ILLINOIS COMMERCE COMMISSION

DOCKET No. 10-0079

REBUTTAL TESTIMONY

OF

CURTIS E. STEPANEK

SUBMITTED ON BEHALF

OF

ILLINOIS POWER COMPANY
d/b/a AmerenIP

September 23, 2010

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I. INTRODUCTION AND WITNESS QUALIFICATIONS

Q. Please state your name.

A. My name is Curtis E. Stepanek.

Q. Are you the same Curtis Stepanek who previously filed testimony in this proceeding?

A. Yes.

II. PURPOSE AND SCOPE

Q. What is the purpose of your rebuttal testimony?

A. The purpose of my rebuttal testimony is to respond to the testimony of Staff witness Ms. Mona Elsaid regarding the need for the Latham to Oreana transmission line ("Latham-Oreana Line") project proposed in this proceeding.

Q. In addition to your testimony are you sponsoring any other exhibits?

A. Yes. I am submitting AmerenIP Exhibit 7.1, a diagram showing the system information for the Decatur area for the same 620 MW load level and double-circuit outage referenced in the response to Staff data request ENG 4.06, with the powerflow

model modified to represent distribution capacitor banks and distribution reactive load separately instead of netted together.

III. RESPONSE TO STAFF WITNESS ELSAID

Q. What position does Staff take with respect to the need for the proposed Latham-Oreana Line?

A. Staff takes the position that the Latham-Oreana Line is not needed at this time. Staff witness Ms. Elsaid testifies that, based on the most recent load forecast information, the Decatur area summer peak load in the year 2013 is expected to be approximately 608 MW. Although she references potential new load additions from large customers that can occur in relatively short time, she states that the exact commitment date of these load additions and the probability of adding these load additions by this particular customer are unknown to AmerenIP at this time. She concludes that, "[f]rom AmerenIP's most recent load forecast, it is apparent that, without load additions, AmerenIP's Decatur area load will not reach 660 MW until after the year 2021. This is too long of a lead-time to support the proposed transmission line at this time. Therefore, AmerenIP could not demonstrate a need for its proposed transmission line by the year 2014." She also states that, with a load level of 620 MW in the year 2016, without any load additions, AmerenIP would not need the proposed transmission line to comply with Ameren Transmission Planning Criteria.

Q. What is your response to her position?

A. AmerenIP's analysis of the need for the Latham-Oreana Line was based on the resultant contingency voltages in the Decatur area associated with load forecasts developed in 2006 that showed 660 MW of load in the Decatur area by 2013. Staff is

correct that more recent load projections show lower forecasted loads in the 2013-2016 time period, with a 620 MW load level projected for 2016.

In determining the need for the Latham-Oreana Line, however, Staff's analysis focuses on the question of projected load growth and does not fully address the exposure to a voltage collapse for the Decatur area. Placing the focus on the risk of voltage collapse in the Decatur area, I believe that the Latham-Oreana Line is required to eliminate the risk of voltage collapse for the double-circuit outage condition. In any event, as I discuss below, the Latham-Oreana Line is needed to provide adequate and reliable service.

Q. Please explain.

A. To better illustrate the voltage collapse issue, AmerenIP has updated and refined its modeling of the loads and distribution capacitor banks in the Decatur area. The results of the updated model clearly show that, at a projected load of 620 MW in 2016, there is significant risk of voltage collapse and therefore, in accordance with the Ameren Transmission Planning Criteria, construction of the Latham-Oreana Line is required to provide adequate and reliable service to the Decatur area. As discussed by Mr. David Endorf, based on this updated analysis, coupled with a review of the construction schedule, AmerenIP has determined that the in-service date for the Latham-Oreana Line should be revised to December, 2015.

