COMMONWEALTH OF KENTUCKY
BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:		
ELECTRONIC APPLICATION OF KENTUCKY	)	
UTILITIES COMPANY FOR AN ADJUSTMENT	)	Case No.
OF ITS ELECTRIC RATES AND FOR	)	2016-00370
CERTIFICATES OF PUBLIC CONVENIENCE	)	
AND NECESSITY	)	

DIRECT TESTIMONY

OF

THOMAS J. O'LOUGHLIN

Submitted on

Behalf of

The Kentucky Cable Telecommunications Association

March 3, 2017

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I. INTRODUCTION AND QUALIFICATIONS.

Q: Please state your name, business address, and occupation?

A: My name is Thomas J. O'Loughlin. My business address is One Charlesview Road, Hopedale, Massachusetts. I am a principal engineer with Consulting Engineers Group ("CEG Consulting") specializing in providing engineering, consulting, and field services to clients in the communications and utility industries.

Q: Please summarize your educational and professional background?

A: I received a Bachelor of Science in Electrical Engineering from Clarkson University and an Associate of Applied Science degree in Engineering Sciences from Broome Community College. I am a Registered Professional Engineer in Connecticut, Rhode Island, New Hampshire, and Massachusetts. I am also a member of the Institute of Electrical and Electronics Engineers.

My professional background includes over 25 years of design, field, and operational experience in the utility industry, including extensive experience overseeing the design and construction of electric distribution systems and facilities. Prior to becoming a principal engineer with CEG Consulting, I was the electrical operations and engineering manager for a large municipal utility in Connecticut. In that role, I was responsible for, among other things, the inspection and make-ready work costs and procedures for a cable company, and I interfaced with the utility, telephone, and third party communications attachers on costs, safety, installations of communications facilities, and National Electric Safety Code ("NESC") requirements. A true and current summary of my experience is attached to my testimony as **Exhibit A**.

Q: Have you ever provided pole loading analyses for communication joint users or third party attachers?

A: Yes. I have performed pole loading analyses for third party pole attachments. These analyses were performed in specific locations, such as new facilities being installed across limited access highways, navigable waterways, or on poles suspected to be overloaded.

Q: Have you served as an expert in any proceedings related to pole attachments?

A: I have previously submitted expert testimony in regulatory proceedings, including before the Federal Communications Commission ("FCC"), involving engineering and construction issues related to third party communications attachments to electric distribution structures.

Q: What is the purpose of your testimony in this proceeding?

A: I was asked to review and evaluate tariff requirements proposed by the Kentucky Utility Company ("KU" or "Company") that relate to pole loading. As I understand the tariff, the Company proposes to require third party Attachment Customers to perform pole loading analyses as part of the application permit process. The utility also proposes to require an Attachment Customer to perform pole loading when seeking to overlash additional fiber onto an existing attachment and to attach a small cell wireless device on an existing strand.

Q: Please summarize your testimony?

A: KU proposes to require Attachment Customers to conduct a pole loading analysis in connection with each attachment application, including each application to overlash an existing attachment or attach a Wi-Fi facility to an existing attachment. These requirements do not appear necessary or reasonable for a number of reasons.

As an initial matter, pole loading analysis serves an important purpose in ensuring the safety and reliability of the electric distribution network. Utility poles are under strain, or load, as a result of a variety of factors, including the equipment placed on the pole, the forces applied to the pole, and environmental considerations like ice, wind pressure, and temperature. Pole loading assesses the horizontal and vertical tensions on a pole to determine if they are within the loading requirements and safety factors of the NESC. Pole loading for third party attachers must be performed by a registered professional engineer and can be time consuming and costly, particularly where there are numerous poles, as is often the case, involved in a construction project.

Pole loading is generally performed when overloading conditions are believed to be present or when utility construction standards are modified or updated, rather than as a default requirement of any permit application to make a communications attachment. The NESC requires utilities to design, construct, operate, and maintain all electric supply and communication lines in compliance with the rules and requirements of the NESC. Pole loading analyses are performed to ensure these NESC requirements are met. Thus, when an attachment application is made, the utility can refer to the existing pole loading analysis and determine whether the structure can bear the attachment or further analysis is required for the attachment. Further, an individual experienced in utility pole loading analysis of similar pole structures can generally evaluate structures visually and assess whether an additional attachment warrants immediate pole loading analysis to ensure the structure can support the attachment or whether the loading can be addressed at a later time.

Typical pole models of a single circuit distribution pole were created under my direction. Additionally, a model similar to the pole outlined in the Third Party Pole Attachment Guidelines was developed to validate my pole analysis methodology against that used by KU.[1] Based on my modeling, the Company's poles as outlined in Case 1 of the Third Party Pole Attachment Guidelines generally should have more than sufficient capacity to accommodate a communications attachment.

I also assessed the marginal increase in load of a half inch overlash attachment. Based on my analysis, an overlash cable has an impact of between two to five percent on pole loading. Consequently, a half inch overlash attachment generally should not materially impact pole loading unless, as a result of existing facilities, a given pole is at or near maximum capacity. Because of this minimal impact, a half inch overlash attachment does not significantly increase the loading, and the overloading condition of the structure is likely caused by the utility's existing equipment.

