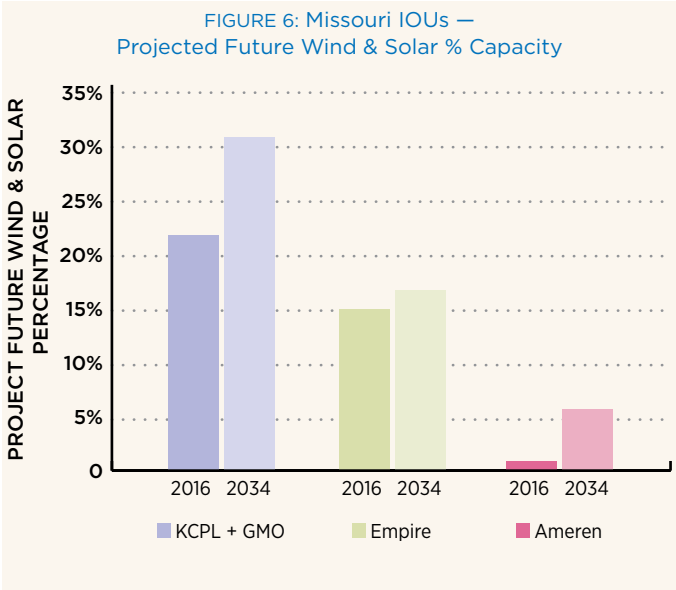
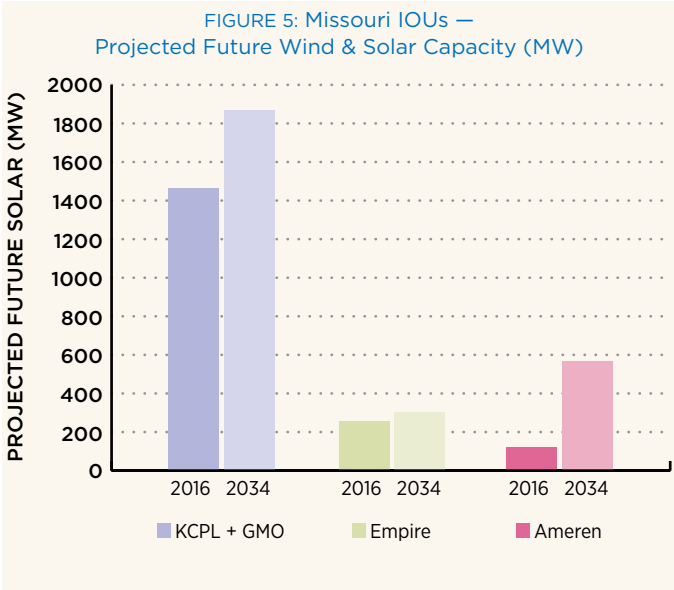
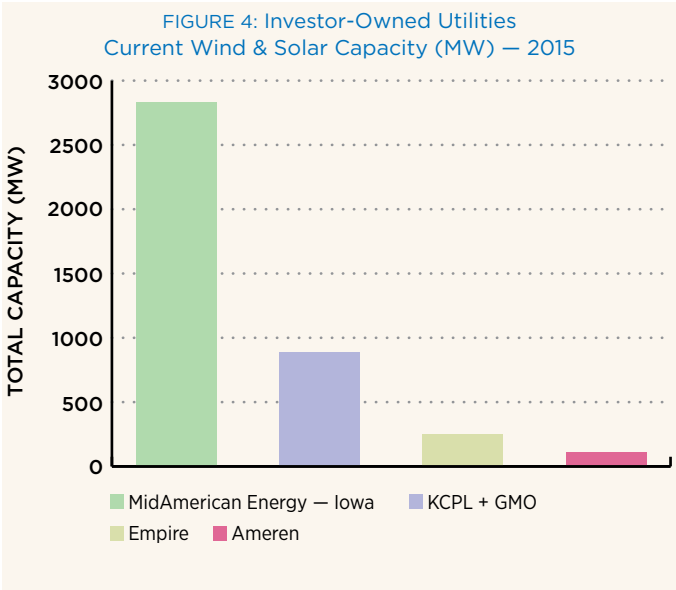
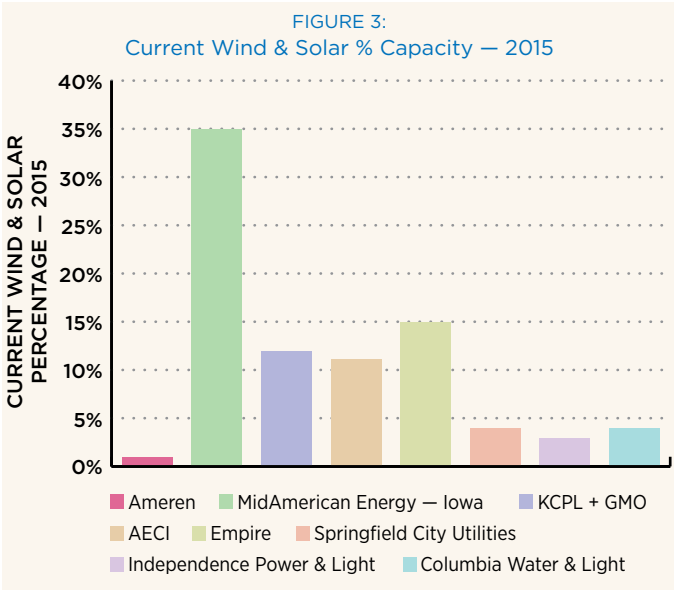
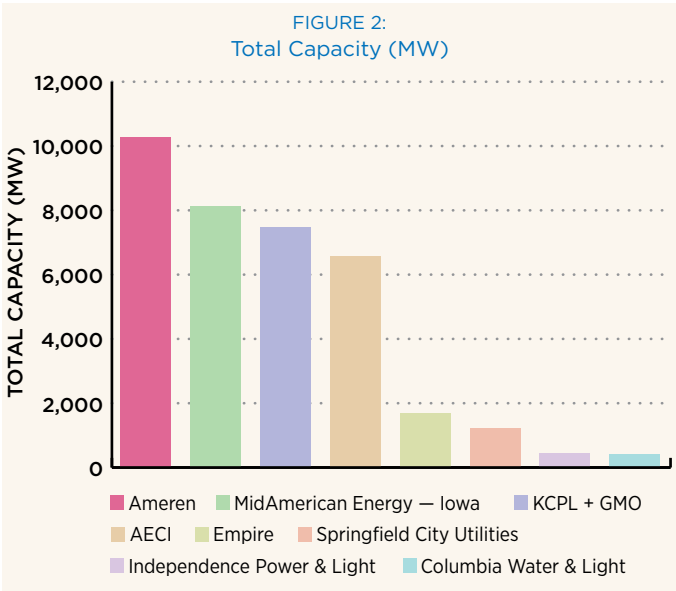
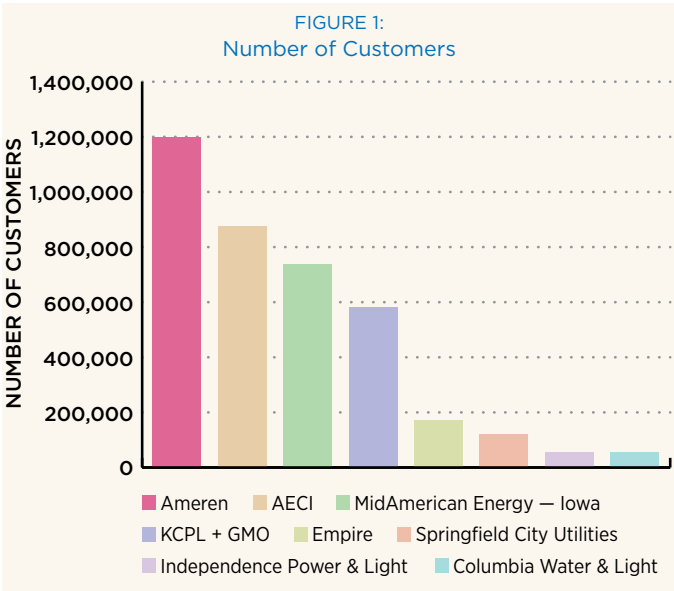
With 1.2 million customers, Ameren is by far the largest of the utilities examined (see Figure 1). Ameren is also the largest in terms of electricity capacity, at 10,280 Megawatts (MW) (see Figure 2). Yet Ameren is currently behind all the other utilities in clean energy investment (see Figures 3 & 4). When

compared to the other utilities that produce long-range plans, Ameren will continue to be outpaced in the clean energy field either in terms of capacity or on a percentage basis (see Figures 5 & 6).

