



Missouri's Energy Outlook

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Talking Points

- World-wide energy demand is expected to continue to rise over the next 25 years, with natural gas and coal meeting a substantial portion of U.S. demand.
- In Missouri, coal is used to generate over 80 percent of electricity needs and will continue to be the primary fuel source in the near future.
- Modifying the existing renewable portfolio standard in addition to exploring cost recovery options for utility companies can help Missouri diversify away from fossil fuels.

Introduction

This policy brief attempts to provide a synopsis of the current state of electricity generation in the state of Missouri along with current policy considerations and possible future directions as the state attempts to meet its future energy needs. Although not meant to be an exhaustive discussion of any particular area in the energy arena, it does provide a primer which can be used as a starting off point to evaluate specific policy recommendations made in the future. To provide proper context for the state of Missouri the brief first details the current energy situation of the world and to a larger extent the United States, followed by a more in-depth view of Missouri.

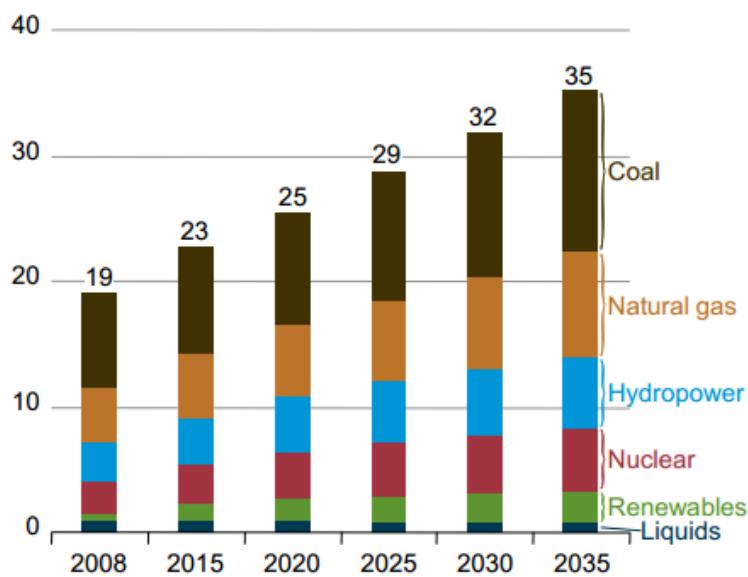
Overview of International Energy Production

Though the global economic crisis halted the growth rate of world-wide electricity consumption throughout 2008 and 2009, expectations are that it will continue to increase over the coming decades. The U.S. Energy Information Administration (EIA) estimates world electricity use will reach 35.2 trillion kilowatt-hours by 2035, an increase of 84 percent over 2008 levels. Not surprisingly, with their large populations and growing economies China and India are expected to have the highest growth at four percent per year. Even the United States and other countries in the Organization for Economic Co-operation and Development (OECD) with sluggish economic recoveries and more mature usage patterns are expected to increase electricity usage by 1.2 percent per year (EIA, 2011, p.4). To meet this demand, the world will need a multi-

faceted approach which includes the use of coal, natural gas, nuclear power and renewable resources.

Two important considerations factoring into energy decisions are national security and concern for the environment. As demonstrated by recent tensions between Russia and Europe over natural gas transmission, countries are more aware of the possibility of distribution interruptions and are searching for alternative energy supplies to mitigate this risk.

FIGURE 1: WORLD NET ELECTRICITY GENERATION BY FUEL TYPE, 2008 – 2035 (TRILLION KILOWATT HOURS)



Source: U.S. Energy Information Administration (2011)

Many countries are also increasingly mindful of environmental impacts such as the levels of pollution and greenhouse gas emissions associated with conventional fossil fuels, and the risk of nuclear disaster as recently experienced by Japan. Together, these factors help explain why renewable resources are expected to see significant growth (EIA, 2011, p. 4).

A renewable resource is by definition a resource that regenerates, allowing it to be used indefinitely, assuming proper management. The most common forms of renewable energy are biomass, hydropower, geothermal, wind and solar. Of these five, 82 percent of the expected increase in renewable resource use for world-wide electricity generation will come from hydropower (55%) and wind (27%). Non-OECD countries such as China with their ambitious hydropower plans are expected to account for 85 percent of the increase in hydro-electric power generation. Wind generation is more evenly split with non-OECD countries expected to account for 42 percent of the increase in wind generated electricity (EIA, 2011, p. 4).

