Ameren TRANSMISSION

PJM RTEP – 2014-15 Long Term Project Proposal:

AP South and AEP - DOM Congestion

Submitted by:

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A. Executive Summary

A.1 Introduction

Ameren Transmission Company of Illinois, Inc. ("ATXI") is pleased to provide this proposal to PJM Interconnection LLC ("PJM") in response to the PJM RTEP 2014-15 Long Term Project Proposal Window to resolve the congestion on both the AP South Interface and the AEP-DOM Interface. This proposal details ATXI's solution to relieve congestion identified in PJM's Problem Statement and Requirements Document, dated October 30, 2014. ATXI is a transmission development subsidiary of St. Louis-based Ameren Corporation (NYSE: AEE). Ameren Corporation is among the nation's largest investor-owned electric and gas utilities with more than $20 billion in assets.

Ameren Corporation serves 2.4 million electric customers and more than 900,000 natural gas customers across 64,000 square miles in Illinois and Missouri. Ameren prides itself on a long, successful tradition of financial strength, cost containment and low rates, as well as more than 100 years of uninterrupted cash dividend payments to shareholders. Ameren has three subsidiaries which are transmission-owning members of the MISO.

- ATXI was formed in March of 2006 to develop, own, construct, acquire, operate, lease and otherwise manage Ameren's strategic investment in electric transmission infrastructure.
- Ameren Missouri is a vertically integrated utility that has provided electric and gas service in central and eastern Missouri since 1902.
- Ameren Illinois has been delivering electric and gas service to its customers throughout southern and central Illinois since the early 1900s.

Between 2004 and 2013, Ameren, through its transmission-owning subsidiaries, has invested approximately $1.05 billion in regulated transmission. From 2015 through 2019, Ameren plans to invest approximately $2.3 billion for current projects under construction or development. Ameren also operates two balancing authority areas, AMMO (which includes Ameren Missouri's customers), and AMIL (which includes Ameren Illinois' customers). Ameren currently owns and operates over 4,700 miles of 138 kV line, over 800 miles of 161 kV line, 140 miles of 230 kV line and around 1,900 miles of 345 kV transmission line. Including the 500 miles of 345kV transmission lines that are currently under development and construction, Ameren has over 8,000 miles of high voltage transmission in operation or under development in Illinois and Missouri.

A.2 A general description of the proposed project

ATXI proposes a project to significantly resolve the congestion on both the AP South Interface and the AEP-DOM Interface as identified in the problem statement of the PJM RTEP Long Term Proposal Window, dated October 30, 2014. The proposed project includes the following components:

1. **New SVC station:** Construct a +400MVAR/-250 MVAR Static VAR Compensator (SVC) adjacent to the 500 kV Dooms Substation located in the Dominion Virginia Power service territory. The SVC will be connected at Dooms Substation utilizing an existing 500 kV breaker position.

2. **SVC Station to Dooms Substation 500 kV Line**: Construct three spans of 500 kV transmission line to accommodate the connection of the SVC into the 500 kV Dooms Substation. Line work for this component will terminate at the last monopole before entering the Dooms Substation.

3. **Upgrades and Connections to Dooms Substation:** Construct two spans of 500 kV transmission line. One span will be used to accommodate the relocation of the existing Dooms – Cunningham 500 kV line to the open position. This would also require the installation of a new 500 kV breaker and associated equipment at the open position. The second span will be used to terminate the new 500 kV line from the SVC station into the position previously occupied by the Dooms – Cunningham line.

A.3 The benefits of the proposed project

The proposed collaboration between ATXI with AECOM will result in a project that will provide the following benefits to PJM and customers in the surrounding regions:

- Increase transfer capability on the AP South interface by approximately 300 MW
- Increase transfer capability on the AEP-DOM interface by approximately 700 MW
- With an estimated B/C ratio of 4.9 (calculated using PROMOD ANALYIS), the proposed solution provides significant value to consumers located in the region
- The proposed SVC also has -250 MVAR reactive component which will provide benefit under light load conditions to maintain voltage levels on 500 kV

ATXI performed a detailed planning analysis and engineering assessment to evaluate a wide range of potential solutions. ATXI offers the following reasons in support of why the proposed project is the most technologically-sound, cost-effective and lowest risk solution to significantly resolve the congestion on both the AP South Interface and the AEP-DOM Interface:

- SVC technology is a proven and reliable solution that provides an instantaneous response to system voltage changes in order to maintain voltage levels on the system; there are currently close to 50 SVC's installed on the transmission systems in the U.S. and Canada, connected from 138 kV through 765 kV and comprising a total installed capacity of approximately 12,500 MVARs
- The Dooms substation has been identified to be the optimum location in the region that provides maximum benefit from the application of SVC technology to increase transfer capability on both of the interfaces.
- A steady state no harm analysis showed no negative impact on the system due to the installation of the SVC.
- ATXI chose to connect the SVC into the 500 kV system at Dooms Substation as opposed to the 230 kV bus because it yielded a much wider regional benefit.

- ATXI provides all the capabilities to finance this project.

Project options

Option 1: ATXI proposes to develop, construct, own, operate and maintain Project component 1 and that the incumbent TO (Dominion Virginia Power) develop, construct, own, operate and maintain Project components 2 and 3.

Option 2: ATXI proposes develop, construct, own, operate and maintain Project components 1 and 2 and that the incumbent TO (Dominion Virginia Power) develop, construct, own, operate and maintain Project component 3.