Ameren's current clean energy capacity is only one percent while other utilities in this analysis range from four percent to 35 percent. Ameren's current clean energy resources total 108 MW and consist of a 102 MW wind farm in Iowa, a 5.7 MW solar farm in O'Fallon, and a 0.1 MW solar installation on Ameren's headquarters in St. Louis. Ameren's IRP projects a total of 123 MW of clean energy in 2016³ (still only one percent of its total portfolio) and 568 MW in 2034 (or six percent of its projected portfolio).⁴

KCPL/GMO is Missouri's second-largest IOU, at about half the size of Ameren with 590,000 customers, and yet it has currently has 889 MW of clean energy (12 percent of its portfolio), nearly nine times that of Ameren. The utility is planning on increasing its clean energy to 1,447 MW in 2016 (22 percent of its projected portfolio) and to 1,869 MW in 2034 (31 percent of its projected portfolio).⁵

Empire is the smallest of Missouri's three IOUs with 168,000 customers. It currently has 255 MW of clean energy (more than twice Ameren's current capacity) comprising 15 percent of its total capacity. Empire is



planning on increasing its clean energy to 305 MW by 2034 (17 percent of its projected portfolio).⁶

In Iowa in 2013, MidAmerican Energy announced the largest ever economic investment in Iowa's history with a \$1.9 billion wind development. The project is forecast to provide a rate reduction for customers totaling \$10 million per year by 2017⁷ With MidAmerican's investment, Iowa will skyrocket from 28 percent wind power in 2014⁸ to 39 percent wind power - six percent more than coal's share and more than twice natural gas - by 2016.⁹ This will bring MidAmerican's clean energy capacity to nearly 3400 MW next year.

In April, 2016, MidAmerican announced its vision to reach 100% renewable energy. It also unveiled its latest proposed investment: \$3.6 billion to add 2,000 MW of new wind power. This would bring MidAmerican to 85% wind generation, closing in on the company's 100% clean energy goal. When completed, the new

wind addition would bring Iowa to more than 40% wind power. MidAmerican predicts that the project will add approximately \$12.5 million per year in property tax payments, \$18 million per year in landowner payments, and \$48 million per year in state and local expenditures associated with the project.¹⁰

By several measures, Springfield is leading the clean energy movement among municipal utilities in Missouri, and even besting other non-municipal companies. Springfield's clean energy capacity is currently at four percent of its portfolio. The city opened its five megawatt solar farm in 2014 and at that time it was the largest in Missouri.¹¹ In December 2015, the city signed a new wind contract for 200 MW of wind, bringing its total wind capacity to 250 MW and its total clean energy capacity to 21 percent.¹² Cost savings played a defining role in Springfield's wind purchase, as the city stated the cost of wind energy would be 15 percent less than the cost of electricity from its own John Twitty coal plant.¹³ In October 2015, Springfield phased out coal at its James River plant.¹⁴

In Independence in 2014, the city council adopted a goal of tripling its renewable energy from five percent in 2014 to 15 percent in 2021. It recently signed a new wind energy contract that will bring the city to 13.5 percent clean energy production by the end of 2016, nearly all the way to their goal—and five years early.¹⁵ The city also phased out coal at its two power plants, totaling 161 MW, in October 2015.

In Columbia, Missouri, voters adopted a city renewable energy mandate that will ultimately bring the city to 30 percent renewable energy by 2028.¹⁶ Columbia currently has four percent clean energy capacity.¹⁷ The city also phased out the use of coal at its municipal plant in October 2015.¹⁸

AECI has added significant wind contracts, totaling 750 MW, to its resource mix in recent years. AECI's current clean energy capacity is at 11 percent of its current portfolio.¹⁹

While Ameren plans on phasing out the Meramec coal plant by 2022 and the Sioux coal plant by 2033, Ameren has also claimed in its Integrated Resource Plan that it will need to build an expensive and unnecessary 600 MW natural gas plant in 2034. With the current low cost of wind and solar, this plan is already outdated and will be even more so in 2034.

AMEREN MAY NOT BE A LEADER, BUT IT SHOULD AT LEAST BE A FOLLOWER

Ameren should follow the example of the above utilities, all of which are smaller than Ameren and yet are leading the way towards a cleaner future for Missouri and the Midwest. Mid-American Energy will be at 39 percent clean energy capacity in 2016. Springfield will be at 18 percent clean energy capacity in 2016. KCPL will be at 31 percent clean energy capacity by 2034. Ameren's current Integrated Resource Plan only plans an additional 465 MW of clean energy over the next 18 years. Ameren should establish a goal in its next Integrated Resource Plan to reach 30 percent - 50 percent clean energy by 2030. Ameren should further establish a goal of reaching 70 percent to 100 percent clean energy by 2050. This would move Ameren from a clean energy laggard to a leader in the Midwest—an appropriate and necessary change for the largest electric utility in Missouri.

A CLEAN ENERGY ECONOMY: HEALTH AND WEALTH GO HAND-IN-HAND

Nationwide, the clean energy job sector is booming. According to the Solar Foundation's 2014 Solar Job Census, the solar industry sector added jobs in 2014 at a rate nearly 20 times faster than the overall economy and accounted for 1.3 percent of all jobs created that year.²⁰ Solar industry employment grew 86 percent between 2010 and 2014, adding nearly 80,000 living-wage jobs to the U.S. economy.²¹ As of November 2014, the solar sector employed 173,807 workers, representing a 21.8 percent growth rate since November 2013.²² Based on surveys of solar industry employers, solar jobs are expected to increase by 20.9 percent to 210,060 jobs in 2015.²³

There are currently 89 manufacturing and installation companies in the solar industry in Missouri.²⁴ Missouri is ranked 16th in the nation for solar jobs, with 2,500 Missourians currently working in the sector.²⁵ In 2013, Missouri was ranked 12th in the nation with a total of 2,800 jobs.²⁶ This drop in employment is attributed to Ameren and KCPL ending a popular solar rebate program.²⁷

Nationally, more than 73,000 Americans are employed in the wind energy manufacturing and development sectors.²⁸ There are currently 10 companies in Missouri involved in wind turbine parts manufacturing, with more than 500 Missourians employed in the wind energy sector.²⁹

Moreover, the costs of wind and solar power are dropping, while the cost of coal is increasing, and consumers are seeing the evidence. In January 2014, KCPL announced it was investing in 400 MW of wind power from new wind farms.³⁰ In May 2014, KCPL announced a \$19 million investment in energy efficiency programs over an 18-month period.³¹ KCPL projects that these wind and energy efficiency investments will save its customers \$1 billion over