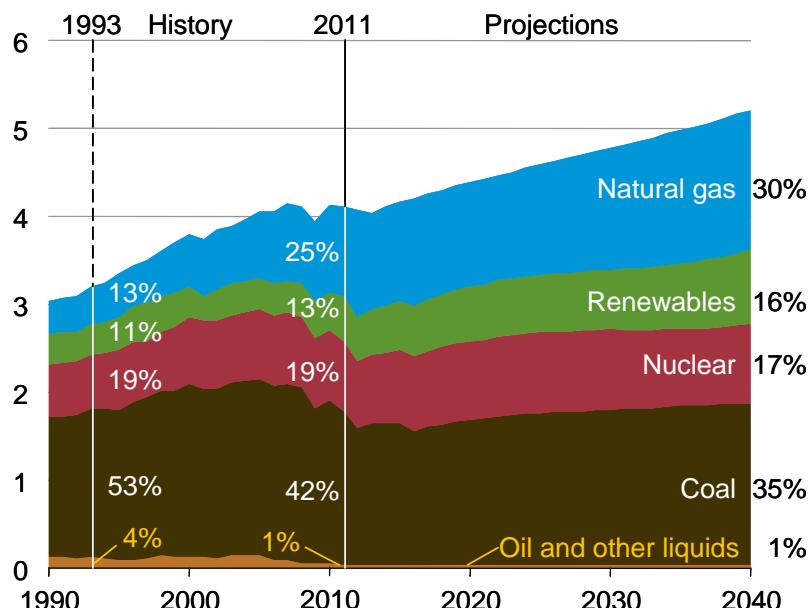
Many factors influence the decisions on renewable energy strategies of individual countries. First and foremost, most renewable energy options involve significant construction and maintenance costs. Second, renewable resources may be located in remote areas where it is both

expensive and inefficient to build adequate transmission. Third, the intermittent nature of resources such as sunlight and wind creates a lack of consistency necessary to supply adequate base load electricity. These reasons help explain why renewable power policies in the United States look different from other countries, and why those of Missouri differ from elsewhere in the United States (EIA, 2011, p. 4; EIA, 2012i).

Overview of United States Energy Production

Until recently, coal has been the single most important resource for generating electricity in the United States. Figure 2 shows that in 2011 coal was used to generate 42 percent of the all electrical needs in the United States, followed by natural gas with 25 percent, nuclear power with 19 percent, and renewables 13 percent (EIA, 2012i; EIA, 2013). However, the abundance of low cost natural gas in the U.S. is leading energy producers to quickly shift towards this fuel (Downey, 2012; Smith, 2012). Even during the unseasonably warm year in 2011, which saw total electricity generation in December fall year over year by seven percent, natural gas production increased by 12 percent and coal-fired generation fell by 21 percent (EIA, 2012a).

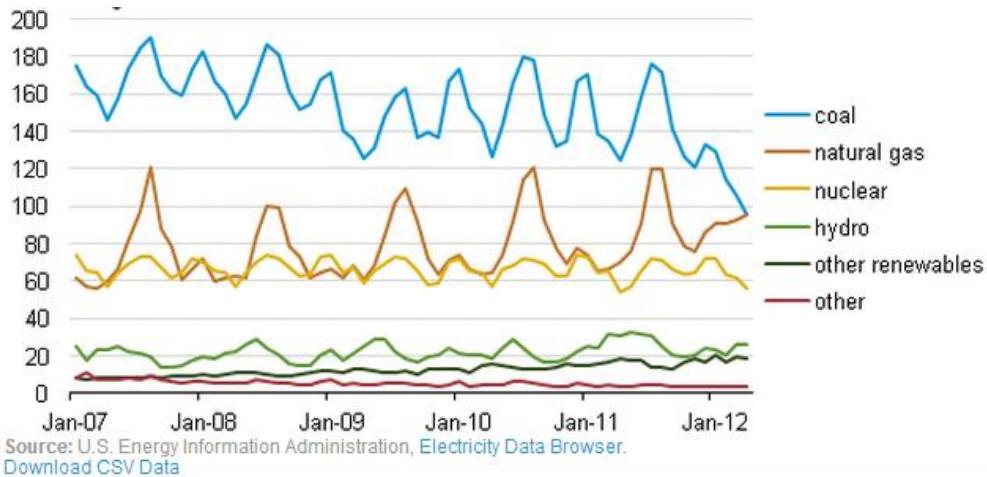
FIGURE 2: ELECTRICITY GENERATION BY FUEL
TRILLION KILOWATT HOURS PER YEAR



Source: U.S. Energy Information Administration (2012)

Furthermore, EIA data (Figure 3) shows that as of May 2012 for the first time the percentage share of electricity generation was the same for both coal and natural gas (EIA, 2012e).