PJM should separately consider and evaluate Project Options 1 and 2 as two whole and separate Projects.

A.4 Total proposed project cost

ATXI and AECOM have endeavored to develop a cost-effective solution that addresses the congestion on the AP South and AEP-DOM Interface identified by PJM, while providing additional value to the ultimate customers using the transmission system. ATXI and AECOM have estimated the cost to develop, design, construct and commission the proposed transmission project at $46.6 million. This figure includes the estimated cost of all proposed upgrades by incumbent TOs.

A.5 Overall schedule duration

ATXI has carefully considered the process for developing, permitting and constructing a project in the proposed region. In the development of our project schedule, we considered the preferred in-service dates, versus the need to maintain reasonable and achievable durations needed for project development and optimize cost. Our schedule assumes execution of a Designated Entity Agreement with PJM on March 1, 2016. The proposed schedule (through commissioning/energization of all greenfield transmission and substation assets) is estimated at roughly 44 months.

A project schedule is attached in Appendix C and the project schedule is further discussed under Section C.4 of this proposal.

A.6 ATXI Eligibility for Designated Entity Status

ATXI has been pre-qualified as a Designated Entity for transmission projects in PJM under section 1.5.8(a) of the PJM Amended and Restated Operating Agreement. The pre-qualification information is contained in the document originally submitted to PJM dated March 5, 2014, entitled "Designated Entity Pre-Qualification Filing by Ameren". This document is on file with PJM and is posted on PJM's website, with a PJM pre-qualification ID of 14-01. An updated version of this document was submitted to PJM in September 2014. PJM confirmed the pre-qualified status for ATXI in a letter dated April 11, 2014 ("Confirmation Letter").

A.7 Statement of intent to be considered the Designated Entity for the proposed project

ATXI is a transmission development subsidiary of Ameren Corporation that was formed in March of 2006 to develop, own, construct, acquire, operate, lease and otherwise manage Ameren's strategic investments in electric transmission infrastructure. ATXI intends to construct, own, operate, maintain and finance the project with support from Ameren Services Company ("AMS"), a subsidiary of Ameren Corporation pursuant to a General Services Agreement ("GSA"). AMS provides Business and Corporate Services and Transmission Services to ATXI and other operating subsidiaries of Ameren Corporation. Upon request, an executed copy of this agreement can be made available for PJM's review.

The AMS Business and Corporate Services function provides support in the areas of accounting and finance, legal, information systems, environmental, real estate, governmental affairs, communications, strategic sourcing, human resources, and talent acquisition.

The AMS Transmission function provides transmission related support services such as planning, development, engineering, construction, operations and maintenance, and regulatory and policy.

B. Company Evaluation Information

B.1 Name, Address and Contact Details for Proposing Entity

Ameren Transmission Company of Illinois, Inc. (ATXI)
1901 Chouteau Avenue, MC 635
St. Louis, MO 63166-6149

Contact: Sean Black, Director Transmission Business Development

Telephone: 314-554-3844

E-Mail:

B.2 Description of proposing entity's (or its affiliate, partner or parent company) technical and engineering qualifications relevant to construction, operation and maintenance of the proposed project

ATXI, through its affiliation with Ameren and its transmission owning subsidiaries and services company, is qualified in all facets of planning, routing and environmental, design, construction, operations, and maintenance of electric transmission facilities. Ameren's experience in operating electric transmission facilities dates back to the early 1900s and includes expertise in the areas of: planning, design, line routing and siting, rights-of-way acquisition, safety, construction, project management, operations and maintenance of transmission, substation, and distribution facilities, vegetation management, system protection, relay and control, and NERC compliance. Ameren's team of engineers, project managers, skilled craftsmen, and business professionals have a long history of designing, financing, constructing, operating, and maintaining large-scale transmission facilities. Ameren's engineering and technical teams have developed the electric transmission system supporting Central and Eastern Missouri as well as Central and Southern Illinois. Ameren's operations and maintenance teams have extensive experience coordinating operations with numerous other transmission entities located in MISO as well as PJM, including AEP, Commonwealth Edison and Duke. As another example, Ameren Missouri currently owns, operates and maintains a transmission line that is located in Iowa, outside its service territory. This line ties into two substations that are owned by MidAmerican Energy. Ameren coordinates with MidAmerican to operate and conduct any planned maintenance for this transmission line and performs this work using our existing strategic service providers. We plan to extend this philosophy to operate and maintain the proposed project.

The following list highlights Ameren's technical and engineering qualifications:

- Transmission planning
- Transmission operations
- 24x7 control center
- NERC certified operators
- Transmission, Line and Substation Design
- Construction and maintenance
- Emergency response and restoration
- Project management
- Project risk assessment and controls
- Real estate acquisition
- Spare equipment

ATXI's Transmission Line Design group is comprised of ten engineers averaging 11 years of experience. The group includes seven licensed professional engineers registered in Missouri, Illinois, and Arkansas. Ameren has consistently shown their commitment to the further development of the Transmission Line industry through its participation in a number of professional and industry associations. Some of these associations include the following: the Midwest Electric Transmission Exchange (METE), the Institute of Electrical and Electronics Engineers (IEEE), Transmission & Distribution Committee and the American Society of Civil Engineers (ASCE), Steel Pole, Wood Pole, and Aesthetic Design of Transmission Line Structures committees. In addition to Ameren's participation on these committees, helping to including the write and review industry standards; Ameren also funds and participates with the Electric Power Research Institute (EPRI) on overhead transmission programs and projects.