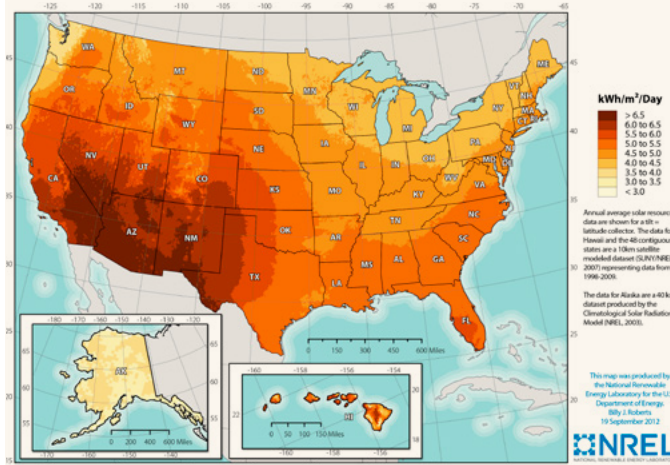
the next 20 years, which equates to \$1,700 per customer.³² And in January 2015, KCPL announced it will phase out 759 MW of coal at its Lake Road, Montrose and Sibley power plants.³³

In Lincoln, Nebraska, the local utility's recent wind and solar projects will push the city's generation mix to 48 percent renewables and save customers \$420 million over 25 years.³⁴

In Minnesota, Xcel Energy's huge investments in wind will save customers \$220 million.³⁵ In Iowa, MidAmerican Energy announced the largest ever economic investment in Iowa's history with a \$1.9 billion wind development, slated to save customers around \$200 million.³⁶ With MidAmerica's investment, Iowa will rise to 39 percent wind power - six percent more than coal's share and more than twice natural gas.³⁷ And in Michigan, DTE Energy announced it would cut rates because of savings realized from wind energy investments.³⁸

Missouri has abundant solar and wind resources. Missouri has more than 200 sunny days per year³⁹, and our solar resources actually exceed those of Germany, which leads the world in solar energy

FIGURE 7:
U.S. Photovoltaic Solar Resource

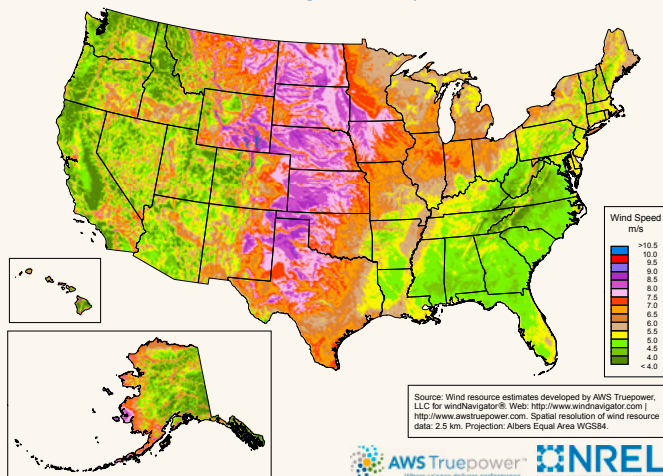


production (see Figure 7 NREL Solar Map). According to the Institute for Local Self Reliance, Missouri could generate 21 percent of its total electric needs using solar power.⁴⁰

Missouri also has large untapped potential for wind power, especially in the northern and northwest parts of the state (see Figure 8 NREL Wind Map). According to the National Renewable Energy Lab, Missouri's wind energy potential is 274,000 MW, or nine times the state's energy needs.⁴¹ Missouri has the 14th best wind resource in the U.S. and yet we only rank 24th in total installed wind generation.⁴² Missouri currently only gets 1.3 percent of its electricity from wind power.⁴³

Energy efficiency programs, such as rebate programs for LED lights, efficient appliances or home insulation, or building codes that require buildings to be more energy efficient, result in direct energy

FIGURE 8:
U.S. Annual Average Wind Speed at 80 m



savings to consumers. Money saved is then available for spending in other sectors of the economy. In Independence, Missouri, the city's utility has replaced all street lights with energy efficient LED lights and projects an annual savings of \$650,000 as a result.⁴⁴

A report by the American Council for an Energy-Efficient Economy (ACEEE) found that a one-time investment of \$15 million in energy efficiency programs would result in the long-term creation of 21 jobs per year for 20 years for a total of 420 new jobs.⁴⁵

Unfortunately, Missouri lags behind most of the country when it comes to energy efficiency, ranked 44th in the nation by the ACEEE.⁴⁶ The good news is that investing in efficiency would bring Missouri multiple benefits. A May 2014 study by the Natural Resources Defense Council found that using energy efficiency to reduce carbon emissions under the U.S. EPA's Clean Power Plan would result in the following benefits by 2020:

- Create 3,900 jobs—largely through investments in energy efficiency.
- Save \$5.60 per month on the average household customer's electricity bill.
- Cut 20.2 million tons of carbon pollution, equal to the annual emissions of 4.2 million cars.
- Save Missouri households \$15 million a month—that's \$180 million annually—on their electricity bills
- Save Missouri business customers \$183 million on their electricity bills.
- Stimulate significant growth in the state's energy efficiency industry.⁴⁷

The potential of energy efficiency to dramatically reduce energy consumption is significant. A 2010 study by Ameren found that energy efficiency alone could reduce consumption by 7.3 percent by 2030. An Ameren official told the *St. Louis Post-Dispatch*, "If we went after the potential that we've seen in our own study, we wouldn't have to build another power plant for 20 years, and we could retire Meramec, and we'd be OK."⁴⁸

The economic benefits of clean energy are clear, as are the costs of staying dependent on dirty coal. Air pollution health effects from Ameren's Labadie, Meramec, Rush Island, and Sioux coal plants have

“If we went after the potential that we’ve seen in our own study, we wouldn’t have to build another power plant for 20 years, and we could retire Meramec, and we’d be OK.”

an estimated negative economic impact of \$1.36 billion per year.⁴⁹ Areas that do not meet federal air quality standards are also subject to more stringent permitting requirements that hinder economic development. Land contaminated by coal ash pollution becomes unusable for future commercial development and leads to lower surrounding property values. In addition, as we’ve seen in other parts of the nation, groundwater contamination by coal ash can lead to costly remedies, such as the replacement of drinking water wells with municipal water supplies or buying up and tearing down entire neighborhoods.

Coal ash ponds and coal’s mercury pollution also threaten Missouri’s fishing and tourism industries. Fishing is a \$400 million industry in the state.⁵⁰ Overall tourism spending topped \$11 billion in the state in 2013, and Missouri hosted 38 million visitors in 2013.⁵¹

If Ameren continues to drag its feet on clean energy, it will saddle its customers with astronomical rate increases, which negatively affect families and businesses and make Missouri less competitive with its neighbors. Ameren’s coal plants are unusually dirty because they lack modern pollution controls and will need major overhauls to keep up with public health-based standards.

In a proceeding before the Missouri Public Service Commission, the Sierra Club, with the help of expert consultants, estimated that Ameren faces nearly \$5.5 billion in needed upgrades to its existing plants.⁵² If incurred, these costs would ultimately be borne by Ameren ratepayers at approximately \$4,600 per customer.

Ameren’s dependence on coal has raised rates by 43 percent between 2009 and 2014.⁵³ This includes a nearly \$175 million increase in 2012,⁵⁴ of which \$100

million was for increased costs of coal, and a \$51 million increase in 2013.⁵⁵ Ameren raised rates by another \$122 million in April 2015.⁵⁶

Less expensive, less polluting electric generation options exist today, and will make Missouri more competitive by avoiding huge rate increases, decreasing pollution and its health costs, and by making the energy economy attractive to progressive employers.