I also evaluated the impact of adding strand-mounted small cell wireless facilities to a typical pole. These facilities are attached directly on an existing steel strand

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[1] While these guidelines were created by Louisville Gas & Electric Company ("LG&E"), KU did not produce its own base case analysis of pole loading. I relied on LG&E's study as a benchmark for KU's own structures and facilities, and for ease of reference, I refer in this report to the specifications and findings in the Third Party Attachment Guidelines as KU's. In any case, the model developed here applies conditions more stringent than those required under loading analyses by either utility.

within approximately three to four feet of the pole. To evaluate the impact of wireless facilities on poles, I assessed the impact of a hypothetical device larger than the Wi-Fi devices I understand are actually installed by cable operators such as Charter. As with half inch overlash attachments, the addition of Wi-Fi facilities should not materially impact the strain on a structure that is not already at or near capacity.

Based on my review of the tariff, my analysis, and my review of relevant record materials, my opinion is that it is not reasonable for the utility to have a default rule that pole loading must be performed for all attachments. Pole loading studies are expensive and time consuming and therefore delay and increase the costs of the deployment of communications facilities. While such analyses can serve an important purpose, where appropriate, communications wires and strand-mounted small cell devices generally do not materially impact pole loading where a pole is not otherwise at or near capacity. As such, requiring pole loading with every permit application adds unnecessary time and expense to the attachment process. A more reasonable approach, given that the utility should know where its structures are at or near capacity, is for the Company to require pole loading only where it has a good faith belief that the addition of communications facilities will overload a pole.

My opinion that such analyses are unnecessary as a default rule is further supported by the fact that the Company does not require joint users or wireless attachers to perform pole loading for every proposed attachment as part of the attachment process. Moreover, the Company itself in this proceeding has put forward no explanation or justification, whether in the form of testimony or documents, demonstrating the need for pole loading to be conducted whenever an Attachment Customer seeks to attach a communications wire, overlash an existing communications attachment, or add a small cell device to existing strand. Based on all of the above, a more reasonable approach is for the Company to have pole loading performed in connection with any of these kinds of attachments only where it had a good faith belief that a pole is near or at capacity based on existing information it maintains.

II. POLE LOADING EVALUATES THE FORCES APPLIED TO A STRUCTURE TO DETERMINE HOW CLOSE THE STRUCTURE IS TO REACHING ITS CAPACITY.

A. General Pole And Attachment Conditions Affecting Pole Loading.

Q: Do you understand the purpose of pole loading analysis?

A: Yes. Pole loading analysis in simple terms assesses the stress, or load, on a given pole by evaluating the many forces applied to the pole. The analysis determines the current strain on the pole relative to the requirements of the NESC for the applicable loading region and construction grade and can also be used to assess the impact of adding additional facilities to a pole.

Q: Do you know how pole loading analysis is conducted?

A: Yes. At a high level, field agents collect a variety of data related to the structures that engineers then import into a software program to analyze the tension on the structure. The field data includes information related to: the distance between poles, existing attachments on the structures, including all cross arms, anchor points, guys, bolts, insulators, wiring, and other equipment, the locations of the various attachments and equipment, the tension of wires attached, and the position of the pole relative to others. Pole owners generally have all of this information about their own structures and the attachments made on them. Because third parties do not, however, their agents need to conduct field investigations and possibly follow up inquiries to provide the engineers the data they need to conduct pole loading analyses.

Once the data relevant to design parameters has been collected, it generally takes an additional day for engineers to run pole loading, which costs in the range of $1,000 per pole, on average. The overall cost and time to complete pole loading varies depending on the number of studies that need to be completed and the amount of information that agents need to collect from the field prior to conducting the analysis, as these factors can increase the costs and time to complete pole loading.

Q: Please describe the pole characteristics that impact pole loading analyses?

A: As mentioned above, pole loading takes account of 1) height, 2) class, 3) the location of the equipment on the structures, 4) loading conditions, and 5) position of the structure relative to other structures. Each structure has a maximum capacity of stress that it can withstand based on these factors, and a pole loading study analyzes the impact of facilities and attachments to a structure on the overall stress the structure is under.

Q: What effect does the height of the structure have on load?

A: Generally, taller structures provide more space for attachments, but those attachments can be placed higher above grade, which puts more stress and moment at the base of the structure. As a matter of physics, attachments made closer to the ground create less bending moment on the structure. By contrast, attachments made higher above the ground can place a correspondingly greater amount of bending moment on a structure.

Q: Can you describe what is meant by a pole "class"?

A: Pole class refers to a pole's diameter. In layman's terms, a structure's "class" refers to its strength. Distribution pole classes typically range from category 1 to 5 with Class 1 poles being the stronger and Class 5 poles being the weaker. Generally speaking, the stronger the pole, the more stress it can withstand.

Q: Do you know whether the location of the attachment on a structure makes a difference in a loading analysis?