FIGURE 3: U.S. MONTHLY NET ELECTRIC POWER GENERATION
TRILLION KILOWATT HOURS PER YEAR



This shift also reflects the growing public concern over harmful pollutants and greenhouse gas emissions. When compared to coal, natural gas used in the most efficient power plants emits significantly smaller levels of sulfur dioxide and less than half of the amount of carbon dioxide (EIA, 2012n). The U.S. Environmental Protection Agency (EPA) has been formulating several controversial regulations including one to reduce mercury emissions, a cross-state air pollution rule requiring upstream states to curtail emissions, and the first ever greenhouse gas emissions limits for newly constructed power plants (Eilperin, 2012).

It was suggested that the first two regulations would force the retirement of eight percent of U.S. coal-fired capacity, while the greenhouse gas regulation could very well make new coal power plants an impossibility without advances in unproven carbon sequestration technology (Kemp, 2012; Columbia Daily Tribune, 2013). The mercury emission regulation was finalized in 2012, while the cross-state air pollution rule was struck down by the U.S. Appeals Court (Wald, 2012; Volcovici, 2012). Although it remains to be seen what will happen with the greenhouse gas regulation, the direction of the current political climate seems to point toward continued regulation that favors the already economically advantaged natural gas fired power plants.

In an attempt to reduce pollution levels, many states have instituted Renewable Portfolio Standards (RPS) that require a certain percentage of electricity to be generated with renewable resources, including wind, solar, geothermal, biomass, hydro, landfill gas, municipal solid waste and tidal energy. As of 2012, 30 states and Washington D.C. had an enforceable RPS, while an additional seven states had a renewable energy goal (EIA, 2012f). On average, states with an RPS have seen an increase in the amount of electricity from renewable sources; however, it is difficult to know the precise impact of an RPS because federal tax credits have encouraged renewable resource expansion in most states regardless of the presence of an RPS (Wiser & Namovicz, 2007).

Of all electricity used in the United States, currently 13 percent is generated with renewable resources. Although the most common type is hydropower which accounts for over 61 percent of the total, most of the capacity was built before 1975, with very little new capacity added since. Given that large scale hydropower projects require significant capital and face stringent regulatory requirements, there are no plans for new capacity. Rather, most incremental renewable capacity is expected to come from efficiency gains to existing hydro power plants and from wind energy, which now makes up 23 percent of the renewable energy total (EIA, 2013a).

Although not an alternative energy source, one often overlooked opportunity for the United States to reduce both electricity demand and emissions is through improved energy efficiency. The U.S. has encouraged energy efficiency through a variety of educational and incentive-based initiatives. One indication that these efforts may be having some impact can be seen in the average energy consumption per home over the past three decades. Although both the number and size of homes have increased over this time, the average consumption per house has been declining at such a rate that total consumption has remained flat (EIA, 2012h; EIA, 2012l).

Impressive as these energy efficiency gains have been, a recent report by McKinsey Global Energy and Materials group suggests much more is possible. Barriers to large scale efficiency strategies include the large capital outlay, the fragmented nature of the problem given the millions of locations and billions of electrical devices used, lack of focus on those in the economy and the relative difficulty of measurement and verification of savings. However, the report's authors believe that with a fully scaled effort to overcome these barriers to implementation, it would be possible to reduce projected future 2020 demand by 23 percent. Although the investment to realize this efficiency gain was estimated to be \$520 billion through 2020, the expected savings would be \$1.2 trillion, making the investment NPV positive (Granade, Creyts, Derkach, Farese, Nyquist, & Ostrowki, 2009).

Electricity Generation in Missouri

In 2011, coal was the primary fuel used to generate approximately 82 percent of all electricity in Missouri. The second largest provider was the single Callaway Nuclear power plant which produced 9.9 percent of total electricity generated. The remainder of energy was generated by natural gas, hydro-electric, wind and other renewable energy sources (EIA, 2012j).