There is a reason companies like Facebook and Google are locating new data centers in Iowa, and pumping millions into the local economy. In 2013, Facebook announced it was building a \$300 million data center in Altoona, Iowa, because it would be able to power the facility with 100 percent wind energy.⁵⁷ Facebook has a policy that it will reach 25 percent of its power needs worldwide through renewable energy by 2015.⁵⁸ In early 2014, Google announced it was investing \$1 billion in 15 renewable

CLEAN ENERGY = MILLIONS \$ SAVED

In May 2014, the Missouri University of Science and Technology (S&T) in Rolla closed its World-War-II-era coal steam plant and switched to an efficient geothermal system. As reported by S&T’s website:

“When completed, the geothermal system is expected to cut the university’s annual energy use by 50 percent and reduce its carbon footprint by 25,000 metric tons per year. That reduction amounts to roughly the equivalent of the greenhouse gas emissions of 4,600 passenger vehicles a year. The geothermal system will also reduce Missouri S&T’s water usage by over 10 percent, or 10 million gallons per year, and eliminate a \$34 million backlog in deferred maintenance costs for the aging power plant.”⁶³

Initial energy and operational cost savings estimated at \$1 million annually are projected to grow to \$2.8 million a year.⁶⁴

In early 2016, S&T signed the Second Nature Carbon Commitment, setting a goal of making its campus carbon-neutral by 2050.⁶⁵



energy projects.⁵⁹ Thirty-four percent of Google's current energy needs are met with renewable energy.⁶⁰ These companies are passing on coal-heavy states in favor of states that have seized clean energy opportunities. Missouri's lack of clean energy investments makes it uncompetitive and unattractive to the new business economy.

Over-reliance on coal has other economic effects. Based on 2012 data, Missouri is fourth in the nation in total expenditures on imported coal at more than \$1.4 billion per year.⁶¹ Missouri imports nearly 100 percent of its coal from other states.⁶² Compare that to clean energy investments such as solar and energy efficiency that allow money to stay in the local economy. Missouri currently has 459 MW in wind production at six wind farms, with at least 200 additional megawatts coming on-line in the near future, so wind investments can also keep money flowing in Missouri's economy.⁶³

Clean energy is driving economies across the Midwest. As Missouri's largest utility, Ameren should seize on clean energy's opportunity and re-emerge as a Midwest energy leader by embracing a path to 30 percent—50 percent clean energy by 2030, ultimately reaching 70 percent—100 percent clean energy by 2050.

CLEAN ENERGY OUTPERFORMS COAL ON MANY ECONOMIC LEVELS:

1. Lower health costs due to decreased air pollution
2. Decreased coal ash contamination, leading to increased land values
3. Job creation in the clean energy field is rising
4. Clean energy such as solar, energy efficiency, and wind keep money in the local and state economy while all money spent on coal (\$1.4 billion in 2012) goes to out-of-state coal mines.
5. No fuel costs for clean energy options such as wind, solar and efficiency
6. Lower overall costs of clean energy lead to lower rates, while continued investments in coal power lead to increased rates

OUR RIVERS AT RISK:

AMEREN'S IMPACT ON ST. LOUIS WATER QUALITY & FISH HABITAT

Coal Ash

Coal ash—the residue left over from burning coal—contains heavy metals including arsenic, mercury, cadmium, selenium, thallium, and hexavalent chromium, and is also radioactive.⁶⁷

These can cause cancer and nervous system effects such as cognitive deficits, developmental delays, and behavioral problems. They can also cause heart damage, lung disease, respiratory distress, kidney disease, reproductive problems, gastrointestinal illness, birth defects, and impaired bone growth in children.⁶⁸

A 2010 United States Environmental Protection Agency (EPA) risk assessment found that the cancer risk from some unlined coal ash ponds was nine times the risk of smoking a pack of cigarettes a day.⁶⁹

Coal ash has made national headlines in recent years. In February 2014, a stormwater pipe burst

beneath a coal ash pond owned by Duke Energy in North Carolina, sending more than 30,000 tons of coal ash and 27,000 gallons of contaminated water into the Dan River.⁷⁰ The pollution flowed 70 miles downstream, threatening fish, wildlife and drinking water supplies.⁷¹

In December 2008, a coal ash pond owned by the Tennessee Valley Authority collapsed, spilling 1.1 billion gallons of ash slurry into Tennessee's Emory and Clinch Rivers.⁷² 5.4 million cubic yards of sludge covered 300 acres, damaging 12 homes.⁷³ Inestimable numbers of fish and wildlife were killed and water samples showed significantly elevated levels of toxic metals—arsenic, copper, barium, cadmium, chromium, lead, mercury, nickel, and thallium—in samples of slurry and river water.⁷⁴

In Missouri, coal ash disposal has been barely regulated. Often coal ash is disposed in unlined waste ponds, and then discharged to surface waters like the Missouri and Mississippi Rivers. In addition, the ponds can (and do) leak into groundwater. Ameren's ash ponds at the Meramec and Rush Island plants are located in the floodplains of the Meramec and Mississippi Rivers. Flooding of the Meramec River in June 2013 caused an ash pond at the Meramec coal plant to overflow, as did heavy rains in April 2015.⁷⁴ Ameren is now building a landfill at its Labadie plant in the Missouri River floodplain; the site flooded in December 2015.⁷⁶

In 1992, Ameren reported to the Missouri Department of Natural Resources (DNR) that a 154-acre, unlined coal ash pond at the Labadie plant was leaking approximately 50,000 gallons per day.⁷⁷ Additional leaks were identified in 2011. Ameren allowed these leaks to continue for 20 years, and ultimately dug a trench 600 feet long and 30 feet deep to try to



Coal ash in the Dan River. SOURCE: Dan River Basin Association



Sierra Club and Labadie Environmental Organization deliver more than 2,000 petitions to Governor Nixon's office in support of strong coal ash protections.

prevent the leakage from spreading outward. These leaks were discovered only because they were visible to the naked eye.⁷⁸ With the exception of Labadie, DNR has yet to require groundwater monitoring to determine whether and how badly the ash ponds are contaminating groundwater, and at Labadie, the monitoring won't be required for another two years. The groundwater around the Labadie plant is used for drinking water and farmland irrigation.

The DNR-issued water discharge permit at Ameren's Labadie coal plant expired in 1999 and was not renewed until August 2015. This permit allows the plant to discharge approximately 16 million gallons per day of coal ash wastewater containing various toxic metals into the Missouri River without any treatment for, or limits on, the metals.⁷⁹ The Missouri River provides 80 percent of the drinking water to the St. Louis region.⁸⁰

Ameren has been dumping coal ash into unlined ponds for decades: Meramec for 62 years, Labadie for 45 years, and Rush Island for 39 years. An Ameren report to DNR shows that the company found groundwater contamination at the Meramec plant in 1988. That report found iron, boron, and manganese above the state's water quality criteria for groundwater and attributed the boron contamination to a coal ash pond.⁸¹ Besides that ad hoc monitoring decades ago, Ameren does no routine groundwater monitoring at the 10 ash ponds at the Meramec plant — even though these ponds are old, many are unlined, and the U.S. EPA rated the six active ponds (the only ones it rated) as “poor.”⁸²

In 2014, as part of its bid to build a new coal ash landfill on top of the coal ash ponds at the Rush Island plant, Ameren conducted four sessions of

“Why would we dump coal ash toxins into our drinking water and beautiful rivers and streams? Missouri boasts a \$400 million fishing and \$11 billion tourism industry in Missouri that brought 38 million visitors to the state in 2013.”

PATRICIA SCHUBA,
PRESIDENT OF LABADIE ENVIRONMENTAL ORGANIZATION,
MEMBER OF THE FRANKLIN COUNTY
TOURISM COMMITTEE, (2013/2014)

groundwater monitoring at the site. Ameren's testing shows contamination exceeding federal drinking water standards and state groundwater standards. High levels of aluminum, antimony, arsenic, and boron occurred in all four monitoring events.⁸³ Boron is a recognized indicator of coal ash contamination. Neither Ameren nor DNR has notified the public of the Rush Island contamination. Ameren has not conducted further groundwater monitoring to determine how far the contamination has spread, and DNR has not required it to do so.



After Ameren hired an “expert” that said that children could safely eat coal ash every day, St. Louis area residents served a mock “coal ash breakfast buffet” to staff at Ameren headquarters.