Q. What is voltage collapse?

A. The term "voltage collapse" is used by electric utility engineers to describe a scenario where an area of the interconnected system experiences rapidly declining voltages followed by a total loss of electric service. A typical voltage collapse situation

occurs when the system is at a high load level and there is a sudden change in the source(s) of electric supply to an area. The change could be the loss of a large generator or one or more transmission lines. In either case, the remaining sources for the area cannot provide adequate voltage support and voltages at both the transmission and distribution levels of the system drop significantly below normal values. The sudden drop of voltage causes the characteristics of the loads to change. Electric motors stall, which results in a significant increase of real power load and a drastic increase in reactive power load. The increased load from the stalled motors drives the voltages even lower. At this point, current flow on the entire system supplying the area is increased, resulting in increased voltage drop to the loads and a spiraling downward of system voltages as more motors stall. Ultimately, the voltages collapse as the transmission and distribution system can no longer support the increased area load. Under these situations, as the collapse develops, flows on distribution, subtransmission, or transmission circuits will exceed the settings of the protective relays, resulting in a total outage to the area. In many instances, the voltage collapse event is precipitated by a fault on a transmission line. During the time the fault is connected to the system, voltages at both the transmission and distribution levels of the system are very low. Although this period of very low voltage may be relatively short, perhaps only 5-10 cycles (0.083-0.167 seconds), some loads connected to the system can change drastically and not return to the pre-fault status when the faulted line is disconnected from the system by the opening of circuit breakers. The drastic change in load characteristic may cause a voltage collapse to occur in situations where, absent the effect of the fault, a collapse would have been avoided.

Q. How quickly can a voltage collapse develop?

A. A voltage collapse can develop within a few seconds or less.

Q. What system conditions lead to a voltage collapse?

A. A voltage collapse is generally caused by the outage of transmission and/or generation equipment. The outage of transmission equipment effectively reduces the number of transmission paths and results in increased impedances from the generation resources to the load. Because of the reduced number of paths, the current flow over these remaining paths is also increased, which results in increased electrical losses and voltage drop.

A voltage collapse can also be caused by the outage of local generation equipment. The outage of generation equipment reduces the real and reactive power supply in a given area, and the replacement of the outaged generation resources may be made up from resources farther away from the load resulting in higher losses and increased voltage drop over the longer distance and higher impedance paths.

As described below and in my direct testimony (lines 332-344), the outage of the double-circuit 345 kV tower line involving the Clinton-Latham 345 kV line 4571 and the Clinton-Goose Creek 345 kV line 4545 severely impacts the strength of the transmission supply and will cause a voltage collapse in the Decatur area if the outage occurs during summer peak conditions. These lines share common transmission structures for approximately 16 miles between the Clinton Nuclear Plant and the Oreana 345/138 kV substation. In addition, each circuit is a three-terminal line. The west circuit has a terminal at Clinton, one at Latham and one at Oreana. The east circuit has a terminal at Clinton, one at Goose Creek, and one at Oreana. This supply arrangement is vulnerable

to a single weather or other event involving a common structure resulting in the outage of both of the lines. The double-circuit outage condition would render the remaining transmission system inadequate to support the forecast load of 620 MW by 2016 or before, exposing the Decatur area to voltage collapse. Therefore, additional facilities need to be constructed to meet system performance requirements and maintain reliable service.

Q. How does system equipment and load respond to a low voltage condition?

A. The response of system equipment and load to a low voltage condition is dependent on the speed at which the low voltage condition develops. If the low voltage condition develops gradually, distribution voltage regulators and transformer load tap-changers (electrical devices that are installed to help control the voltages in certain areas of the power system within specific ranges) may have time to react to increase the voltages. If the low voltage condition develops instantaneously due to the loss of a generating unit or the sudden opening of a transmission line, tap changers and regulators will not have time to react. Most load tap-changers (LTCs) or regulators have a time delay of at least 15 seconds, and then take about a second to move each tap step. While the voltages are depressed, the output of area capacitor banks drops as the square of the voltage. If the system voltage drops 10%, the var output of capacitors on the system will drop by about 20%.

Load response is also dependent on the speed at which the low voltage condition develops. The response of the motors driving residential air conditioning units is of most interest, since their influence has the most significant impact on the outcome of a developing situation in this area. If the low voltage condition develops slowly, motors

will begin drawing more reactive power and will operate with lower efficiency. For thermostatically controlled air conditioning, each unit will run longer. The net impact over time will be slightly higher real power load and higher reactive load. If the voltage continues to decrease, the motors on some air conditioners will stall. The real power demand of a stalled air conditioner compressor motor is about double the normal running load, while the reactive power demand of a stalled air conditioner compressor motor is about six times the normal running load. If one residential air conditioner compressor motor supplied by a distribution transformer stalls, the motors on other air conditioners supplied by that same transformer will likely stall because of the increased load and voltage drop. This increased load, particularly the reactive load, will cause the voltage on the distribution feeder to drop further and cause other air conditioner compressor motors to stall. The pattern may accelerate and propagate into a widespread voltage collapse.