Conventional hydro power accounts for approximately 50 percent of all renewable energy (EIA, 2012k). Two of Missouri's major hydro-electric generation stations are the Osage system at the Lake of the Ozarks and the White system near Branson. As is the case nationally, the majority of electricity generating capacity was built decades ago, and although expected to continue to generate power into the future, there are no immediate plans for additional large scale development (Ameren, 2013).

TABLE 1: SOURCES OF ELECTRICITY GENERATION (GIGAWATT HOURS) IN MISSOURI 2011¹
ENERGY PRODUCTION IN MISSOURI

	2011 (GWh)	%
Coal	78,316	82.7
Nuclear	9,371	9.9
Natural Gas	4,548	4.8
Hydropower	1,185	1.3
Wind	1,178	1.2
Biomass	62	0.1
Solar	N/A	N/A
Total	94,660	100.0

Source: U.S. Energy Information Administration (2013)

The second largest source of renewable energy in Missouri is wind power. Prior to 2007 there was virtually no electricity generated from wind powered turbines. However, since 2008 it has quickly reached of its current level of 1,178 GWh largely from wind farms clustered in the northwest corner of the state (McEwen, 2006; American Wind Energy Association, 2011; Galbraith, 2009). This rapid increase makes Missouri one of the fastest growing states in wind energy, although this is largely due to the small initial base from which it started.

In November 2008, Missouri became one of the 30 states with a RPS when voters passed a ballot measure changing an existing voluntary renewable energy target to a mandated renewable energy goal of 15 percent by 2021. This new RPS has increasing targets starting from two percent between 2011 and 2013, and then increasing to five percent between 2014 and 2017, 10 percent between 2018 to 2020 and 15 percent in 2021 and thereafter. The RPS also has specific solar power goals starting at 0.04 percent between 2011 and 2013 and ending at 0.3 percent by 2021 and thereafter. Compliance with these requirements can be fulfilled, up to 10 percent, through the purchase of renewable energy credits (REC) and solar renewable energy credits (SREC). Similar to other states with an RPS, there is an escape clause which allows the targets to be adjusted downwards if meeting them would require utility rates to increase rates by more than one percent in any given year (NC State University, 2012a).

The RPS has been the subject of significant political activity since 2008. The first major controversy came after the Missouri Public Service Commission (PUC) issued rules for the RPS. The Joint Committee on Administrative Rules (JCAR) disapproved a section requiring RECs to be bundled, which would have mandated that electricity associated with a purchased REC be delivered to the state. These changes were then voted on and sustained by the legislature. Environmental groups claimed that by removing this requirement, money would flow out of Missouri to purchase unbundled RECs from other states where renewable energy is cheaper to generate. The economic and environmental benefits promised to Missouri would not be realized without an incentive to develop renewable resources inside the state. However, opponents of the geographic sourcing measure said that it went beyond the original ballot measure passed in 2008,

¹ Excludes electricity generated from pumped storage, non-biogenic municipal solid waste, batteries, hydrogen, purchased steam, sulfur, tire-derived fuel, and other miscellaneous energy sources.

lacked flexibility and would have been cumbersome to verify electricity transmission (Beniwal, 2011; Noble, 2011).

Another legislative initiative (HB 44, 2013) that is stimulating debate would allow hydropower from existing facilities owned by Missouri utility companies, or shared under power agreements, to be used to count towards RPS requirements starting in 2018. This would, when combined with the previous changes, enable utility companies to purchase renewable energy credits from older hydroelectric power plants from around the country. Opponents of HB 44 state that this measure will even further weaken the effectiveness of the RPS and reduce any potential for new renewable development to yield economic and environmental benefits for the state of Missouri. HB 44 recently passed the House with a 95 to 46 vote, and is under consideration by the Senate in May 2013 (CBS St. Louis, 2013).

Although it is possible to purchase RECs from other states, Missouri's RPS provides specific incentives for both utilities and customers to generate renewable power locally. For utility companies, any in-state generated renewable power is given a multiplier of 1.25 compared to out-of-state power generation, counting 25 percent more towards RPS compliance. For utility customers, the RPS mandates that utility companies offer rebates of \$2 per watt for customer-sited solar systems of 25KW or less. In addition, the regulation allows utility companies to purchase SRECs from customer-generated solar electric systems to be used towards RPS compliance (NC State University, 2012a).