Ameren has repeatedly attempted to downplay the risks associated with coal ash. In 2011, an Ameren expert witness said in a public hearing on a proposed coal ash landfill at Labadie that if “...a child was exposed to that coal ash every day by eating it...” that the “...exposure dose to arsenic is what you are getting in your food every day.”⁸⁴

In January 2014, Ameren released its own groundwater data from groundwater samples taken in April, August, and November 2013 at its proposed coal ash landfill site adjacent to the Labadie plant. Ameren’s own data for pollutants such as arsenic, manganese and selenium, shows that groundwater contamination exceeded the federal Safe Drinking Water Act limits in 120 instances, the federal Superfund screening level in 45 instances, and both the Safe Drinking Water Act and Superfund levels in 70 instances.⁸⁵ Arsenic levels were found at more than six times the Safe Drinking Water Act limits.⁸⁶

Unlike Missouri, Illinois requires utilities to conduct routine groundwater monitoring at risky ash ponds. Based on that data, the Illinois EPA issued violation notices to Ameren for exceeding the state’s groundwater standards for arsenic, manganese, zinc, iron, boron, sulfate, pH, and/or total dissolved solids at four of its Illinois coal plants.⁸⁷ In response to the Dan River spill in North Carolina, Illinois is also increasing its inspections of coal ash ponds.⁸⁸ Many other states have also bolstered coal ash protections,



Sara Edgar, Missouri Beyond Coal Campaign joins with Missouri Coalition for the Environment and Labadie Environmental Organization in call for protecting our rivers and floodplains from harmful landfills.

yet Missouri has yet to take any steps to protect the public from this risk.

New federal safeguards for coal ash disposal were finalized in December 2014. However many of those provisions will not go into effect for years and it is unclear whether they will adequately address the legacy disposal sites that continue to threaten Missouri’s water.

Mercury

Burning coal is the largest source of mercury air pollution in the U.S., accounting for more than 50 percent of human caused mercury emissions⁸⁹ When emitted from coal plant smoke stacks, mercury particles rain down into rivers and lakes where they enter the food chain, contaminating the fish that we eat.

The Missouri Department of Health and Senior Services advises that sensitive populations—pregnant women, women of childbearing age, nursing mothers, and children younger than age 13—limit eating certain species of fish, such as bass, walleye, and catfish caught in any Missouri stream or lake, to no more than once a month.⁹⁰ The entire lengths of the Missouri and Mississippi Rivers in Missouri are impaired due to mercury pollution.⁹¹ The Department has additional

fish consumption advisories related to mercury for all other consumers of fish, which can be viewed at: <http://health.mo.gov/living/environment/fishadvisory/index.php>

Mercury is a highly potent neurotoxin and especially dangerous for pregnant women and small children. In children, mercury poisoning can slow brain and nervous system development, and in adults it can cause infertility, memory loss, and vision loss.⁹²

Even very small amounts of mercury can contaminate our rivers and lakes. Only 1/25 of a teaspoon will contaminate a 60-acre lake.⁹³ In 2012, Ameren’s Meramec, Rush Island, Labadie, and Sioux power plants emitted 1,553 pounds of mercury air pollution.⁹⁴

Harm to Fish and Their Habitat

Coal-fired power plants are often located on major rivers because they use tremendous amounts of water to generate electricity. For example, the Labadie plant takes in and discharges approximately one billion gallons of water each day.⁹⁵ The process of pumping water from the river kills a large number of fish.⁹⁵ Hot water dumped back in the river from the power plant increases the temperature of the river water, harming fish habitat downstream from the plant.

Some fish, including sturgeon, are highly susceptible to thermal pollution. Pallid sturgeon populations have significantly decreased over the last 50 years, and the US Fish & Wildlife Service declared it endangered in 1990.⁹⁷ Studies have shown that deaths of shovelnose sturgeon, a threatened species, increase by 10 percent when water temperatures are between 82 and 86 degrees Fahrenheit and likely rise even more with higher temperatures.⁹⁸ Pallid sturgeons are also suffering reduced reproductive fitness from heat and water pollution stress on the Lower Missouri River.⁹⁹

Ameren's current water pollution permits do not have a temperature limit for discharge water. In July and August of 2014, the daily average temperature

discharge of water into the Missouri River at Ameren's Labadie plant was 103 degrees, and the daily maximum ranged from 105 degrees to 110 degrees¹⁰⁰; much higher than considered safe for the shovelnose sturgeon.

To make matters worse, water pollution permits for three of Ameren's power plants have been expired for years; the Labadie permit was renewed in 2015 after being expired for 16 years. Millions of gallons of unmonitored, untreated waste water are being discharged into our rivers and streams from coal ash ponds from the other three plants.

While monitoring will increase at Labadie under the new permit, waste water at the other plants is only monitored for temperature, grease, turbidity, and pH. DNR could fix these and other issues related to water pollution by issuing new power plant permits with modern pollution control requirements and testing waste water for a suite of toxins and heavy metals to ensure they are not getting into our rivers and streams. The use of widely-available cooling tower technology, for example, would eliminate warm water discharge impacts on fish and can reduce water use at power plants by 98 percent.¹⁰¹



Gary Kappler and his grandson enjoy fishing along Missouri's many rivers, lakes, and streams but worry that Ameren's Rush Island coal plant could be impacting the mercury levels in the fish.

GASPING FOR BREATH:

AMEREN'S IMPACT ON PUBLIC HEALTH AND ST. LOUIS AIR QUALITY

In 2015 the American Lung Association named St. Louis as one of the nation's most polluted cities in its State of the Air report.¹⁰² This pollution makes it unsafe to breathe in St. Louis; the entire region, including St. Louis, Franklin, Jefferson, and St. Charles Counties, and St. Louis City, fails the federal smog standard set by the U.S. EPA. In all, more than two million people live in these areas that fail to meet public health air quality standards. If Metro-East counties across the river in Illinois are included, the number adds up to 2.6 million people living with dirty air.¹⁰³

Smog, also known as ozone, causes premature death and asthma attacks, aggravates other lung diseases such as bronchitis and emphysema, and can cause permanent lung damage as well as neurological damage.¹⁰⁴ Coal-fired power plants are one of the largest contributors to smog, as oxides

of nitrogen emitted from their stacks interact with other pollutants and sunlight to form smog.

The area is also burdened by unsafe concentrations of sulfur dioxide (SO₂) pollution. Air quality monitoring by DNR shows that Ameren's Rush



Andy Knott, Missouri Beyond Coal Campaign announces Sierra Club's Notice of Intent to file legal action against Ameren for air pollution violations.