If the low voltage condition develops suddenly due to loss of a generating unit or a transmission line, a large portion of the compressor motors on residential air conditioners in the area affected may stall quickly, and if so the condition can migrate to a widespread collapse very quickly. If only a small percentage of the units stall initially, it may take a few seconds for the condition to propagate and cause other units to stall. It is possible that a voltage collapse might take five to ten seconds to fully develop into a widespread collapse.

Q. How does the load react to low voltages during fault conditions?

A. If the low voltage condition is preceded by a fault on the transmission system, there may be a significant percentage of residential air conditioner compressor motors in the area which stall during the time the fault is connected to the system, typically less

than 0.1 seconds. When the fault is removed by the opening of circuit breakers to isolate the faulted element, the load characteristic is already changed. This may cause a collapse to occur very rapidly. Although a Good Utility Practice has not been established regarding how to model the load response during the fault, the voltages would be worse than indicated in a steady-state analysis that I discuss below.

Q. Will the transformer load tap-changers be able to respond fast enough to avert a voltage collapse following a contingency event?

A. For a fast acting voltage collapse involving an outage to a transmission line or generator, the transformer load tap-changers (LTCs) will not act quickly enough to avert a voltage collapse. As mentioned above, LTCs and regulators will not have time to react. Most LTCs or regulators have a time delay of at least 15 seconds, and then take about a second to move each tap step. The voltage collapse event could be over before the LTCs would start to move.

Q. Will system operators be able to respond quickly enough to avert a voltage collapse following a contingency?

A. For a fast acting voltage collapse involving an outage to a transmission line or generator, system operators will not be able to respond quickly enough to avert a voltage collapse.

Q. Will protective relays on various portions of the system prevent a voltage collapse from occurring?

A. No. The protective relaying systems are not designed to prevent a voltage collapse from occurring.

Q. Once a voltage collapse has occurred, what is the expected time to return the system to normal conditions?

A. If a voltage collapse event occurred, most of the outaged load would be out of service for many hours. Operating personnel would have to determine the cause of the event and then begin restoring segments of the system in a gradual manner. Depending on the duration of the outage and the ambient temperatures, hot load pick-up may be a concern where all of the load diversity would be exhausted and customers would have to be restored feeder by feeder or perhaps tap by tap to avoid overloading equipment or being subject to extreme low voltages and another voltage collapse.

Q. If a voltage collapse event would occur, could the situation be repeated again?

A. Yes. A second voltage collapse event could occur, particularly during the system restoration if the double-circuit 345 kV line is still out-of-service. And, even if the double-circuit line is returned to service, and all of the load is restored to service, another event could occur at any time.

Q. In its planning and analysis of the Decatur area transmission system, did AmerenIP consider concerns about voltage collapse?

A. Yes. As I explained in my direct testimony (lines 345-358), Ameren has established transmission planning criteria which are applied to ensure the development of a transmission system that will adequately and reliably serve the projected customer loads as well as meet its obligations to its transmission service customers, as part of the interconnected transmission system. The transmission system is planned to supply all load and transmission services without violating facility ratings or voltage limits during

normal and single contingency outage conditions. The system is planned to provide reliable operation including an outage of any single generating unit or transmission facility. In addition, with any one generator out of service, the system is planned to operate with all equipment loaded at or below emergency ratings and with all voltages within acceptable limits for the loss of any one transmission facility.

In my direct testimony (lines 165-172), I stated that in all cases, the system is planned, designed and operated to maintain adequate voltages to the customers. The system is also planned to avoid thermal overload of equipment and minimize the likelihood of catastrophic equipment failure and widespread service outages. The higher voltage lines have greater load carrying capability than the lower voltage lines, and the higher voltage lines can deliver power over greater distances more efficiently, with less energy loss and less voltage drop, than lower voltage lines. As a result, extending transmission facilities close to the load minimizes energy losses and improves the delivery voltage.

