



REPORT ON

Ameren Missouri's Smart Energy Plan

2.14.2019



AMEREN MISSOURI'S SMART ENERGY PLAN



A Brighter Energy Future for Ameren Missouri Customers

Electricity is a fundamental part of everyday life. As a stronger and smarter energy grid becomes even more vital to our quality of life, reliability and affordability remain those constants that are critically important to our customers and the communities we serve. At the same time, technology is changing the way energy companies and the energy grid will operate in the future, requiring a refocus on implementing innovative energy solutions to continue to deliver true value for our customers.

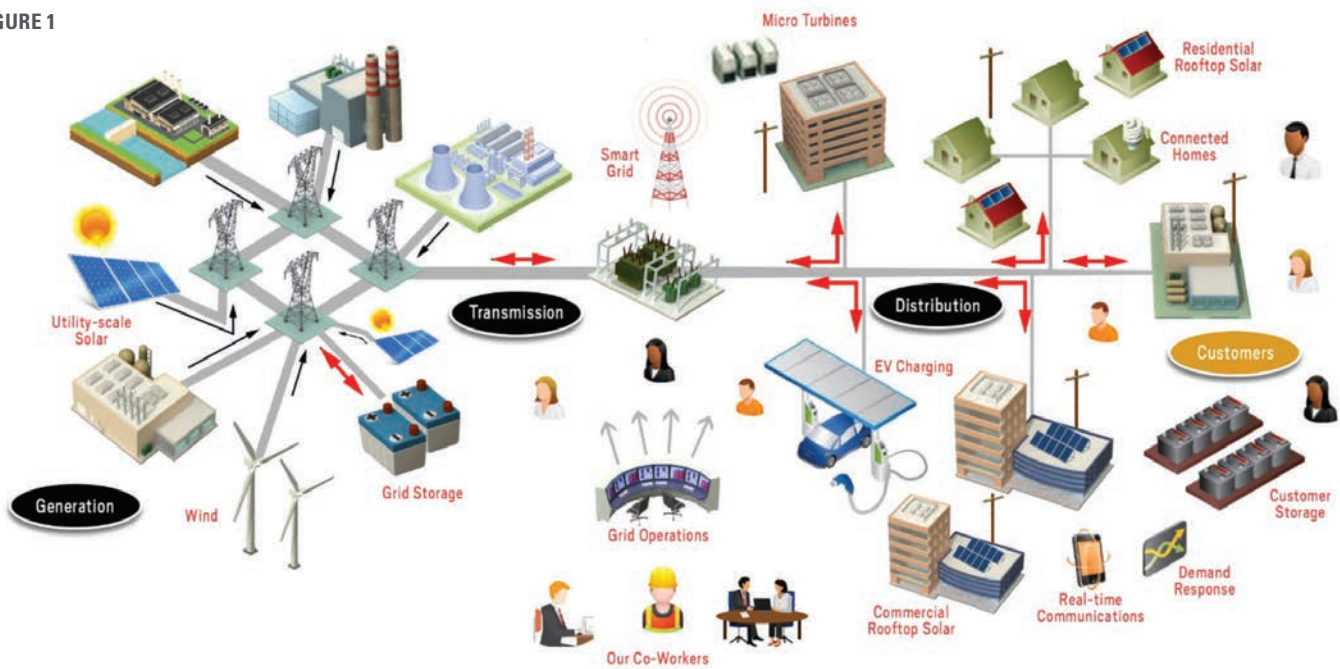
What is driving the transformation? Today's energy grid remains much the same as it has for the past 100 years. Electricity generally flows one way – from the generation source to the transmission and distribution system and then to the customer. But to meet future needs for cleaner energy and distributed energy resources, the grid must become bi-directional, or flowing to and from our customers and generation sources. Electrification of the transportation and industrial sectors will improve the efficient utilization of the grid while significantly benefiting the environment. Rising customer needs and expectations for greater energy

reliability, security and control over energy usage requires us to innovate and upgrade our system. Changing customer needs challenge us to introduce specialized products and services that give customers greater control over their energy usage.

At Ameren Missouri, we are imagining the future. We see a brighter energy future for our customers, the communities we serve and our co-workers. We envision a modernized energy grid that will be more reliable, resilient and secure – enabled by investments throughout the state that will benefit Missouri families and businesses.