The ATXI Civil & Structural Engineering (CSE) Group is composed of 11 members with an average of 12 years of engineering experience. The group has six Professional Engineers (PE) registered in MO and IL, and a Structural Engineer registered in IL. All non-PE members have passed the Engineer in Training exam and are working toward their PE licenses. Group members have expertise in structural modelling, analysis and design in the areas of concrete, steel, foundations (spread footings, drilled piers, driven pile), and seismic. Design of steel poles and lattice tower structures using state of the art software are areas of regular practice. Site development expertise include site grading, hydrology, drainage, culvert and piping systems, retention/detention, roadway design, and spill prevention/containment systems. This group is also responsible for the design and implementation of security methods and measure for compliance with CIP standards. Group members belong to ASCE, ACI, and AISC; and have written and proposed technical papers for presentation at national conferences. We have a group member serving on the IEEE 693 committee and a NETRAC committee investigating galvanized coating on line hardware

Ameren provides thought leadership to the national transmission community through active participation in various working groups and committees to drive development of new standards and best practices. Through this participation, Ameren also learns from other transmission

operators to ensure that we are applying best practices throughout our operating system. Appendix E provides a comprehensive and current list of Ameren employees that actively participate in different national committees and working groups.

In the area of Electric Power Systems, AECOM combines technical expertise in planning and engineering transmission and distribution systems with experience in construction and program management of transmission and distribution projects, regardless of the logistical, environmental, and technical conditions. AECOM's technical personnel have extensive backgrounds in system planning, transmission, distribution and substation engineering, with specific experience in feasibility studies, conceptual and detailed design, rehabilitation of existing systems, and the evaluation of advanced concepts in design and utilization. AECOM's construction and project management teams have overcome challenges to successfully build transmission lines, substations, and SCADA systems in locations ranging from cramped urban environments to post-war Iraq.

To implement the results of feasibility studies and conceptual and detailed engineering and design, AECOM offers complete project and construction management services. Through AECOM, a project is able to be undertaken from inception to commercial operation.

B.3 Detailed description of proposing entity's (or its affiliate, partner or parent company) experience

Developing, constructing, operating and maintaining transmission facilities included in the proposal

Ameren, through its transmission owning subsidiaries and services company, has over 100 years of experience in siting, designing, constructing, operating, and maintaining approximately 7,500 miles of high voltage transmission lines and substations rated at 138kV and above, with voltages ranging from 138kV to 345kV. Over this period, Ameren has promptly responded to all kinds of weather emergencies that affected its transmission assets, including ice storms, tornadoes, derechoes, floods, etc., and supported other utilities during emergency situations affecting their service territories. In addition, Ameren has developed and maintained numerous transmission interconnections with 15 separate transmission operators, which include other investor owned utilities (e.g., ComEd, AEP, Duke Energy, First Energy), TVA, municipal utilities (e.g., City of Columbia, MO and Springfield, IL) and cooperatives, with the largest being AECI. We have experience coordinating with utilities located in MISO, SPP, and PJM regions. Ameren also has specific experience coordinating operations with Dominion Virginia Power, the existing incumbent utility, primarily through SERC studies.

Ameren has experience developing, constructing, maintaining, and operating transmission lines of all common types including wood pole, lattice steel tower, steel pole, and concrete pole construction. In addition, Ameren operates and maintains 28 extra-long transmission line spans for crossing major rivers including multiple crossings of the Mississippi and Illinois rivers. Ameren's internal resources are supplemented by a large array of experienced contractors and consultants that regularly perform transmission-related activities for Ameren under contractual

agreements. At any time, multiple suppliers in each technical area are maintained under contract.

Ameren is highly committed to protecting the health and safety of all those working on an Ameren project. Therefore, both Ameren employees and contractors comply with Ameren's health and safety programs as outlined in Appendix J.

Multi-Value Projects

ATXI is currently developing three MISO-approved, major transmission projects in Illinois and Missouri, consisting of over 500 miles of 345kV transmission lines. These three projects, named Illinois Rivers, Mark Twain, and Spoon River, are part of the MISO approved Multi-Value Project (MVP) portfolio that will facilitate the delivery of renewable energy, improve reliability and provide economic and efficiency benefits. These projects are directly aligned with Ameren's strategic goals of providing customers with reliable, efficient and environmentally responsible energy.

Illinois Rivers Project

This project involves the construction of a 345-kilovolt line that will extend from a new substation near Palmyra, Missouri, across the Mississippi River to Quincy, Illinois and continue east across Illinois connecting into the following substations: Meredosia, Pawnee, Pana, Faraday, Mt. Zion, and Kansas, then across the Indiana border to Sugar Creek where the line will tie into a substation owned by Duke Energy. The project includes two additional segments from Meredosia to Ipava and Sidney to Rising. At an estimated cost of $1.4 billion, the complexities of this transmission project are summarized as follows:

- Ten substations will be developed, including: five greenfield substations, four brownfield substations and a greenfield switching station
- Includes 380 miles of 345 kV transmission line
- Includes three river crossings:
    - One crossing of the Mississippi River; 1-1/2 miles long with a 2,600 ft. span
    - Two Illinois River crossings; one 3/4 mile and one 1-1/4 mile with a 2,900 ft. span
- Impacts 66 Levee and drainage districts and 16 Counties
- Involves the construction of approximately 2,100 steel poles and foundations
- Requires the procurement of property rights for approximately 1,350 tracts of land

In May 2011, this project received FERC approval for incentive ratemaking treatment, including Construction Work in Progress (CWIP), use of a hypothetical capital structure during construction, and future recovery of abandonment costs. After nearly 100 public meetings throughout Illinois over six months on the proposed Illinois Rivers route, a filing with the Illinois Commerce Commission was made in November 2012 requesting a Certificate of Public Convenience and Necessity (CPCN). In August 2013, the Illinois Commerce Commission (ICC) issued an order supporting the need for the project and granting a CPCN for the construction of portions of the Illinois Rivers transmission project. In February 2014, the ICC issued a final order approving the remaining substations and routes for the Illinois Rivers project.