As I also discussed (lines 204-218), the voltage criteria used in AmerenIP transmission system planning has been developed to provide voltages to the customer consistent with the 83 Illinois Administrative Code Part 410 Standards of Service for Electric Utilities. The distribution system planning criteria sets maximum and minimum steady state voltage limit guidelines at the low voltage bus of distribution and customer substations and at 34.5 kV and above customer delivery points for normal and contingency outage conditions. Voltages below these limits are investigated to ensure adequate voltage will be maintained on the distribution feeders. Transmission system low voltage limits of 95% of nominal have been established considering the above

voltage requirements for the subtransmission and distribution systems. Voltages below this threshold would initiate discussion with the distribution system planner to ensure that adequate distribution voltages would be provided for normal and single contingency conditions. For conditions beyond single contingencies, transmission voltages below 95% would be investigated further to determine what actions, if any, are required so that the contingencies would not result in widespread outages.

Q. How is exposure to a voltage collapse identified?

A. Although a voltage collapse is a dynamic process, planning engineers frequently use steady-state analyses (e.g., power flow models/tools) to identify areas that are exposed to this type of scenario. Planning engineers using models of the transmission system will typically take notice of any situation where the steady-state analysis shows transmission voltages would be below 95% of nominal. Additional review is performed to determine if the topology of the rest of the delivery system indicates there might be a problem. If a steady-state analysis shows transmission voltages below 85% of nominal, the assumption is that a voltage collapse is essentially certain for the conditions being examined. If a steady state analysis shows transmission voltages between 85% and 95% of nominal, additional review of the system in the area affected is needed. When the steady-state analysis shows voltages in this range, there is no bright line to identify if a voltage collapse will occur, since the exact characteristics of the load are not known. However, it is known that some motors connected to the distribution system will begin to stall when the distribution bus voltages fall below 90% of nominal.

Q. What did AmerenIP initially conclude about voltage collapse in the Decatur area?

A. As I explained in my direct testimony, and using conventional load modeling techniques, it was expected by 2012 that a large part of the Decatur area load would be subject to low voltage conditions and voltage collapse should an outage event occur that results in the loss of two or more bulk electric system elements during peak load conditions. The Clinton to Latham 345 kV line 4571 and the Clinton to Goose Creek 345 kV line 4545 share common transmission structures for approximately 16 miles between the Clinton Nuclear Plant and the Oreana 345/138 kV substation. If the outage of these circuits would occur during high load conditions, the analysis showed that the voltages would be so low that motors would stall resulting in a voltage collapse and dropping of a large amount of load in the Decatur area. Under the 2006 load projections and conventional power flow modeling used for planning purposes at the time I prepared my direct testimony, the amount of load that would be dropped for this double-circuit outage event at time of summer peak conditions caused concerns from an Ameren planning perspective. As stated at lines 368-383 of my direct testimony, the amount of load exposed to being dropped for more than 15 minutes due to the system topology and/or the natural response of the system in a voltage collapse event would exceed 300 MW. With the new Latham-Oreana line and the circuit breaker additions at Oreana Substation, the outage of the tower-line circuits that presently supply the Oreana Substation will no longer cause low voltages in the Decatur area.

Q. Why did you rely on conventional modeling when evaluating the Decatur system?

A. In the periodic analyses of the Ameren system, using conventional modeling assumptions, the Decatur area was identified as possibly being vulnerable to a voltage collapse. A study performed in 2007-2008 confirmed that the area would be exposed to a voltage collapse. At that time, the load forecast for the Decatur area showed a total load of 660 MW in 2013. The analysis indicated that the area would be clearly exposed to a voltage collapse in 2013 or before. In response to this study, mitigation options were evaluated and the addition of a 345 kV line from Latham to Oreana was identified as the best solution. Due to lead time constraints, the target in-service date for the new Latham-Oreana line was set as 2014. Because the need for the line was so clear-cut at that time, there was no reason to consider more in-depth modeling of the area.

Q. Are there aspects of the electric system that are not reflected in conventional modeling?

A. Yes. Generally, power flow models used to evaluate the transmission system do not explicitly represent the details of the distribution system. Typically, the model explicitly shows only the transformers at distribution substations connected to the transmission system, with all of the downstream distribution system shown simply as a net load. Capacitors connected to the low-side bus of the distribution substation may or may not be netted with the load. The power flow model used in the analysis to support my direct testimony related to the Latham-Oreana project, for example, used a net load representation at many of the low-side load buses for all substations connected to the transmission system. The model did explicitly include large 34 kV capacitor banks at those substations that have 34 kV capacitor banks. However, the entirety of the rest of the distribution system was represented simply as lumped net load.

