ATTACHMENT A
Building a Smarter Energy Grid for the Future

Distribution[1, 2]:	Customer Benefits:	Years				
		2018	2019	2020	2021	2022
Aging Substation Infrastructure Investment	Replacing aging, end-of-life substations will result in far fewer customer outages due to failed equipment. Modern designs will be installed which will prevent violent failures and equipment misoperations, both of which result in lengthy outages for thousands of customers. The new equipment is expected to require less maintenance, reducing costs to customers. The smart equipment installed in modern substation designs also improves operations, enabling faster and less costly restoration of outages when they do occur.	$ 10	$ 30	$ 35	$ 40	$ 60
Downtown St. Louis Underground Grid Revitalization	Replacing the aging power cables, conduit, and manholes in the St. Louis downtown underground grid will prevent the catastrophic failures and outages to the 100,000+ downtown customers that may occur as equipment ages beyond its useful life. This investment will result in a more robust and reliable downtown grid that will experience very few failures and outages. The investment also enables implementation of smart devices which automatically restore power to customers when outages do occur, reducing the outage duration from multiple hours to a few seconds.	$ 5	$ 10	$ 10	$ 10	$ 10
Smart Meter Program	Replacement of the 1990s technology Automated Meter Reading (AMR) system with modern Smart Meter technology will reduce customer costs associated with metering customer energy usage. The present AMR system is maintenance intensive and is facing obsolescence, which results in high maintenance costs borne by customers. Smart meter technology also enables customers to better manage their energy usage and reduce their energy bill by providing customers more information about their energy usage. Smart meter technology enables the utility to provide better outage response and more seamless implementation of Distributed Energy Resource technologies. It could also provide benefits to customers in the form of pre-pay options, and reduced disconnect/reconnect charges which impact low-income customers.	$ 80	$ 80	$ 80	$ 80	$ 23
Distribution Automation upgrades	Investment in distribution automation will enable installation of modern technology smart devices on distribution power lines to meet the increasing expectations of customers. Installation of smart switches will enable automated restoration of customers who experience outages, reducing outage duration from multiple hours to a few minutes. Installation of faulted circuit indicators enables fast identification of the location on a circuit where a repair needs to be made, also enabling reduced outage duration. Installation of smart capacitor controls enable voltage swings experienced by customers to be eliminated and enhances the energy efficiency of the distribution system.	$ 2	$ 3	$ 7	$ 7	$ 13

Storm Hardening	Investment in storm hardening projects will enhance the distribution system in withstanding the physical forces associated with severe thunderstorms and ice storms. 1) Distribution lines that cross major highways and roads will be rebuilt with stronger structures or bored and installed underneath the highway. This will eliminate lengthy outages to customers and disruption to the community due to multi-hour traffic delays on major roads associated with failures of highway crossings during severe storms. 2) Major sub-transmission line structures will be modified with new designs which are more compact and have less hardware. These structures and are more reliable during high winds and more aesthetically appealing compared to traditional wooden crossarm designs. 3) Replacing fuses with reclosing devices at key locations on the distribution system will greatly reduce the duration of and the cost of responding to many storm related customer outages. Many customer interruptions are caused by temporary problems such as a branch coming loose from a tree and making contact with a circuit as it blows clear of the circuit. In this case, a fuse blows and must be manually replaced before customers' power can be restored. Installation of automatic reclosing devices on these circuits would allow restoration of these outages without requiring a manual response, reducing the outage duration to a few seconds, and reducing costs borne by customers 4) Convert overhead circuits to underground in locations that are prone to frequent outages due to exposure to dense woods and tall trees.	**$ 3**	**$ 3**	**$ 6**	**$ 6**	**$ 10**
Customer Service Self-Serve Technology Upgrade	Investing in customer self-serve technologies will provide customers with more personalized, low-effort interactions. It will also allow Ameren Missouri to provide more proactive communications to its customers.	**-**	**$ 1**	**$ 2**	**$ 2**	**$ 14**
Replace End of Life Overhead Conductor (#6 Copper)	By replacing end of life, brittle # 6 Copper wire, customers will benefit from improved reliability. Customer interruptions related to tree contact breaking this brittle wire will be greatly reduced. Upgraded wire will be more robust, less prone to failures, and enables the distribution system to integrate more Distributed Energy Resource technologies.	**-**	**$ 3**	**$ 5**	**$ 5**	**$ 10**
Total		**$100**	**$130**	**$145**	**$150**	**$140**