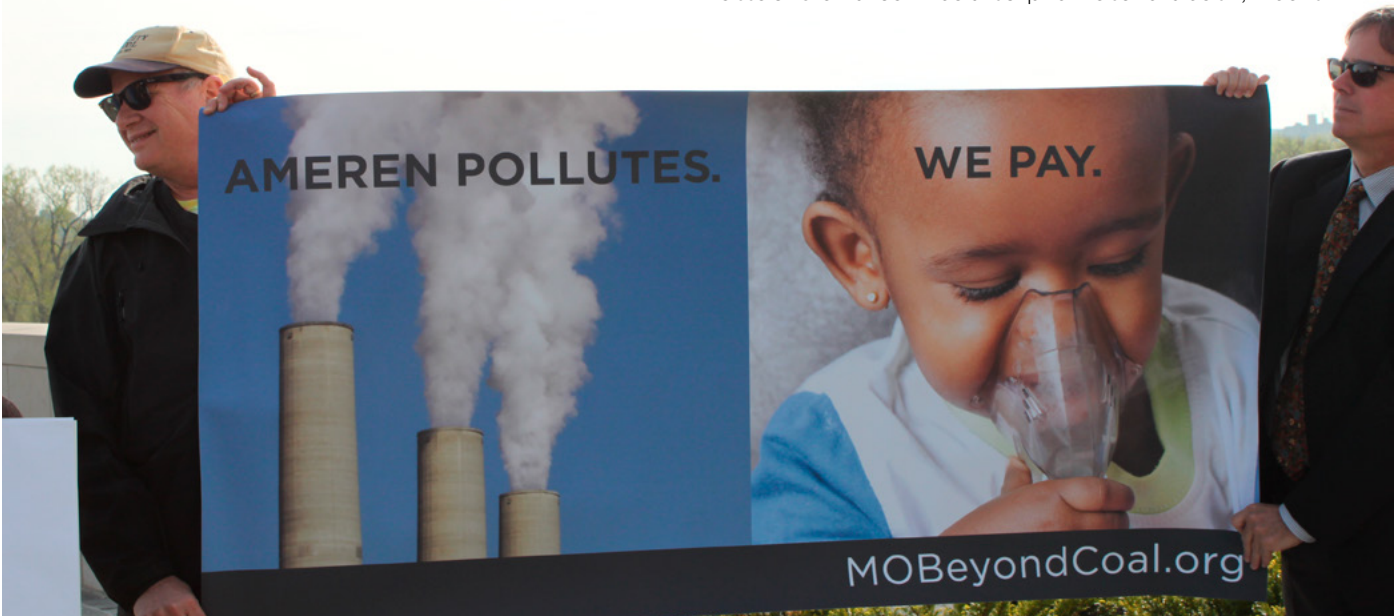


Patricia Schuba of Labadie Environmental Organization stands amidst the corn fields in the Missouri River Bottoms in front of Ameren's Labadie coal plant. Residents there are concerned about dangerous levels of sulfur dioxide pollution.

Island, Meramec, and Labadie plants contribute to unsafe SO₂ levels in Jefferson County. In February 2016, the EPA issued a notice to Missouri Governor Jay Nixon stating the agency's intent to classify the area around the Labadie plant as failing to meet air quality health standards for SO₂. An air monitor in Jefferson County showed readings well above the EPA's safe level, and both the DNR and the EPA have identified Ameren's Rush Island, Meramec

and Labadie plants as contributing to those high readings. Nearby areas that do not have air monitors are not necessarily safe. Computer modeling of SO₂ pollution shows large portions of our region have unsafe air caused by Ameren's coal plants.

Coal plants are responsible for more than 60 percent of the SO₂ pollution in our country.¹⁰⁵ This toxic pollution exacerbates asthma and asthma attacks and can lead to premature death, heart

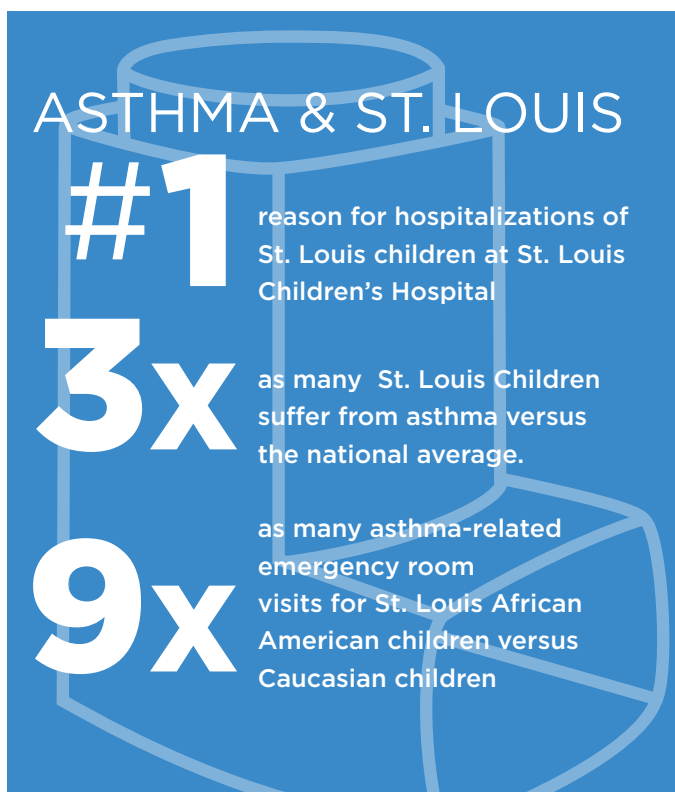


In 2014 Sierra Club launched a billboard campaign across St. Louis to raise awareness about the health impacts of coal.

attacks, and other lung problems.¹⁰⁶ The Clean Air Task Force estimates that, every year, SO₂ pollution from Ameren's Meramec, Rush Island, Labadie, and Sioux power plants in the St. Louis region cause 169 premature deaths, 259 heart attacks, 2,830 asthma attacks, and 305 hospitalizations and emergency room visits.¹⁰⁷ The economic costs of these health impacts exceed \$1.36 billion every year.¹⁰⁸

Modern pollution controls such as "scrubbers" can reduce 98 percent of SO₂ emissions from coal plants¹⁰⁹, yet only one of Ameren's four plants, the Sioux plant, is equipped with this life-saving technology.

Both SO₂ and smog affect the most vulnerable populations: children, the elderly, low income communities, and anyone with existing lung problems. The number of children in the St. Louis region suffering from asthma is nearly three times the national average.¹¹⁰ At the St. Louis Children's Hospital, asthma is the number one reason for hospitalizations.¹¹¹ In 2008, African American children accounted for 92 percent of asthma-related emergency room visits in St. Louis City, a rate nine times greater than that among white children.¹¹² Nationally, from 2001 through 2009, asthma rates increased the most among black children, almost a 50 percent increase.¹¹³



“As a student and resident of St. Louis, I breathe the air at every moment of the day – whether I’m running, working, or sleeping. I believe that our health is not simply a privilege that can be bought away. Clean air is a right!”

SHAWN SHEU,
WASHINGTON UNIVERSITY CLASS OF 2016

This pollution has created a major environmental injustice within our community.

Ameren's Meramec, Rush Island, and Labadie plants emitted 72,201 tons of SO₂ in 2012.¹¹⁴ And in that same year, they emitted 13,639 tons of nitrogen oxides, a key ingredient for ozone formation.¹¹⁵ Unlike many coal plants in the U.S., these Ameren plants do not have modern pollution control devices. A 2012 Environmental Integrity Project report estimated premature deaths caused by the largest power plants in the country that lack scrubbers for pollution control. An analysis comparing health impacts relative to the value of electricity production from 51 coal plants in the US found that Ameren's Labadie coal plant is the most deadly in the entire country.¹¹⁶ And Ameren's Labadie, Meramec, and Rush Island coal plants all produce adverse health impacts that are economically greater than the value of the electricity they produce.¹¹⁷

In 2011, the U.S. EPA sued Ameren for alleged Clean Air Act violations at its Rush Island plant. The EPA alleges that Ameren made changes to the plant without obtaining proper permits, resulting in higher SO₂ emissions.¹¹⁸ And, in March 2014, the Sierra Club filed a lawsuit against Ameren for alleged Clean Air Act violations at the Meramec, Labadie, and Rush Island plants. The suit alleges that the plants violated their permit requirements for opacity, a measure of fine particle pollution, nearly 8,000 times over a four-year period.

TOXIC LEGACIES:

LEAVING CONTAMINATED LAND BEHIND

Improper disposal of coal ash waste from power plants can also lead to devastating impacts to the land, making land unusable for other purposes, hindering local economic development, and lowering nearby property values.

Between 2004 and 2009, contractors hauled 140,000 tons of coal ash from Ameren's Rush Island plant and dumped the material at a proposed, 10-acre commercial development site near Crystal City in Jefferson County.¹¹⁹ In 2012, Missouri DNR issued notices of violation to Ameren, the property owner, Rotary Drilling Supply, and the hauling contractors for violations of Missouri's solid waste regulations.¹²⁰ In 2013, the EPA alleged that this illegal dumping by contractors for Rotary Drilling Supply contaminated local wetlands and other nearby water sources,¹²¹ including Elks Lodge Lake, which is often used by local Boy Scout troops for fishing.