The Missouri RPS only regulates investor owned companies. As of 2009, these companies accounted for 63 percent of the utility customers and approximately 70 percent of total electricity sales in the state. The remainder receives electricity primarily from either cooperatives or publicly-owned utility companies, neither of which is covered under the existing RPS. Currently the City of Columbia is the only non-investor owned utility provider to adopt an RPS, which has standards very similar to state level legislation, albeit with a maximum utility rate increase of three percent instead of one percent (EIA, 2010; NC State University, 2012). However, even without an RPS mandating targets, it should be noted that the Associated Electric Co-Op Inc., the primary entity with responsibility of generation and procurement for Co-Ops located in Missouri and parts of Iowa and Oklahoma, has sizable renewable energy commitments with a long-term purchase agreement to buy 600 MW of wind energy from farms located in Missouri and Kansas (AECI, 2013; AECI, 2013a).

The Energy Efficiency Investment Act of 2009 encourages Missouri's investor-owned utility companies to implement more energy efficiency programs and limit customer energy use. Given that Missouri is currently ranked 44th out of all other states on an energy efficiency scorecard developed by the American Council for an Energy-Efficient Economy (ACEEE), this legislation has the possibility to drive substantial efficiency gains (Sciortino, Young, & Nadel, 2012; Tomich J. , 2012a). In an initial response to the Act, Ameren invested \$70 million between 2009 and 2011 in efficiency programs, with the results far surpassing their original target by ultimately reducing the demand equivalent of 42,000 homes. However, the manner in which the Act was written provided no method for utility companies to recoup their upfront investment or lost sales of electricity to customers, resulting in losses for Ameren's shareholders. This led to Ameren curtailing funding for the efficiency programs in 2011 (Tomich J. , 2011).

In mid-2012, Ameren proposed a new plan in which the utility customers would directly pay \$145 million through rate increases to fund the energy efficiency program. Ameren estimates that this will create nearly \$500 million in avoided fuel and transmission line construction through the reduction of 800,000 MWh by 2015, and will ultimately lead to lower electricity costs for all customers (Tomich J. , 2012). The Missouri Public Service Commission approved the proposal last year making funds available for energy reduction programs and incentives, thus fundamentally altering the economic model of utility companies from load-growth to energy efficiency (Missouri Public Service Commission, 2012). The implementation of this plan is set to take place starting in 2013.

**TABLE 2: TECHNICAL POTENTIAL AND ESTIMATED LEVELIZED COST BY SOURCE
MISSOURI'S ENERGY POSSIBILITIES**

Source	Missouri Technical Potential ² (GWh)	U.S. Average Levelized Cost (2010 \$/MW Hour) ³
Coal	N/A	97.7
Nuclear	N/A	111.4
Natural Gas	N/A	66.1
Hydropower	7,198	88.9
Wind	689,519	96.0
Biomass	13,986	115.4
Solar	5,381,975	152.7

Source: National Renewable Energy Laboratory (2012); U.S. Energy Information Administration

Coal

Missouri's largest producer of electricity, Ameren, has to date tried to defer some costly power plant upgrades necessary to achieve compliance with EPA standards by using lower sulfur emitting coal. In 2011, the company placed an order to purchase 91 million tons of coal from Peabody's Wyoming Powder River Basin to supply the company with low sulfur coal through 2017 (Tomich J. , 2011a; Volkmann, 2011). However, the expectation is that the recent mercury regulations finalized in 2012, to be phased in over the next three years, will cost the company hundreds of millions in plant upgrades to meet the strict 90 percent reduction in emissions (Tomich J. , 2011). In spite of these new regulations, Ameren has no plans to close coal plants in Missouri, and coal is expected to remain an important source of electricity for the state of Missouri in the immediate future.

² Technical potential factors in system/topographic constraints, land-use constraints and system performance constraints; however, it is not to be confused with economic or market potential which would include other assumptions related to technology costs, fuel costs, regulation and competition.

³ Estimated costs for plants entering service in 2017.

Natural Gas

Although the economics are more favorable for new natural gas plants when compared to coal by \$31.6 per MW hour, there is no evidence of a rapid shift towards this fuel source in Missouri (EIA, 2012c). However, regulatory pressures against the use of coal combined with continued low natural gas prices will make the gradual shift towards natural gas an almost certainty over the coming decades. It is very likely that natural gas will be the preferred energy source for power generation and will continue to compete for market share not only with existing coal plants, but also with nuclear power and renewable energy (Ameren, 2012, p. 43).