THE INTEGRATED GRID OF THE FUTURE

FIGURE 1



And we have a plan. It's called **Ameren Missouri's Smart Energy Plan**. In 2018, the Missouri legislature, energy companies, customers, business organizations, and Missouri leaders collaborated on passing landmark energy legislation (Missouri Senate Bill 564) that modernized Missouri's energy policies, enabling the Smart Energy Plan. This forward-looking plan is designed to upgrade the electric grid and bring significant benefits to customers for decades. The plan includes \$5.3 billion of electric and \$1 billion in wind investments from 2019 through 2023 that will, among other things, accelerate our investment in smart grid technologies and renewable energy as we build the grid of the future, all while keeping electric rates stable and predictable through the state's first-ever rate caps. The plan also accelerates smart energy infrastructure construction that will drive job creation and economic development in Missouri.

At the core of the Smart Energy Plan is transforming the grid to ensure customers have safe, reliable and increasingly cleaner energy to meet their growing needs and expectations. To support continued affordability, Missouri Senate Bill 564 enabled a 6 percent decrease in customer rates due to federal tax law changes. That's why in August 2018, customers' rates decreased approximately 6 percent; customers also will benefit from a base rate freeze with no changes before April 2020, and a 2.85 percent compound annual growth rate cap on electric rate increases.

In addition, communities and residents across the state benefit through a special economic rate incentive in this law that

positions Ameren Missouri as an active partner in the effort to attract new businesses to Missouri and encourages existing businesses to grow and expand. Within months of the law passing, Quaker Window Products announced a \$65 million expansion, which in turn will create more than 300 quality jobs in Eldon, Missouri. New and expanding businesses bring jobs and more stable electric costs for all customers by spreading out the fixed costs all customers pay.

Ameren Missouri aims to "lead today to transform tomorrow" by building a bright energy future for our customers. To this end, the upgrades we make, enabled by the Smart Energy Plan, are focused on improving the quality of life for the Missouri families, businesses and communities we serve.

As expectations, technology and innovation change the way customers think about, use and purchase electricity, the grid will continue to be at the center of value creation for our customers, communities, shareholders and co-workers. Ameren Missouri's plan to upgrade the energy infrastructure will enable a grid that meets customers' evolving needs long into the future. The Smart Energy Plan will also bolster the infrastructure to support a portfolio of projects to meet a significant portion of our customers' needs through cleaner generation. This includes the planned addition of at least 700 megawatts (MW) of wind generation by 2020, as well as 100 MW of solar generation by 2027. Solar energy will be delivered through utility-scale installations as well as the Community

SMART ENERGY PLAN PRINCIPLES

FIGURE 2



Solar pilot project involving a new solar energy facility at St. Louis Lambert International Airport and a partnership that allows businesses to host Ameren Missouri-owned solar generation at their locations. Customers are also taking advantage of \$28 million in solar rebates to install private solar generation on their homes and businesses. These initiatives will help enable Ameren Missouri to meet our commitment to reduce carbon emissions 80 percent by 2050, based on 2005 levels, and fulfill our customers’ desire for cleaner energy, as witnessed through Missouri’s Renewable Energy Standard, which voters approved by a wide margin in 2008.

Implementation of the Smart Energy Plan

The electric grid of tomorrow will be more complex. We expect that the traditional central station generation, transmission and distribution system will evolve into the Integrated Grid, which will

incorporate increasing levels of distributed energy resources and customer interfaces (e.g., connected devices and homes, electric vehicles), all working together in a coordinated, bi-directional fashion to continuously and reliably maintain the balance between resources and demand, as seen in Figure 1.

Based upon our vision of the Integrated Grid, Ameren Missouri has developed guiding principles to drive implementation of the Smart Energy Plan, as shown in Figure 2.

Upgrades in safety, security, reliability and resiliency throughout our service territory are the foundation of our Smart Energy Plan.

Ameren Missouri is implementing over 2,000 Smart Energy Plan projects to provide customers with improved safety, security, reliability and resiliency, while also committing to keeping





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rates stable and predictable. As we upgrade and harden the electric grid, we will continue to ensure robust cybersecurity protections and controls.