Q. What was the impact of using conventional modeling in your direct testimony?

A. As a result of using conventional modeling, in responses to data requests from Staff, I commented on various load levels and corresponding voltages on the segments of the system included in the model, including the response to Staff data request ENG 4.06(d_. Using 85% as a threshold for indication of a voltage collapse, the conclusion reached was that the Decatur area may not be exposed to voltage collapse in 2016, as the model showed contingency voltages dropping to as low as 87%. This was based on the standard power flow model and updated load forecasts that showed lower future load levels. It should be noted that 85% is the level at which a voltage collapse is essentially assured. Situations which show 86% - 89% voltage in a steady-state analysis carry significant risk for voltage collapse.

Q. Is it possible to develop a model that would better reflect the impact to the distribution system?

A. Yes. The Transmission Planning staff at Ameren reviewed the model used in the initial evaluation of the Decatur area and determined that some assumptions made in the development of the model resulted in under-stating the exposure to voltage collapse. It was identified that the model could be improved by showing more detailed information for the underlying distribution system. Although a significant amount of detail could be added, it was decided that one key improvement would be to explicitly model the capacitors on the underlying distribution system instead of showing a net reactive load representation.

Q. What was the result of the more detailed modeling?

A. To include the effects of distribution capacitors, a power flow model was developed considering a 620 MW load level in the Decatur area expected by 2016 without the addition of new large customer loads (the same model that was used to develop the response to Staff data request ENG 4.06(d)). The distribution capacitors previously netted against reactive power load were modeled as discrete items at all relevant distribution buses in the model.

A side-by side comparison of the bus voltages in the Decatur area for the double-circuit outage of the Clinton-Latham 345 kV line 4571 and the Clinton-Goose Creek 345 kV line 4545 shows that modeling the distribution shunt compensation capacitors explicitly produces lower voltages as compared to the conventional net load model. (Bus voltages below 89% of nominal are highlighted in red; bus voltages below 90% but above 89% are highlighted in yellow.)

Decatur Area Double-Circuit Outage of Clinton-Latham line 4571 and Clinton-Goose Creek line 4545 Load Tap-Changers Locked				
Bus Number	Bus name	Bus voltages with conventional net load model	Bus voltages with shunt compensation capacitors modeled	Delta Voltage
84400	East Main 34 kV	0.9197	0.8943	-0.0254
84401	North Decatur 34 kV	0.9209	0.8943	-0.0266
84402	North Decatur 34 kV	0.9181	0.8923	-0.0258
84403	N 27th Firestone 34 kV	0.9193	0.8906	-0.0287
84404	N 27th Firestone 34 kV	0.9186	0.8926	-0.0260
84408	North Decatur 69 kV	0.9139	0.8777	-0.0362
84415	South Clinton 34 kV	0.9631	0.9382	-0.0249
84548	ADM North 34 kV	0.8945	0.8735	-0.0210
84549	ADM North 34 kV	0.9197	0.8932	-0.0265
84553	Cnty Hiway 20 34 kV	0.9275	0.8988	-0.0287