This project is currently under construction. The first substation is expected to be placed into service in 2015. The first transmission line sections of Illinois Rivers are expected to be in-service in 2016, and the project is on schedule to be completed by the end of 2019. On this project, AECOM is providing program management services to ATXI to support project procurement and construction for transmission line segments and substations.

Mark Twain Project

This project consists of a new, approximately 55 mile long, 345 kV transmission line between Maywood Substation, near Palmyra, Missouri and the new Zachary Substation to be constructed as part of this project near Kirksville, MO. A new 35-mile long, 345 kV transmission line will also be built north from the Zachary substation to the Iowa border. The estimate for this project is $225 million.

Spoon River Project

This project consists of a new 40 mile, 345 kV transmission line in Northwest Illinois with connections to new substation facilities at each end. A portion of this project will be built by another MISO transmission owner because this project connects with facilities of two MISO transmission owners. The estimated total project cost is $150 million and all portions of the project are expected to be completed by the end of 2018.

ATXI developed a strategic communication and outreach plan in early 2014. The plan created a foundation for the Routing Team to pursue an open stakeholder outreach effort, providing various opportunities for landowners, community representatives, agencies, and non-governmental organizations to be involved in the routing process. ATXI used various communication tools to inform stakeholders and solicit their feedback. Outreach events included Focus Group Workshops (FGWs), Community Representative Forums (CRFs), and Open Houses. These events were held during the three phases of the Project that coincided with the three phases of route selection. In addition, stakeholder feedback was welcomed and incorporated into the process throughout the route development process. Stakeholders had the opportunities to reach the Communication Team and Routing Team through the Project hotline and website, where they were able to review the most current Project information. A complete description of ATXI's routing study for the Spoon River project is included as reference in Appendix H.

Selected Reference List of Other ATXI Projects

A selected list of other recent projects is summarized in the following table:

Stage	Dates (start-end)	State	Project Name	Description
Completed	2002-2010	MO/IL	Rush-Baldwin 345 kV Line	Rush Island-Baldwin 345 kV Line – New 29 mile 345 kV 3000 A Line, 345 kV line terminal and 2 mile double-circuit river crossing at Rush Island. Upgrade Baldwin 345 kV switchyard.
Completed	2004-2011	IL	Wedron Fox River 138 kV Supplies	LaSalle Area – Construct new Wedron Fox River 138-34.5 kV Substation, N. LaSalle-Wedron Fox River 138 kV Line, and Ottawa-Wedron Fox River 138 kV line (total of 34 miles 138 kV line).
Completed	2006-2011	MO	Big River-Rockwood 138 kV Line	Big River-Rockwood 138 kV Line – New 13 mile 138 kV, 2000 A Line.
Completed	2008-2013	IL	Latham-Oreana 345 kV Line	Latham-Oreana 345 kV Line – Convert Oreana 345 kV Bus to 6-Position Ring Bus with 3000 A Capability; Construct 8.5 miles of 345 kV line from Oreana Substation to 345 kV Line 4571 tap to Latham Substation.
Completed	2002-2010	IL	Prairie State Plant 345 kV Connections	Prairie State 345 kV Plant Connection – New 7.5 miles 345 kV 3000 A double-circuit line for Baldwin-Stallings outlet, New 1.5 miles 345 kV 3000 A double-circuit line for Baldwin-W. Mt. Vernon outlet.
Completed	2008-2010	MO	Gray Summit 2nd. 345/138 kV Transformer	Gray Summit 345/138 kV Substation – 345 kV 6-position Ring Bus, 2nd 560 MVA transformer.
Completed	2006-2010	IL	Conoco-Phillips 138 kV Supply	Conoco-Phillips 138 kV Supply – Tap the Wood River-Roxford 138 kV Line and extend approximately 2.7 miles; extend the Roxford-BOC 138 kV Line approximately 3.3 miles to supply new Conoco Phillips 138-34.5 kV Substations.
Completed	2011-2013	IL	Sidney 2nd. 345/138 kV Transformer	Sidney 345/138 kV Substation – Add a second 345/138 kV, 560 MVA Transformer. Install 2-345 kV PCB's to complete a ring bus. Rearrange existing Sidney 138 kV outlet lines as needed.
Under Construction	2008-current	IL	South Bloomington – Install new 560 MVA 345 /138 Transformer	South Bloomington Area 345/138 kV Substation – Install 345/138 kV, 560 MVA Transformer. Extend new 345 kV line approximately 8 miles from Brokaw Substation to South Bloomington Substation.

Stage	Dates (start-end)	State	Project Name	Description
Completed	2009-2014	IL	Bondville-S.W. Campus 138 kV Line	Bondville-S.W. Campus 138 kV – Construct 8 miles of new 138 kV line. Construct 138 kV Ring Bus at Bondville and a 138 kV Ring Bus at Champaign S.W. Campus.