The EPA's assessment of the dumping found that the "direct physical impact to the wetland environment results in a total loss of ecological habitat," and that the "unique wetland characteristics of the site may be irreplaceable."¹²²

The site, which was intended for future development, may never be developed due to the contamination, resulting in an economic loss for the city. The contamination found included arsenic, selenium, chromium, and barium.¹²³

Such effects and their related economic costs are common where coal ash is disposed improperly. For example, in 2009, We Energies in Wisconsin began buying bottled water for residents due to molybdenum contamination in groundwater near the company's Oak Creek coal plant, allegedly caused by improper coal ash waste disposal.¹²⁴ We Energies has since spent \$5.2 million to purchase and demolish 20 homes near the plant.¹²⁵

In the town of Pines, Indiana, the Northern Indiana Public Service Company (NIPSCO) and two other companies were found responsible for boron and molybdenum groundwater contamination due to improper disposal of coal ash waste from NIPSCO's Michigan City coal plant.¹²⁶ In 2004, the companies agreed to replace drinking water wells with municipal drinking water for 270 homes.¹²⁷

In 2013, the Illinois Attorney General filed a complaint against an Ameren subsidiary alleging illegal dumping of 180,000 tons of coal ash at a three-acre site near Peoria.¹²⁸ This followed an investigation by the Illinois EPA that found levels of boron, antimony, and silver above the state's groundwater standard.¹²⁹

Coal mining itself is also devastating to the land. Strip mining displaces rural communities and creates water pollution including acid mine drainage. Mountaintop-removal coal mining in Appalachia has destroyed more than 500 mountains,¹³⁰ displaced entire communities,¹³¹ increased the risk of cancer and disease,¹³² and resulted in entire creeks being filled with debris and permanently destroyed.¹³³

Legacies of pollution can devastate land values, making homes valueless, and those who stay are forced to take extraordinary measures to protect themselves from contaminated water and soil. One study found that coal ash landfills depress property values within a five-mile radius of the site.¹³⁴



CARBON POLLUTION:

CLIMATE AND PUBLIC HEALTH

Carbon pollution is the main contributor to climate disruption, making extreme weather worse—including more severe floods, widespread wildfires, and record drought.

Nationally, power plants are responsible for 71 percent of industrial carbon emissions.¹³⁵ In Missouri, power plants are responsible for 83 percent of industrial carbon emissions.¹³⁶ This is largely because Missouri derives approximately 78 percent of its electricity from coal.¹³⁷

Ameren's Labadie, Rush Island, Sioux, and Meramec plants are responsible for 43 percent of Missouri's power plant carbon emissions and 36 percent of the state's industrial carbon emissions.¹³⁸ Total carbon pollution from these four plants in 2014 was more than 30 million metric tons.¹³⁹

The risks of climate disruption to Missouri are dramatic. More frequent, extreme weather events such as floods and tornados are already taking a toll. In 2008, all but five Missouri counties were subject to federal storm or flood-related federal disaster declarations.¹⁴⁰ In 2011 and 2012, Missouri ranked

seventh in the nation in federal disaster recovery spending at \$2.5 billion.¹⁴¹

Climate disruption also affects crop growth and plant habitat. In 2012, the U.S. Department of Agriculture updated its plant hardiness zones across the country, reflecting new average annual extreme minimum temperatures.¹⁴² Almost all of Missouri was moved up to a warmer zone.¹⁴³ The 2014 National Climate Assessment also predicts that the composition of the Midwest's forests is expected to change as rising temperatures drive habitats northward for many tree species.¹⁴⁴

According to the Union of Concerned Scientists, precipitation is more likely to arrive in the form of heavy rains, and summers are expected to be drier.¹⁴⁵ Missouri will also see more hot summer days due to climate disruption. Historically, St. Louis has averaged 36 days per summer with temperatures more than 90 degrees.¹⁴⁶ That could increase to between 62 and 105 days due to climate disruption.¹⁴⁷

Increased temperatures lead to increased smog pollution.¹⁴⁸ As noted earlier, five counties in the metro St. Louis region already fail air quality standards for smog. Increases in smog will increase asthma attacks and other lung problems among children, the elderly and other vulnerable populations.

Temperature extremes and drought are expected to cause higher heat stress on agricultural crops and livestock, decreasing yields. Crop pests are expected to increase. For example, conditions conducive to corn earworm currently occur approximately three times every 10 years in southern Missouri.¹⁴⁹ These



The Meramec River reached record flood stage in January 2016. Studies have shown that climate change will increase the likelihood of more extreme weather events in Missouri. SOURCE: Larry Lazar.



Dr. Dan Berg and his daughter Ella show support for clean energy and climate action in Missouri.

conditions are expected to increase to nearly every year by the end of the century.¹⁵⁰ Accordingly, a huge portion of Missouri’s economy is at risk. Corn alone is a \$1.9 billion industry in Missouri.¹⁵¹ The state is one of the nation’s top agricultural producers, and is second in the nation for the number of farms.¹⁵²

Climate disruption also affects fish and wildlife habitat. According to the U.S. Fish and Wildlife Service, above-average fluctuations in rainfall, snowmelt, and runoff in the lower Missouri River are complicating U.S. Fish and Wildlife Service efforts to recover the endangered pallid sturgeon, one of the continent’s largest freshwater fish.¹⁵³

Climate-induced flooding is expected to increase. The “Great Flood of 1993” caused the evacuation of approximately 54,000 people in nine states.¹⁵⁴ Approximately 50,000 homes were destroyed or damaged, and losses were estimated at \$15 to \$20 billion.¹⁵⁴

In August 2015, the EPA finalized the first-ever reductions for carbon dioxide emissions from existing power plants, called the Clean Power Plan.¹⁵⁶ Under the plan, Missouri would reduce its power plant carbon emissions by 37 percent by 2030.¹⁵⁷ The Clean Power Plan allows great flexibility for states to meet their emission reduction goals, including increased deployment of clean energy and energy efficiency. Ameren has stated that it would build a large, unnecessary and expensive natural gas plant in order to comply with the Clean Power Plan. As this report shows, clean energy from wind and solar are the common sense alternatives to such a natural gas plant.



More than 400 residents rally at the St. Louis People’s Climate March in September 2014.

CLEAN ENERGY WORKFORCE:

A FAIR AND JUST TRANSITION

As a union shop itself, the Sierra Club understands the importance of labor to our nation's economy. As our country moves to a 21st century clean energy economy, we must ensure that this transition provides family-sustaining livelihoods to workers in the coal sector. Employees at coal plants have dedicated their careers to providing electricity to our society.

The Sierra Club, as a member of the BlueGreen Alliance, a coalition of labor and environmental organizations, strongly supports a fair and just transition for fossil fuel workers as we move to a clean energy economy.

Agreements on such transitions have occurred throughout the country. For example, in 2011 in Centralia, Washington, union workers with the International Brotherhood of Electrical Workers at TransAlta's coal plant joined with environmental groups, community leaders, and utility officials to reach consensus on a transition plan that allowed



SOURCE: NREL

“Clean energy plays a huge role in the future of my job and the future of a clean environment for our children. Should we not think about the future of our planet and the cleanliness of our environment? I should hope that everyone wants to do anything and everything we possibly can to ensure a clean environment, clean rivers and streams, clean drinking water for ourselves and future generations. Let's all do our part to ensure a cleaner and brighter future.”

GERALD NICKELSON,
PAST PRESIDENT OF IUE-CWA LOCAL 86114
IN WASHINGTON, MISSOURI.