84554	ADM East 34 kV	0.8929	0.8715	-0.0214
84556	Northgate #1 12 kV	0.9030	0.8677	-0.0353
84567	Northgate #2 12 kV	0.8727	0.8160	-0.0567
84568	Route 51 #2 12 kV	0.9019	0.8767	-0.0252
84569	Route 121 #1 12 kV	0.8702	0.8197	-0.0505
84570	Clinton Rte 54 12 kV	0.9165	0.8898	-0.0267
84571	Route 51 #1 12 kV	0.8981	0.8712	-0.0269
84572	Clinton Rte 54 12 kV	0.9464	0.9304	-0.0160
84614	Route 121 #2 12 kV	0.9104	0.8987	-0.0117
348842	S Clinton Tap 138 kV	0.9116	0.9064	-0.0052
348845	Clinton Tap 138 kV	0.9178	0.9064	-0.0114
348853	ADM North 138 kV	0.8810	0.8623	-0.0184
348862	N Decatur W 138 kV	0.9041	0.8871	-0.0170
348863	N Decatur E 138 kV	0.8980	0.8807	-0.0173
348864	N 27th St 138 kV	0.8924	0.8743	-0.0181
348865	Decatur Jct 138 kV	0.8993	0.8816	-0.0177
348866	E Main St 138 kV	0.9013	0.8816	-0.0197
348867	Route 51 138 kV	0.9003	0.8828	-0.0175
348868	Route 51 Tap 138 kV	0.9013	0.8841	-0.0172
348869	Moweaqua Tap 138 kV	0.9387	0.9280	-0.0107
348870	Caterpillar 138 kV	0.8847	0.8662	-0.0185
348871	Faries Parkway 138 kV	0.8804	0.8617	-0.0187
348872	Mt. Zion 121 138 kV	0.8882	0.8696	-0.0186
348873	Mt. Zion PPG 138 kV	0.8922	0.8741	-0.0181
348876	Clinton Rte 54 138 kV	0.9133	0.9009	-0.0124
348877	Cnty Hiway 20 138 kV	0.8983	0.8819	-0.0164
Max		0.9631	0.9382	-0.0567
Min		0.8702	0.8160	-0.0052
Avg		0.9064	0.8838	-0.0226

In general, modeling distribution shunt compensation capacitors provides an average difference of about 2.3% in the Decatur area compared to net load modeling. The additional detail shows a larger impact on distribution bus voltages than the transmission bus voltages because of the increased voltage drop through the bulk and distribution substation transformers. The heavily loaded 138-12 kV substations at Northgate #1 and Mt. Zion Route 121 #1 have voltage differences exceeding 5% compared to net load modeling.

With 12 kV bus voltages less than 89% at several stations, <u>and 5-7% lower downstream on the distribution feeders</u>, it is expected that many motors connected to these stations would stall. The real power demand of the stalled motors would increase significantly, and the reactive power demand of the stalled motors would increase drastically, further decreasing the area voltages and causing more motors to stall, resulting in a rapid deterioration of the voltages and ultimate collapse of the Decatur area. It should also be noted that an even more detailed model (including distribution feeders, etc.) would be expected to show voltages that are lower than those shown in the Table.

Also, even with the slightly more detailed representation to specifically model the distribution system capacitors, this steady-state analysis still does not consider the added impact of load characteristic change due to a transmission fault. Although the industry has not yet developed a Good Utility Practice which would provide a framework for including this aspect, the phenomenon is present and would make the voltage situation worse than indicated by the steady-state analysis. This suggests that the refined model I discuss above is conservative in its results. The powerflow diagram attached as AmerenIP Exhibit 7.1 shows the same voltage results that are included in the table above.

Q. Is it practical to install additional distribution capacitors or perform other upgrades on the distribution system to avert a voltage collapse for the double-circuit outage of the Clinton-Latham and Clinton-Goose Creek 345 kV lines?

A. No. It is not practical to install additional distribution capacitor banks or voltage regulators, or other electrical equipment on the subtransmission or distribution system to avert a wide area voltage collapse caused by the outage of the Clinton-Latham and Clinton-Goose Creek 345 kV lines. As explained above, the distribution voltages are too low for the double-circuit transmission line outage event, such that the addition of distribution capacitors would not be able to keep the air conditioner motors from stalling.

Q. Was the addition of transmission capacitor banks in the Decatur area analyzed to determine if that approach could be used as a way to avert a voltage collapse?

A. Yes. The addition of transmission capacitor banks in the Decatur area was considered. The addition of capacitor banks is not a feasible solution to prevent a voltage collapse for the Decatur area considering the topology of the supply system. The amount of additional reactive support required to assure that a voltage collapse would not develop as a result of an outage of the double-circuit 345 kV supply to Oreana is estimated to be in the range of 300 Mvar to over 700 Mvar. The lower number considers only the steady state conditions. The higher number represents the amount of reactive support needed to assure adequate voltage during a fault on the double-circuit line, and it is simply not feasible to operate the system with this much additional reactive supply. Adding this much reactive supply would cause unacceptably high voltages with normal conditions on

the system. Also, it is not feasible to have the capacitors switch-on only during a voltage collapse, due to fact that the voltage collapse may develop quickly.