Nuclear Power

There has been little nuclear development in the United States in the past 30 years. This lack of new capacity is largely driven by both the perception of the technology and the economics of plant construction and operation when compared to alternatives (Biello, 2011; Joskow, 2006, pp. 1-2,22). Although there has been no new development in Missouri, exploration of additional capacity occurred recently in 2008 when Ameren sought Nuclear Regulatory Commission approval for the construction of a 1600MW reactor next to the existing Callaway plant near Fulton, Missouri (St. Louis Business Journal, 2008). The high cost of construction and legislation preventing Ameren from charging customers for new construction before a new power plant is brought online, caused the company to withdraw the proposal (Ganey, 2009).

Prospects of new nuclear power were recently reignited when Ameren partnered with Westinghouse in mid-2012 to bid for \$452 million in federal funds for the design and construction of five small modular nuclear reactors (SMR) capable of producing 225MW. There is significant interest in these reactors because their small size would require less on-site construction and have greater containment capabilities. Critics of the plan argued that the cost per kilowatt hour of the new plant would exceed that of not only coal and natural gas, but other renewable energy options. Proponents hoped that such a development would position Missouri as a worldwide producer and exporter of SMRs (Hancock & Everly, 2012). Even though the Ameren-Westinghouse bid was not awarded in the first round of funding, Westinghouse recently submitted a letter of intent to respond to the second round of funding announced by the U.S. Department of Energy to be awarded in September 2013 (Break Bulk, 2013; Famuliner, 2012; St. Louis Business Journal, 2012).

Another consideration beyond the economic cost of new nuclear power plant construction is the ongoing dilemma on what to do with nuclear waste from spent fuel rods. When the nuclear industry began, on-site storage of spent nuclear fuel rods was viewed only a temporary solution before being shipped away for reprocessing (Hileman, 1982). Half a century later, the U.S. Department of Energy is still searching for an adequate location for permanent storage, with much focus historically placed on Yucca Mountain, Nevada. However, the current administration declared this site unworkable for long term nuclear waste storage. Given that approval for additional temporary storage seems tenuous without agreement on a long-term storage site, it is unlikely that either will be approved in the near future (US NRC, 2002; Tracy, 2013). In light of the future uncertainty, many states of have passed legislation restricting the development of new nuclear power without the identification technology allowing for

reprocessing or disposal (Hendrick, 2010). If Missouri does intend to increase nuclear capacity to meet its future energy needs, long-term waste storage will become an even more critical consideration.

Beyond waste storage, an additional area of concern for nuclear power is that of safety. A 2013 report by the Union of Concerned Scientist argues that the Nuclear Regulatory Commission (NRC) has a history of failing to enforce critical safety measures, a culture that discourages employees from raising safety concerns, and a general disconnect between senior management and the rest of the organization regarding its safety culture. Although the United States has been fortunate to date and avoided any nuclear accident with the severity similar to Chernobyl or Fukushima, in 2012 alone there were fourteen ‘near-miss’ events, each which increased the chances of core reactor meltdown by at least ten times. Every future such event that occurs without effective regulatory oversight by the NRC increases the risk of severe nuclear disaster (Lochbaum, 2013).

Hydro-electric Power

Regulatory hurdles and environmental impacts of large scale dams make smaller “run of the river” or “low head” options more likely candidates for development. An older U.S. Department of Energy directed study identified 29 sites in Missouri with hydropower potential. These sites included a mix of already developed, developed but untapped and undeveloped locations. Although in total 697MW of potential capacity was identified, high environmental costs reduced this potential by half (Tarlock, 2012; Francfort, 1993).

In a follow-up assessment by Ameren in 2011, 25 of the 29 initial sites were omitted as viable locations due to regulatory and/or environmental constraints. Of the four remaining sites, one was a developed site which had efficiency improvement potential while the other three were undeveloped. If all four were to be developed completely, the maximum predicted capacity would be 25MW, or approximately 95,000 MWh per year. The costs per kilowatt hour would average between two to three times the current Missouri price of electricity of 7.1 cents per kilowatt hour (Missouri Department of Natural Resources, n.d.; Ameren, 2012, pp. 8-11).