The following are examples of some of the strategic actions we will take on behalf of our customers to ensure a safe, secure, reliable and resilient grid:

- Automate the electric distribution system. To help isolate problems and restore customers more quickly following storms and other power interruptions, we will deploy switching devices and accompanying communications technologies to build self-healing power lines. These devices are designed to significantly reduce the length of outages.
- Harden the electric distribution system. A stronger, more secure energy delivery backbone will better withstand severe weather. This includes 12,000 new utility poles for storm hardening, many fortified with composite materials and stronger equipment.
- Measure and track momentary service interruptions. Many of our business customers cannot accept even momentary interruptions in their operations, so we are making investments to reduce these types of outages to improve the reliability of their service.
- Upgrade aging and under-performing assets (e.g., substations, overhead and underground). As part of our plan, we will target upgrades to the worst-performing circuits annually across our service territory to improve service reliability for our customers. To make the grid operate more efficiently, we plan to standardize Ameren Missouri's various distribution voltages at the 12kV level, streamlining a system that currently has varying voltages. This will improve system capacity, increase reliability for customers and control ongoing costs, a benefit to our operations and our customers. Our plan also features more than 70 new or upgraded substations to increase energy service reliability and serve



Martin Luther King substation.

more customers through a streamlined network that is more cost-effective and efficient.

- Enhance our underground revitalization program. Developing a strong and secure underground system is vital to being able to serve expanding business districts and residential customers. We plan to enhance our underground revitalization program by upgrading infrastructure and incorporating route diversity and smart grid sensor technology into our operations, which will lead to higher levels of reliability, real-time information and faster response times to customer outages.
- Employ smart grid technologies (e.g., relaying, monitoring, fault information, communications) as we upgrade existing and install new substations. By upgrading existing substations and consolidating and building new substations, customers will experience higher reliability, better customer service and more stable rates through controlled cost management. Ameren Missouri has developed a comprehensive substation asset management plan that strategically targets upgrading assets with inherent reliability problems that cannot be cost-effectively controlled with predictive or preventive maintenance practices. We are analyzing the layout and design of our substation fleet to optimize the system, which will reduce the overall number of substations by 5-10 percent in the long term. Doing so will improve

the quality of their operations and better control fleet maintenance costs.

- Develop a communications network to monitor and enable analytics from connected grid devices. To enable the grid of the future, the system requires a smarter, stronger and more secure communications network with far greater bandwidth. Our plan is to develop a wireless footprint statewide, starting with the St. Louis metropolitan area. Initially we are expanding our fiber network to 50 distribution substations by installing what's known as a private "Long Term Evolution" (LTE) cell site. This expansion will provide a uniform, private cellular network to operate the additional required distribution automation switches and will provide better real-time system operational information. In the future, this network could be expanded to other areas with higher customer density such as Cape Girardeau and Jefferson City, where communications infrastructure may become saturated.

Our plan revolves around our commitment to deliver distinctive value to our customers and the communities we serve.

We are working to foster a "customer-first" mindset, one in which we always put the customer first in the way we design, operate and maintain our electric infrastructure and serve our customers. To do this, we seek to deeply understand our residential and business customers, their energy needs and their expectations.



Ameren Missouri is partnering with Missouri University of Science and Technology at the campus' EcoVillage living laboratory.

To ensure we deliver on our customer-first commitment in an affordable manner, we will implement the following strategies:

- Develop and promote customer adoption of new online and mobile products and services such as enhanced text and email alerts for outage updates, usage thresholds and other interactions as well as new billing and payment options.
- Ensure our co-workers are properly trained and deliver on our customer service expectations.
- Provide commercial and industrial customers with nationally competitive service through greater collaboration concerning their operations and specific needs.
- Transform Ameren Missouri's digital landscape with new co-worker tools and technologies to better serve our customers in the field and in real-time.
- Offer customers greater visibility into their usage, through smart meter-enabled data that will provide enhanced alerts and more flexible energy management options.
- Provide additional energy efficiency products and services to low-income communities.
- Manage our costs wisely to drive efficiencies that benefit customers and deliver long-term value to them.

- Proactively approach existing and potential customers with economic development and electrification opportunities to help optimize their operations.
- Upgrade the electric system to enable a fully integrated grid where central station generation, transmission, distribution, distributed energy resources and customers all work together in a coordinated fashion to provide cleaner energy and a more reliable grid.