Project fact sheets for key projects, containing additional details are included under Appendix F.

AECOM Transmission Experience

AECOM is a recognized leader in the Engineering, Procurement, Construction and Startup of power generation facilities both new facilities and modifications to existing units and transmission lines. AECOM's experience includes all stages of transmission and distribution projects, from planning and environmental and regulatory analyses through engineering, construction, program management, and commissioning. AECOM has successfully performed a variety of transmission line projects, overhead and underground, both domestic and abroad. These projects have included challenging major river crossings and covered all voltage classes, configurations, structures type, cable technologies, meteorological conditions, geographical locations, topographic, and soil conditions. Substation projects have been diversified including design of conventional open-air and SF6 gas-insulated substations, state-of-the-art equipment applications and complete protection and relaying studies.

AECOM maintains a position on the leading edge of technologies as they apply to power delivery systems, through a policy of seeking, accepting and successfully completing the most challenging assignments. Examples include:

- Restoration of Iraqi electricity, including transmission lines, substations, distribution and SCADA
- Modernization of a U.S. government intelligence agency's electrical infrastructure
- Licensing, engineering, design and construction support for the $330 million Long Island Sound Crossing project that includes 8 circuit miles of the world's largest installed submarine cable (345 kV, 4000 kc mil, SCFF), 19 miles of high pressure fluid-filled pipe-type cable, one open-air substation and three gas-insulated substations

- Turnkey services for the installation of a 345 kV high pressure fluid-filled pipe-type cable using horizontal drilling methods to cross under an oil re-finery, a 12 lane state highway and a major waterway
- Planning studies, engineering and design to demonstrate the practicality of HVDC interface of the world's largest Superconducting Magnetic Energy Storage (SMES) system dc coil with a utility ac system through a power converter
- Engineering, procurement and construction management for the world's first commercial six-phase 93 kV overhead transmission line
- Engineering and design for a direct embedded 8 mile 138 kV wood H-frame transmission line designed to sustain 160 mile per hour wind conditions
- Consulting services to close a major 500 kV transmission ring around Cairo, Egypt. Included in the 100 miles of 500 kV and 230 kV transmission lines are three separate overhead crossings of the Nile River in the Fayoum area
- The "Electric Distribution Systems Engineering Handbook" published by McGraw-Hill, and authored by URS, provides the latest technological information for planning, designing and constructing power distribution systems

AECOM combines technical expertise in planning and engineering transmission and distribution systems with experience in construction and program management of transmission and distribution projects:

- AECOM substation design experience encompasses the full range of transmission voltage levels through 765 kV, open air-insulated designs, and indoor and outdoor SF6 gas-insulated designs, reactive compensation facilities and HVDC stations.
- AECOM transmission design engineers are experienced in execution of all types and voltage levels of overhead, underground, or submarine transmission line projects, supporting all project phases from conceptual design studies through to final engineering, civil, structural and electrical design and project management services.
- AECOM performs system interconnection facility studies for various ISOs (such as NYISO, PJM, MISO, ERCOT and ISO New England) and developers of new generation to identify if transmission reinforcements are necessary, the associated costs, and risks, to connect new generation at locations throughout the United States.
- In the specialized field of high voltage underground and submarine cable applications, AECOM has the technical specialists and program management who have successfully executed virtually every aspect of AC and HVDC high voltage cable engineering and construction projects.
- In the Procurement of major engineered electric power equipment and systems, in the last four years, AECOM has issued more than a thousand formal inquiries and placed contracts with a total value exceeding $1.5 billion.
- In the area of Environmental Assessment and Permitting, AECOM has committed to the utilization of systematic, comprehensive, defensible, and understandable study and decision methodologies appropriate to the project study areas and issues.

- AECOM computer software for power system engineering, transmission and substation design, consists of virtually all industry recognized and supported engineering calculation and modelling software, as well as many in-house programs, which are used in applications tailored to the specific project needs.

Please refer to Appendix I for detailed information on AECOM's transmission and substation capabilities.

AECOM's Experience Executing SVC Projects

In the design, procurement and construction of electric power systems, AECOM combines technical expertise in planning and engineering with experience in construction and program management of transmission projects in a wide variety of logistical, environmental, and technical situations. Design and installation of reactive compensation devices in a transmission system requires simultaneous attention to the physical and system performance aspects of the project. AECOM has performed a variety of FACTS based compensation projects, including SVC projects, comprising the following aspects:

- Reactive power (VAR) planning
- Transient analysis, switching and lightning surge studies (TNA, EMTP)
- System protection studies, relay selection, setting, coordination
- PSCAD – System transient studies (Switching surges, Transient Recovery Voltage (TRV)
- Engineering and schedule management of manufacturer detailed system studies, design, fabrication, testing and delivery
- Construction management
- Testing and commissioning program

AECOM has provided investigative and detailed design services for various state-or-the-art power electronics based projects of the following types:

- High Phase Order Transmission
- HVDC Transmission
- Static VAR Compensation
- Series Capacitors
- Solid State Arresters
- Thyristor-Controlled Series Capacitors
- Power Angle Regulation
- Phase Shifting Transformers
- Sub-synchronous Resonance (SSR) Mitigation

Recently AECOM has executed the following major SVC projects, successfully put into commercial operation in December 2013:

Owner/Location	Station Name	Bus voltage [kV]	Dynamic shunt range	
			Capacitive [MVAr]	Inductive [MVAr]
AEP-ETT/ Texas	Tesla	345	300	-100
AEP-ETT/ Texas	Hamilton	138	200	-50

Other recent dynamic compensation installations performed by AECOM include the following recently completed projects, on which AECOM's scope of work included overall Project Management, Procurement, and Construction Management:

AEP-ETT CREZ Projects:

- Gauss Series Capacitor Station (24 Ohms, 3000 Amps) – mid-line of the 80 mile, 345 kV Edith Clarke- Clear Crossing North transmission line
- Kirchoff Series Capacitor Station (24 Ohms, 3000 Amps) – mid-line of the 86 mile, 345 kV Dermott – Clear Crossing West transmission line
- Edison and Oersted Series Capacitor Stations (each 24 Ohms, 3600 Amps) – Mid-line of 25% and 50% points of the 130 mile, 345 kV Big Hill – Kendall transmission line.