St. Louis residents show they are ready for a just transition to 100% clean energy

time—eight years—for a fair transition in retiring the plant. TransAlta also agreed to fund \$55 million in programs to diversify the region’s job base, \$30 million to a community investment fund for energy efficiency projects, and \$25 million to support innovative energy projects.¹⁵⁸

In 2011, as part of an agreement to phase out 18 coal plants, the Tennessee Valley Authority agreed to fund \$290 million in energy efficiency and clean energy projects.¹⁵⁹

In 2010, as part of an agreement to close its Indian River coal plant in Delaware, NRG Energy also agreed to develop job-training programs in partnership with Delaware colleges. The programs would provide

training opportunities for current employees and the local labor force for clean-energy jobs, including a planned wind project, electric vehicle infrastructure, and solar technology. NRG said it expected to close the coal-fired plant without layoffs through retirements, retraining, attrition, and redeployment.¹⁶⁰

Investing in a clean energy economy pays huge dividends both in terms of improved public health resulting from less coal pollution and increasing employment. A University of Massachusetts study found that a clean-energy investment agenda generates more than three times the number of jobs within the U.S. as does spending the same amount of money within the fossil fuel sectors.¹⁶¹

WE ALL HAVE A ROLE:

SOCIAL JUSTICE AND CORPORATE RESPONSIBILITY

The moral implications of coal use are becoming more apparent every day. Climate disruption impacts the most vulnerable among us, both locally and across the globe. Island nations and low-lying cities in developing countries — entire cultures — are at risk from rising sea levels. Some communities are already being forced to relocate.¹⁶²

Across the world, five million people die every year from health effects and weather disasters related to climate change.¹⁶³ Right here in the St. Louis region, heat stress caused by climate disruption will affect children, the elderly, asthmatics, low-income communities, and communities of color.

“Plain and simple: Missouri’s dependence on coal is a bad investment for our state, our state’s ratepayers and investors. The technology is there for the common good. It is our moral obligation to create a better world for future generations. Investing in clean energy is an important step to creating a healthier economic, social, and environmental future for Missouri.”

SISTER BARBARA JENNINGS,
SISTER OF ST. JOSEPH OF CARONDELET AND DIRECTOR,
MIDWEST COALITION FOR RESPONSIBLE INVESTMENT

Ozone, or smog pollution, which would increase in a warmer climate, already poses risks to asthmatics, especially children, in the St. Louis region:

- In 2012, the Asthma and Allergy Foundation of America ranked St. Louis as the 7th worst “asthma capital” in the nation.
- According to Asthma Friendly St. Louis, the number of children suffering from asthma in the metro area is nearly three times the national average.
- At the St. Louis Children’s Hospital, asthma is the number one reason for patient admissions, and St. Louis County’s rate of emergency room visits for asthma-related incidents among children under 15 is 52 percent higher than in the rest of Missouri.
- In 2008, African American children accounted for 91.9 percent of asthma-related emergency room visits in St. Louis City, a rate nine times greater than that among white children.¹⁶⁴

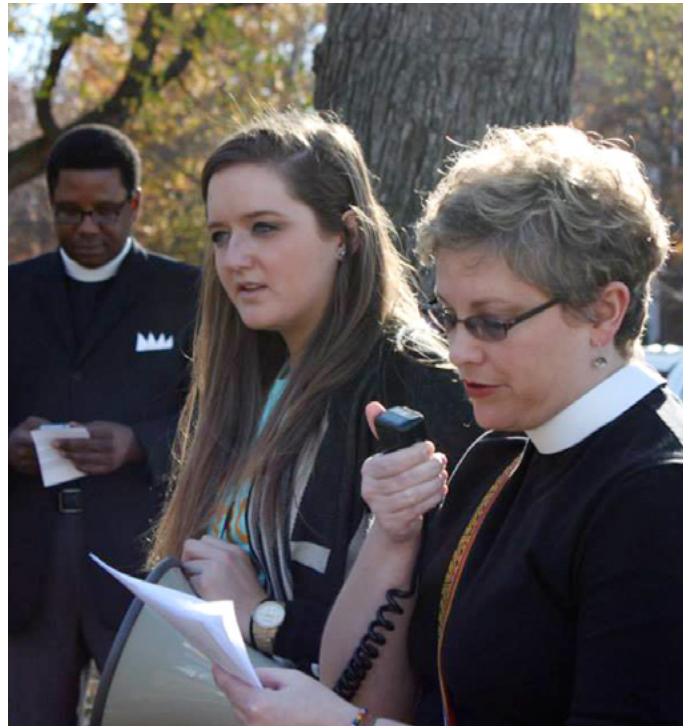
In May 2015, Pope Francis issued a Papal Encyclical called “On Care for Our Common Home” or “Laudato Si (Praise be to you).” The Pope calls upon all people to engage in a

“new dialogue about how we are shaping the future of our planet. We need a conversation that includes everyone, since the environment challenge we are undergoing, and its human roots, concern and affects us all.”¹⁶⁵

Faith-based organizations — such as Interfaith Power & Light, Midwest Coalition for Responsible Investment and GreenFaith — are increasingly calling for corporate accountability based on ethical and moral responsibility to care for our fellow humans. Every major faith tradition has a stance on caring for creation, the importance of environmental stewardship, and reducing the threat of climate change.¹⁶⁶

Likewise, we all have responsibility to change our own behavior to bring about positive results. These include taking actions such as making our own investments in conservation and energy efficiency, voting for shareholder resolutions for utility companies to increase renewable energy production, and urging our public officials to similarly demand better performance from our utility companies.

Ultimately we need the ways in which we produce power in our community to better match our personal and community values of caring for our neighbors both near and far. We need our utility companies, including Ameren, to be good corporate citizens that are proactive and aggressively pursue cleaner energy options that protect the most vulnerable.



Rev. Elston McCowan, Maddy Salzman and Rev. Kristen Koch lead participants in an interfaith march for climate action.

We all use electricity. We all need to play a part in our personal lives, our work lives, our neighborhoods, and our institutions in reducing the impacts of the electricity we use. And we need Ameren to join us.



Health leaders and concerned residents form human billboard in front of Ameren's headquarters after delivering letter from 48 health professionals.

CONCLUSION

The challenges of coal dependency also present great opportunities for positive change. Cleaning up our energy mix not only reduces pollution but also provides jobs and economic development while improving our overall quality of life.

Across the country, outdated inefficient coal plants are closing while communities invest in clean energy. Ameren's Meramec, Sioux, Labadie, and Rush Island coal plants are 62, 48, 45, and 39 years old respectively.

Since 2010, more than 230 coal plants across the U.S. have committed to close, retiring more than 99,000 MW of dirty power.¹⁶⁷ Meanwhile, more than 50,000 MW of clean energy such as wind and solar has come online across the US.¹⁶⁸

Other utilities are making great strides in clean energy development while Ameren lags behind. As the largest utility in Missouri, Ameren should act boldly and become a clean energy leader by moving to 30 percent–50 percent clean energy by 2030, and ultimately reaching 70 percent to 100 percent clean energy by 2050.

Moving the St. Louis Region to a clean energy future will take effort by everyone in our community: residents, faith communities, businesses, civic organizations, local government, and the largest utility in Missouri: Ameren. Ameren can be a leader in reducing Missouri's over-dependence on dirty coal. We owe it to our children and to future generations of St. Louisans to attain a future where our water, air, and land are pristine and our economy is driven by clean energy.

TAKE ACTION

1. Ask your local officials to urge Ameren to take the lead in moving the St. Louis region from coal to clean energy. Get involved in community efforts to call for clean energy.
2. Send a message directly to Ameren asking them to reduce dirty coal use, increase clean energy, and implement a fair and just transition for coal plant workers.
3. Support efforts to move cities, university campuses and businesses to 100% clean energy.
4. Get involved in urging Missouri DNR and the U.S. EPA to reduce smog, sulfur dioxide, and carbon pollution from power plants.
5. Write a letter-to-the editor supporting a coal to clean energy transition in the St. Louis region.
6. Take advantage of Ameren energy efficiency rebates on LED lights and appliances.
7. For more information go to:
<http://content.sierraclub.org/coal/missouri>
Or call: (314) 644-1011

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