Solar Power

Historically solar power has not played a significant role in electricity generation in Missouri due to extraordinarily high costs of the technology. Although the state has over 200 sunny days per year and relatively favorable solar resource potential, unless there are continued reductions in the price of the technology, utility-scale developments to harness this resource seem unlikely. It is much more probable that smaller growth in this sector will be driven by customer-level installations encouraged by favorable tax and depreciation incentives offered by the federal government (Ameren, 2012; Missouri Partnership, n.d.).

Wind Power

Recent reports from the National Renewable Energy Laboratory show Missouri accounts for approximately 2.5 percent of total wind potential in the United States. Specifically, it currently ranks 14th among states in installed wind capacity. Logistical and economic considerations aside, this capacity could power over nine times the current electricity needs of the state of Missouri. If even a small fraction of the total potential could be harnessed for a reasonable cost, wind energy has the potential to substantially move the needle on Missouri's renewable resource goals (American Wind Energy Association, 2012; National Renewable Energy Laboratory, 2012).

A serious barrier to the development of new wind farms both in Missouri and the U.S. at large is the expiration of generous federal subsidies. It was expected that the loss of such subsidies would slow dramatically wind farm development beginning in 2013 after massive build out at the end of the 2012 (Chen, 2012). However, as part of the bi-partisan deal signed at the beginning of 2013 to avoid the fiscal cliff, the wind industry will receive \$12 billion in subsidies over the next 10 years in the form of production and investment tax credits for any project started in 2013. Sustained growth beyond 2013 will likely be dependent on continued large federal subsidies and the installation of additional transmission lines (Schwartz & Wald, 2013).

Both wind and solar power are intermittent in nature, making them unsuitable for base load usage. One recent study showed that for wind in particular, pollution levels can increase more than if the renewable resources were not used at all. This surprising outcome happens because with sufficiently large wind capacity, nighttime electricity generation can become so significant that coal-fired plants have to cycle down to accommodate the generated power. Coal-fired plants become much less efficient when operating at a lower capacity, and produce more SO₂ and NO_x emissions. These findings suggest that storage capacity and/or use of more efficient combined cycle natural gas power plants should be an important consideration when building significant amounts of new wind capacity (Bentek Energy, LLC, 2010).

Missouri's Next Steps

The base load power generation in Missouri will be met by either coal or natural gas in the near and intermediate future. The particular mix of fossil fuels will largely be dictated both by the price of natural gas and future EPA emissions regulations. Although Missouri has little ability to control either, with the passage of the RPS the state does have a commitment to lowering emission levels while at the same time diversifying away from fossil fuels and towards renewable resources.

The two largest debates around Missouri's push towards renewable resources include the decisions to allow unbundled RECs and existing hydropower to be used towards RPS targets. Although critics claim that unbundled RECs simply send money out of the state and deliver little economic development, the reality is that an open and well-managed REC market would provide states with a more flexible and cost-effective method of achieving RPS standards. By including existing hydroelectric power, critics argue, that development in renewable resources will be lower. Although likely correct, determining and tracking eligibility of renewable resources and

purchased unbundled RECs would be cumbersome to enforce. A more logical approach would be simply to raise the overall RPS targets.

To help continue the progress that Missouri has made so far in its use of renewable energy, the state should first consider modifying the existing RPS to make it more inclusive and also to expand incentives for in-state renewable energy development to promote energy diversification. Given that cooperatives and municipalities provide a significant portion of the state's electricity needs, it is reasonable that they also should be bound to the RPS. The exact renewable energy targets need not be the same, and could be tailored to account for entity size, as is the case with the Colorado RPS which has lower guidelines and exemptions for municipalities serving fewer than 40,000 customers (NC State University, 2012b). In addition, to encourage further energy diversification through development of renewable resources within state lines, legislators might explore either increasing the 1.25 multiplier on in-state generated power, or reducing the percentage of compliance that can be met with RECs (currently at 10%). Either of these options would promote more renewable resource development within the state, while at the same time providing flexibility to find the most cost-effective option.

Finally, to help facilitate further investment of in-state renewable energy, it will be important to explore cost-recovery options for utility companies. Significant costs often exist both in facility development and construction of transmission lines from those facilities to the main grid. Using the recent energy efficiency initiative as a model, utility companies might be given the opportunity to claw-back investment costs upfront thus removing a significant barrier to investment in renewable resources.

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