NYPA/National Grid/NYSEG Project (ongoing):

Marcy South Series Capacitor Compensation Project - this project contains three 25% series capacitor compensation facilities to be installed in three existing 345 kV transmission lines. This project is designed to improve power transfer across the NYISO Central – East interface. This project has strong benefits from both a system reliability and economic standpoint

These three projects are currently being executed and will be in commercial operation in summer 2016.

Owner / Location	Substation Name	Bus Voltage (kV)	Capacitive Compensation (MVAR)
NYPA	Marcy - Coopers Corners	345	915
NYSEG	Fraser – Coopers Corners	345	240
NG	Edic - Fraser	345	340

AECOM's scope of work includes Engineering, Procurement and Construction Management for three 345 kV series compensation capacitor facilities. AECOM is also providing technical assessment for the overall protection schemes and communications between the new facilities and the existing substations.

AECOM is also well experienced in the procurement of highly sophisticated engineered equipment on a turnkey basis, using pre-approved qualified bidding, with comprehensive bid evaluations, including cost, technical, constructability, and schedule risk elements based upon project requirements. To ensure the desired results engineering and quality assurance personnel provide vendor contact management including:

- Data and Drawing Reviews
- Material Expediting
- Shop Surveillance
- Witnesses for Testing
- Equipment Inspection

Selected AECOM Experience List

The following list highlights featured AECOM projects that are most relevant to the proposed project and region. A complete list of AECOM projects is included as reference in Appendix G.

Selected Transmission Projects

Project Name	Project Description	Project Work Performed	Project Role	Location	Date
Northeast/Pocono Reliability Project (NEPOC)	New 230 kV Transmission Line and Substations, 138 kV Connector Lines, and 130 kV Rebuilds	Currently contracted to provide PPL with engineering, siting, and permitting of a new 57 mile long 230 kV transmission line and two associated 230 kV substations to be located in northeastern PA. The 230 kV line consists of 310 double circuit tubular steel structures. The project will also rebuild a 19.4-mile long section of the existing Peckville – Honesdale 138 kV line, 2.9 miles of the existing Lakeville 138/69 kV Tap and 4.0 miles of the existing Blooming Grove – Honesdale 138/69 kV Transmission Line. The new 138 kV transmission lines consist of 98 double circuit tubular steel structures.	Detailed Engineering and Design	Pennsylvania	2010-Ongoing
Hosensack Quarry 1 & 2	Transmission Line Rebuild for PPL	Rebuild the existing Hosensack-Quarry 1 & 2 double circuit lines between Quarry substation to Seidersville substation and tap into the Homer Research Lab. New line is designed to client's 138 kV steel pole design standards and operate at 69 kV.	Prime Contractor	Pennsylvania	2013

Lake Naomi 138 kV Line Rebuild	Rebuild of a 25-mile 69 kV line	Transmission design and manage the rebuild of a 25-mile 69 kV line connecting Jackson Lackawanna Tap to Lake Naomi, Wagner, East Palmerton substations along the existing right-of-way.	Prime Contractor	Pennsylvania	2013
Allegheny 138 kV Transmission Line	Design	Transmission line engineering design for Sithe Energies.	Design	Pennsylvania	1998
Bethlehem Plant Project, Conectiv Energy	230 kV solid dielectric cable line, 12.47 kV distribution feeder	Detailed engineering and design, procurement support for 230 kV solid dielectric cable line, 12.47 kV distribution feeder.	detailed engineering and design, procuremen t support	Pennsylvania	2004
Warren Substation, Pennsylvania Electric Company	230/115	230/115	Engineering	Pennsylvania	
Brandon Shores	Constellation Energy Brandon Shores AQCS Project/Baltimore Gas & Electric Interconnection	Project management, engineering and design, procurement, foundation construction of 230 kV double circuit steel pole line.	Prime Contractor	Maryland	2008-2009
Hassayampa-North Gila (HANG) 2	112-mile 500 kV Transmission Line for APS	Program management and Owner's Agent for a new 112-mile 500 kV transmission line	Prime Contractor	Arizona	2012-2015
Firebag Stage 3 and 4 Facilities	Firebag 144 kV Transmission Lines, Alberta, Canada	Project management, engineering and design, procurement and pole erection, construction and installation of 144 kV double circuit steel pole line, 144 kV single circuit steel line and 8 km 144 kV single circuit wood pole line.	Prime Contractor	Canada	2007-Present
Garden State Reliability Project	New 50-mile 230 kV single circuit and double circuit transmission lines connecting to existing and upgraded	Program management and conceptual and detailed engineering, permitting support, cost estimating, scheduling and construction sequence planning for overhead transmission lines and	Prime Contractor	New Jersey	2009-2010