Provide our customers with more choices and meet their evolving energy needs by enabling a smarter grid that supports the bi-directional flow of electricity.

Customers' energy needs and expectations are changing. We must transform the grid to meet those needs. It will require bi-directional energy flows to accommodate distributed energy resources and other connected devices. The Smart Energy Plan provides coordination among various grid devices and our customers to enable the two-way flow of electricity and information. We will also continue to work collaboratively with regulators and legislators to ensure positive energy policies are in place to support the grid of the future and our ability to deliver on our customers' evolving energy needs. Listed below are a few examples of our strategic focus areas:

- Leveraging lessons learned from smart meter deployments in Illinois, design and implement Advanced Metering

Infrastructure (AMI) across our service territory. To provide customers with greater control and visibility into their usage, new smart meters will be installed that provide enhanced customer alerts and more flexible energy management options. Ameren Missouri was one of the first utilities in the country to install Automated Meter Reading (AMR) technology across our system more than 20 years ago to help maintain customer affordability. While AMR has provided benefits to our customers, it doesn't allow for two-way information flow and can't provide real-time information to our customers. Smart meter technology will also facilitate better storm response, faster service restoration and the ability to remotely reconnect services, which will all lead to greater efficiencies and contribute to customer affordability.

- Design and upgrade sub-transmission circuits to enable distributed energy resources, meet new energy standards and enhance reliability. To enable two-way energy flow and to strengthen the system against storms as we increase overall system reliability for customers, we are employing a system-hardening strategy with the goal of upgrading the least reliable sub-transmission circuits across the Ameren Missouri service territory.
- Develop a pilot portfolio to test microgrid, net metering inverters and other technologies to better understand the future grid and potential customer impacts. We plan to work with customers and universities to develop a test facility with a working microgrid and applicable technologies, so we can evaluate the benefits associated with these devices and how they can best be integrated into the energy grid.
- Develop and refine sub-transmission system models and real-time contingency analysis. Develop a sub-transmission system model for the Ameren Missouri energy grid and utilize that model to assist customers in implementing distributed energy resources and bi-directional flow across our system. This model will also enable real-time contingency analysis to help system operators make better switching decisions, provide faster storm response and enhance customer reliability.

Our goal is to deliver on our promises and provide value to our customers, shareholders, communities and co-workers by managing resources effectively.

- Utilize established governance structure to implement the Smart Energy Plan. We have implemented a formal planning process for all Smart Energy Plan projects. This includes a project management organization, collection

and internal reporting of capital investment and operations and maintenance (O&M) expenditures, forecasting, and a formal resource allocation process to become more agile at supporting customer needs. We have developed a customized Smart Energy Plan dashboard that tracks the total capital spend, capital investment by ZIP code, the number of customers by operating center and spend by category. In addition, we will monitor customer counts, revenue, outages per customer and average outage duration to track progress as we implement the plan. In addition to the customer and reliability benefits these projects provide, upgrades to the grid will also assure improvement in annual operations and help control O&M expenses for the benefit of our customers.

- We will meet our commitments by creating and adhering to consistent operational and design standards, including cyber protections and controls. To ensure efficiency and effectiveness in executing Smart Energy Plan projects, Ameren Missouri will utilize system-wide design standards, verify consistency with technology requirements and customer communications protocols and proactively identify and address any project not executed to those standards. We will do this by tracking the status of all approved Smart Energy Plan projects and establish transparent internal reporting and escalation processes. We will also perform select post-construction audits to confirm work was done to standard.

CONCLUSION

As Missourians navigate our rapidly transforming world, they are counting on a grid that is robust, flexible, safe, resilient, secure, and able to facilitate two-way flows of energy to accommodate more renewable energy, distributed energy resources and innovative products and services. In light of the fact that Missouri's electric infrastructure was largely built in response to the economic and industrial growth of the 1950s, '60s and '70s, it's time to upgrade to the smarter, integrated grid of tomorrow, today. That is Ameren Missouri's plan.

This plan will meet our customers' desire for stable and predictable rates, a smarter energy grid that is even more reliable, flexible and secure, new sources of clean energy and more tools to manage their energy usage. Through this plan, we will transform the energy grid of today to power their quality of life for generations to come, as we build a brighter energy future for Missouri.