Q. Is the proposed Latham-Oreana Line addition the only system upgrade that can be installed to avert a voltage collapse in the Decatur area?

A. No; however, it is the least cost option. AmerenIP considered several possible 345 kV line extensions to Oreana Substation from the nearest 345 kV sources in central Illinois. In addition, Ameren considered the installation of static-var-compensators. However, the cost estimates for other alternatives were $18 million to $100 million higher than the cost of the proposed Latham-Oreana Line. The proposed option to build a short 8-10 mile Latham to Oreana 345 kV line is the least cost method to meet the requirements of NERC Standard TPL-003 and Ameren transmission planning criteria. It does not make engineering or economic sense to build a much longer line and create a larger impact to the public when a simple modification to the connection arrangement of the existing Clinton-Latham line 4571 and a short line extension will suffice.

Q. Although the analysis above was based on a load level of 620 MW expected by 2016, is the Decatur area subject to voltage collapse before that time?

A. Yes. Based on the more detailed load modeling (results included above) which shows distribution bus voltages at less than 89%, and knowing that the voltages would be up to 7% lower downstream from these buses and indicating that a voltage collapse would be assured, it appears that the Decatur area would be vulnerable to a voltage collapse during summer peak conditions before 2016.

Q. Are there any proposed load additions in the Decatur area that could significantly change the Decatur area load forecast?

A. Yes. AmerenIP is in negotiations with a large customer in the Decatur area that could add 30-100 MW of load over the next several years. The customer has projected a 30 MW load addition as early as 2011, with an additional 30 MW targeted for 2012. A 40 MW load addition could be added some time after 2013. The customer presently has not committed to the expansion and is working with AmerenIP to address specific design issues, including the addition of a 138 kV transmission loop and supply to a new substation. As the customer is reviewing its business plan before determining to move forward, AmerenIP has not included these proposed load additions in its load forecasts for the Decatur area.

Q. How would a large load addition in the Decatur area impact the contingency voltages?

A. A large load addition would result in lower Decatur area voltages during contingencies and advance and increase the exposure to voltage collapse if the proposed line addition is not constructed.

Q. Can the existing Ameren system accommodate the proposed initial load addition of 30 MW from this large customer?

A. No. The proposed Latham-Oreana 345 kV line is needed to enable Ameren to maintain reliable service to the Decatur area in the near future with only the expected general load growth in the area. The addition of a 30 MW load in the Decatur area would advance the timeframe for the need for the line.

Q. Would additional transmission facilities be required to maintain reliable service for the Decatur area if the large customer proceeds with the addition of a total of 100 MW?

A. Yes. Although the full expansion of the large customer has not been studied completely, it is believed that transmission facilities in addition to the Latham-Oreana 345 kV line would be needed to maintain reliable service to the Decatur area.

Q. What load level was experienced for the Decatur area for the summer of 2010?

A. Preliminary analysis of the loads experienced during the summer of 2010 shows the area reached a peak load of approximately 608 MW. This system peak would be approximately 626 MW on a weather-normalized basis. This load level exceeds last year's forecast for 2016 of 620 MW.

IV. CONCLUSION

Q. What is your conclusion?

A. The existing transmission system in the Decatur, IL area, without the double-circuit tower line that supplies the Oreana 345/138 kV substation, is inadequate to support the Decatur area load in the near-term. Further, the existing transmission system would not be able to support possible large load additions while providing adequate voltages to customers during contingencies. Based on the revised power flow analysis of the Decatur area, which shows many distribution bus voltages between 86% and 89% (levels that carry a significant risk for voltage collapse) and a few distribution bus voltages below 85% (the level at which a voltage collapse is essentially assured) for the double-circuit tower line outage, and knowing that the voltages would be up to 7% lower downstream from these buses, it is concluded that the Decatur area will be exposed to voltage collapse by 2016 (or before). A review of the low voltages indicates that the voltage collapse would result in the loss of service to most if not all of the load (over 600 MW) in the Decatur area. A loss of this magnitude far exceeds the 300 MW limit in

Ameren's Transmission Planning Criteria for the amount of load dropped by the natural response of the system. In order to avoid exposure to this outage and to comply with Ameren's Transmission Planning Criteria, the Latham-Oreana 345 kV project should be completed by 2015.

Q. Does this conclude your prepared rebuttal testimony?

A. Yes, it does.

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