	switching stations and a new 500/345/230 kV switching station	multiple substation upgrades.			
Electric Transmission Texas (ETT) Competitive Renewable Energy Zone (CREZ) Program	465 miles of new 345 kV Transmission Lines and Substations, to deliver power from wind generation facilities to bring 18,500 MW of wind energy from West Texas to Dallas/Fort Worth and Austin.	Program management and owner's agent/engineer services for design, procurement and construction or entire project. Included new 345 kV double circuit transmission line, 5-345 kV switching stations, 4-Series capacitor stations, 2-Static VAR Compensator stations	Program Manager and Owner's Agent	Texas	2010-2013
Ithaca Reinforcement Project	NYSE&G	Detail engineering and design of 30 mile 115 kV wood pole line of various structure types and steel 345 kV tie-line to Clarks Corner Substation.	Licensing, environmental, engineering and design, procurement support, construction management	New York	2008-2010

Adhering to standardized construction, maintenance, and operating practices, including the capability for emergency response and restoration of damaged equipment

ATXI is fully committed to compliance with standardized construction, maintenance, and operating practices. Standards set by the North American Electric Reliability Corporation (NERC), SERC Reliability Corporation (SERC), the Occupational Safety & Health Administration (OSHA), National Electrical Safety Code (NESC), the Institute for Electrical and Electronics Engineers (IEEE), and the American National Standards Institute (ANSI), as well as other regulatory and standards setting organizations are the basic components in a culture of compliance at Ameren. As testament to this, Ameren has never had a NERC Standard violation for the Order 693 standards and has successfully completed three on-site SERC audits.

ATXI currently adheres to standardized operating processes consistent with NERC Standards relating to coordinated operation. ATXI encourages participation in forums and seminars to support continuous learning and training for NERC standards. By supporting these activities, and committing the resources required for participation, Ameren "communicates" that it values compliance. By way of examples, the Reliability Standards Compliance Department personnel and the Compliance Contacts attend the annual SERC Compliance Seminars, participate in the

quarterly SERC Compliance Open Forum WebEx meetings, attend NERC MRC/BOT meetings and webinars, and attend the North American Transmission Forum WebEx meetings and face-to-face meetings. Also, several Compliance Contacts are involved in NERC and SERC committees, as well as the North American Transmission Forum committees, and thus stay abreast of the issues associated with proposed new or revised standards as well as compliance with the existing standards. ATXI internal processes govern normal, emergency, and abnormal conditions. As to external processes, Ameren adheres to operating practices of PJM as a neighboring Balancing Authority (BA) and Transmission Operator (TO), and with MISO, its Reliability Coordinator (RC). Additionally, Ameren adheres to good utility practice in the absence of formal operating practice processes.

ATXI has developed Standard Specifications, Design Criteria, and Guidelines that assure a consistent approach will be followed in the design and construction of transmission lines and substations. These construction specifications are issued with each job to the ATXI crew or the Contractor crew. Each job is monitored throughout the construction phase by a construction supervisor. Prior to energizing, each project is inspected by engineering, maintenance, and forestry to assure that the project was constructed as per all Ameren Standards, Design Criteria, and Guidelines. Any deficiencies found either during construction or upon final inspection are added to a punch-list, subsequently corrected, and then verified as properly corrected prior to the transmission line or substation equipment being released to Ameren Transmission Operations for start-up. A written Commissioning (start-up) procedure is then followed to assure the equipment is energized in the proper sequence. During the commissioning, testing/measurements are performed as required and the equipment verified to be functioning properly prior to an official release to the operations group for service.

Examples of Design and Construction standards are as follows:

- 30 Transmission Line Design Specifications
- 23 Transmission Line Guidelines
- 14 Transmission Line Design Criteria
- 18 Transmission Line Construction Inspection Checklist
- 97 Substation Design Guides, Material/Equipment/Construction Specifications and numerous standard drawings

ATXI has developed procedures to support compliance with NERC reliability and planning standards. For example, Ameren's Transmission Planning Group is responsible for compliance with the NERC Facility Rating Methodology standard (FAC-008-3), the NERC standard to determine and communicate System Operating Limits (FAC-014-2), and the NERC planning standards (TPL Standards 001 through 004). Documents have been created detailing the procedures followed to meet compliance for each of these standards.

ATXI's planning group looks at the 'uniqueness' of a transmission area; to identify any additional criteria, as needed, to ensure reliability that will exceed NERC reliability standards from both a steady-state and a dynamics perspective. For example, the following criteria have been used now, or in the past, to address current state transmission issues such as load shifts or generation retirements:

- Upgrades required for the coincident outage of a generator and a transmission line or transformer
- Limits to dropping load for coincident (Category C) transmission outages
- Minimize the use of special protection systems to meet reliability standards
- Maintain margins between contingency flow and emergency ratings for incremental transfer capability (simultaneous and non-simultaneous)
- No allowance for high-speed reclosing of 345 kV circuits to maintain stability
- Stability to be maintained for double line to ground faults (2LG) with delayed clearing

Working in the geographical region in which the project has been proposed

Acquiring rights-of-way with specific emphasis on the geographical region in which the project has been proposed

Ameren has a substantial full-time internal staff dedicated to researching, acquiring, and managing company real property assets, which include fee owned properties, transmission and distribution rights-of-way and other miscellaneous property rights. This group has personnel located throughout the Ameren service areas served by Ameren companies with numerous property right acquisition efforts underway at all times. Ameren also has a list of nationally approved service providers that assist us in surveying and right-of-way acquisition. In the last several years, Ameren has acquired hundreds of miles of transmission right-of-way in both Illinois and Missouri and has a very substantial acquisition program underway in 2015. The Real Estate Department works very closely with Ameren's Planning, Stakeholder Relations, Engineering, Environmental Services, Legal, Governmental Affairs and Communications departments to either verify existing rights-of-way or acquire new rights-of-way and real property interests necessary to advance pending projects, as well as sustain, modify, and improve existing facilities.