Transmission[1,2]:	**Customer Benefits**:					
Rebuild the Cape switching station and Viaduct bulk substation at a new joint location to avoid flood exposure. 161kV to be breaker and a half. (Cape ~1951, Viaduct ~1953)	Current flood control measures will not protect against major floods at this site. These stations are also vulnerable to seismic events. Current funding doesn't allow these high-impact / low-probability events to be addressed. Upon completion of this project, customers in southeast Missouri will not be subject to potential outages or rotating outages caused by major floods, securing the supply for residential, commercial, and industrial customers. The new station will also be designed to better withstand seismic events.	-	$ 17	$ 25	$ 8	-
Build 138kV 3-position ring bus with a 161/138kV transformer at Miller substation. Build a 161kV 4-position ring bus at Zion. (Miller ~1945, Zion ~1967)	This project will increase the reliability of central Missouri including the Jefferson City area. The new substation design increases resiliency when short-circuits occur and provides isolation points for service restoration. The new circuit breakers which will be installed as part of the ring bus projects will be equipped with smart diagnostics and advanced relaying that will allow faster detection of problems and thus restoration.	$ 11	$ 4	-	-	-
Construct 138kV breaker station at Carrollton substation. (Carrolton ~1978)	This project will increase the reliability of the northwest St. Louis County area. The new substation design increases resiliency when short-circuits occur and provides isolation points for service restoration. The new circuit breakers which will be installed as part of the project will be equipped with smart diagnostics and advanced relaying that will allow faster detection of problems and thus restoration.	-	-	-	-	$ 5
Install 138kV 4-position ring bus at Lakeside substation. (Lakeside ~1983)	This project will increase the reliability of the Lake of the Ozarks area. The new substation design increases resiliency when short-circuits occur and provides isolation points for service restoration. The new circuit breakers which will be installed as part of the ring bus project will be equipped with smart diagnostics and advanced relaying that will allow faster detection of problems and thus restoration.	-	-	$ 1	$ 7	$ 9
Relocate the existing 138/34kV Page substation to the new Bugle site. 138kV to be built as breaker and a half arrangement. (Page ~1917)	The current Page substation was an original hub in the transmission system development linking the Osage Plant, the Keokuk Plant, and the customer load in St. Louis. As electrical demands grew, Page continued to serve as an important hub to the St. Louis region. But those additions did not address the condition of the facility. This project will rebuild the capability of Page at a new site (because service must be maintained at Page during construction) so that customers in the St. Louis area can be assured of a reliable supply of electricity. With this rebuilding, advanced relay, control, and communication will be installed that provide smart grid analytics, high speed protection, next-generation physical security, and fiber optic capabilities.	-	-	-	$ 10	$ 20

Install 138kV 4-position ring bus at Lemay substation. (Lemay ~1958)	This project will increase the reliability of south St. Louis City and County. The new substation design increases resiliency when short-circuits occur and provides isolation points for service restoration. The new circuit breakers which will be installed as part of the ring bus project will be equipped with smart diagnostics and advanced relaying that will allow faster detection of problems and thus restoration.	**$ 10**	**$ 5**			
Install optical ground wire on existing transmission lines.	Smart grid is driven by data. The installation of optical ground on these lines will bring high-speed communications to the electric supply points and form part of a larger, robust communication network which will allow the needed information to flow bilaterally from customers and distributed energy resources back to Ameren systems and control room operators to assure reliability in the 21st century grid.	**$ 4**	**$ 4**	**$ 4**	**$ 5**	**$ 6**
Accelerate replacement of aging transformers, circuit breakers, relays and instrument transformers at existing substations across Ameren Missouri before equipment reaches end-of-life.	The current framework is run-to-failure and a significant number of customer outages are caused by substation equipment failures. Transmission substation outages due to equipment failure are often long-term and can lead to widespread customer outages, and proactive replacement of aging assets will reduce the number of such outages. Additionally, new devices supporting a smarter grid with increased diagnostics and capabilities will be installed. In some cases, the devices being replaced are oil-filled and thus this project would reduce environmental exposure. In addition, proactive replacement will help mitigate future increases in maintenance expenses.	**$ 10**	**$ 10**	**$ 10**	**$ 10**	**$ 15**
Total		**$ 35**	**$ 40**	**$ 40**	**$ 40**	**$ 55**

Sustainable Energy, Micro-Grid & Vehicle/Equipment Electrification[1,2]:

Solar Partnerships		**$ 10**	**$ 10**	**$ 10**	**$ 10**	**-**
Micro-Grid Projects		**$ 10**	**-**	**$ 10**	**-**	**$ 10**
EV Charging, Metro Link EV, Industrial Equip. Electrification		**$ 5**	**$ 8**	**$ 10**	**$ 10**	**$ 10**
Universal Solar (Montgomery)		**-**	**-**	**-**	**-**	**$ 30**
Total		**$ 25**	**$ 18**	**$ 30**	**$ 20**	**$ 50**

	Years					
	2018	**2019**	**2020**	**2021**	**2022**	**Years 1-5 Total**
Investment Supportive Regulatory Framework Incremental $s (M) - TOTAL:	**$160**	**$188**	**$215**	**$210**	**$245**	**$1,018**

1) Additional beneficial incremental investments have been identified in years 1 through 5 for distribution, transmission and sustainable and innovate energy technologies of approximately $1.9 to 2.0 billion.
2) Additional beneficial incremental investments have been identified in years 6 through 10 for distribution, transmission, and sustainable and innovative energy technologies of approximately $1.6 to. 1.7 billion.