In addition, pursuant to state law, Ameren has utilized its ability to exercise eminent domain in Illinois and Missouri to acquire properties for transmission related projects. However, Ameren has a strong preference for acquiring necessary property rights through fair and meaningful negotiations with affected property owners. Moreover, the Ameren Real Estate Department has considerable experience working with the state regulatory commissions and local courts to ensure all necessary property rights are acquired in a fair, equitable and timely manner to keep projects on schedule.

B.4 Proposed financing plan for the project including discussion of any cost advantages available to the proposing entity as a result of their financing plan and structure

Ameren Transmission Company of Illinois (ATXI) is the proposed financing source for construction of this Project. ATXI is currently constructing three major transmission projects in Illinois and Missouri that are part of the MISO MVP portfolio with investment totaling $1.4 billion over the 2015 to 2019 timeframe. Additional funding for this Project would be part of the existing financing plan for ATXI. This plan calls for a balanced source of equity and debt financing currently targeted at 56% equity, 44% debt. Ameren Corporation will provide sources of equity financing in addition to the internal sources of retained earnings generated at ATXI. There are no public equity issuances expected by Ameren to finance ATXI construction through 2018. ATXI would acquire debt financing from Ameren until ATXI achieves its own standalone credit rating. These financing plans are subject to change depending on the timing of future capital needs, but ATXI would be committed to maintaining a balanced source of debt and equity.

The construction of this Project is supportive of Ameren's business goal to invest in regulated development initiatives. Ameren has an overall $8.9 billion funding program supporting new regulated infrastructure investment from 2015 to 2019. At year-end 2014, Ameren had combined assets totaling approximately $22.7 billion with $17.4 billion of plant and equipment, including approximately $900 million of FERC regulated (unbundled) transmission assets. Ameren is forecasting FERC regulated transmission assets to rise to $2.6 billion by 2018 with

the majority of this investment at ATXI. Additional information regarding Ameren's business plans can be found at its website: http://www.ameren.com/

Ameren Corporation has access to extensive short and long term sources of financing with stable issuer rating of Baa2/BBB+/BBB+ and commercial paper ratings of P-2, A-2, F2 from Moody's, S&P, and Fitch. Credit ratings have been upgraded by all agencies within the last 12 months. Short term sources of credit include Ameren's $2.1 billion credit facilities. Ameren accesses $1.6 billion of commercial paper as part of its $2.1 billion of short term credit to minimize short term interest costs. Ameren and its operating subsidiaries have significant and competitive access to long term debt, and have raised a total of $2.07 billion in debt since 2011. All of these recent debt issuances have lowered the imbedded debt costs, and therefore lowered costs to its customers. We anticipate that ATXI will benefit from the excellent credit profile of its parent company, and that this will translate into low borrowing costs for this Project.

B.5 Description of proposing entity's (or its affiliate, partner or parent company) managerial ability to contain costs and adhere to construction schedules for the proposed project, including a description of verifiable past achievement of these goals

B.6 Details of any construction cost caps or commitment the proposing entity wishes PJM to consider in its analysis, including the conditions and exceptions to such construction cost caps or commitments

B.7 Description of any other unique qualifications the entity may have to construct, operate, and maintain the proposed project, including any cost commitment the entity may wish to submit

B.8 List of assumptions used in developing the project proposal package such as work to be executed by incumbent Transmission Owner(s)

C. Proposed Project Constructability Information

C.1. Component Scope

C.1.a Greenfield Substation/Switchyard Facility Element Detail (New SVC station)

C.1.a.1 General description of the proposed location(s)

Land ownership in the vicinity of proposed location

C.1.a.2 One-line diagram and general arrangement drawing

C.1.a.3 Electrical design including specifications and ratings for transformers or reactive devices

C.1.a.4 Relay communications plan

C.1.a.5 Geographic map with proposed substation location superimposed

C.1.b Transmission Facilities to be Constructed by Others (SVC Station to Dooms Substation 500 kV Line)

C.1.b.1 Terminal Points

C.1.b.2 Physical characteristics

C.1.c Transmission and Substation Facilities to be Constructed by Others

C.1.c.1 Proposed Transmission Line Relocation

C.1.c.2 Physical characteristics

C.1.c.3 Proposed Substation Expansion or Modification

C.1.d Environmental, Permitting and Land Acquisition

C.2 Planning Analytical Assessment

C.3 Project Component Cost Estimates

C.4 Schedule

C.5 On-going Transmission Facility Items

C.5.a Operational Plan

C.5.b Maintenance Plan

C.6 Assumptions

Development (routing, siting, environmental studies, permitting, site acquisition)

Engineering, Procurement, Construction

Appendix A – (Redacted)

Appendix B (Redacted)

Appendix C – (Redacted)

Appendix D –
(Redacted)

Appendix E –
(Redacted)

Appendix F –

(Redacted)

Appendix G – (Redacted)

Appendix H – (Redacted)

Appendix I –

(Redacted)

Appendix J – **(Redacted)**