A: Yes. The closer to the ground an attachment is placed the less strain it will place on the structure. Attachments closest to the top of the structure tend to have the greatest impact on the outcome of a pole loading study.

Q: Please describe how environmental conditions effect pole loading?

A: The NESC has four general and widely-recognized loading districts due to weather conditions: heavy, medium, light, and warm island loading. These conditions refer to the amount of additional stress that weather conditions, such as wind, ice, and temperature, can have on the structure. Structures of the same size and class with the same attachment configurations face different stress conditions based on these factors. Structures under warm island loading and light loading conditions will typically experience less extreme weather conditions than structures subject to heavy loading conditions. As a result, structures under warm island loading and light loading experience less weather-related strain than structures under heavy loading conditions. Thus, holding all other factors constant, a structure that can withstand calculated tensions under "heavy" loading conditions will withstand expected tensions under "medium" loading conditions.

Q: Does the relative position of the structure impact pole loading?

A: Yes. Structures generally exist in one of three locations. First, a "deadend" pole is the last structure in a line of poles. Because there are only attachments on one side of the structure, the forces imposed on the structure are not even. To offset these uneven forces, guying/anchoring is installed on the opposite side of the pole. Second, a "corner" pole is exactly what it sounds like: Where the structures change course, a "corner" pole is located at the change in direction. The forces created by the conductors attached at different angles also require guying/anchoring to support the structure. The guying/anchoring for a corner pole is typically installed to bisect the angle created by conductors and installed on the opposite side of the pole. Finally, a "tangent" pole describes the majority of structures. These structures are essentially struts in the mainline of a pole run. Because the attachments to each side of the structure pull in diametrically opposed directions, guying/anchoring of these poles is not typically required.

Q: Can you describe the kinds of forces that impact loading studies?

A: Structures endure both horizontal and vertical forces – that is, the pressures of attachments and the structure itself as it relates to the dead weight of the structure and the pull on the structure resulting from attachments. A loading study evaluates the overall forces on the structure to determine if they are within the requirements of the NESC.

B. The KU Poles On Which Communications Attachments Customers Install Their Wires And Facilities.

Q: Do you know the types of Company structures to which cable operators attach?

A: I understand most of KU's structures to which communications attachers like KCTA's members attach are Class 4 forty-foot wood poles.

Q: Do you know the loading conditions that apply to KU's structures?

A: Yes. KU evaluates its structures under "medium" loading conditions and the appropriate grade of construction (B, C or C@ crossing), which means that under the loading analysis the structure is analyzed to meet the requirements and safety factors for the "medium" loading district weather conditions, such as wind and ice, in Kentucky and the applicable construction grade.

Q: Do you know what kind of attachments cable operators make to KU's structures?

A: I understand that there are generally three categories of attachments that cable operators make to KU's structures. First, cable operators can make new construction attachments which include items such as bolts and guys, a messenger strand, a coaxial or fiber communications wire, and associated hardware and equipment components necessary to complete the new buildout. Second, cable operators often overlash half inch fiber optic cable, affixing the cable on top of the existing strand for a pre-existing mainline communications wire attachment. Finally, cable operators attach strand-mounted small cell wireless facilities to their messenger strands. These attachments are stationary Wi-Fi extenders that sit on a strand about three to four feet from a structure.

Q: **Do you know where on a pole a cable operator installs its attachments on KU's structures?**

A: Cable operators are typically limited to a certain section of the pole. Cable attachments must maintain all necessary ground clearance depending on their location. Additionally, cable attachments need to maintain the 40" communication workers safety zone. This zone is measured from the lowest point of the utilities supply space. Typical communication attachments range from approximately 16 to 22 feet above grade. The closer to the ground an attachment is placed, the less bending moment it will place on the structure. Attachments higher on the pole impose greater bending moment.

Q: **What is your understanding of how cable operators overlash existing cable facilities?**

A: I understand that when cable operator attachers place an overlash attachment the additional fiber optic cable is typically about half an inch in diameter and placed on top of the strand supporting a pre-existing mainline communications wire attachment. Because the diameter of the fiber is small and typically lightweight (unlike old copper wire historically installed by incumbent telephone companies) impact on the loading due to wind and ice conditions is generally a very small percentage of the pole's total loading capacity, as demonstrated by my pole loading analysis.

Q: **What is your understanding of how cable operators install strand-mounted wireless facilities?**

A: Strand-mounted Wi-Fi facilities are placed directly on the strand supporting a pre-existing communications wire attachment within about three to four feet off the structure. They are relatively small – about 16 inches long and nine inches high and wide – and do not require additional space outside the one foot of communications space allocated to a cable operator. I also understand that these attachments weigh only about 13 pounds.

III. POLE LOADING ANALYSIS OF COMMUNICATIONS ATTACHMENTS ON KU'S POLES.

A. Modeling The Load Bearing Capacity Of KU's Structures.

Q: Did you develop a model to evaluate the impact of communications attachments on the load of KU's structures?

A: Yes. A base case pole using KU's Case 1 data outlined in the Third Party Pole Attachment Guidelines was developed. *See* LG&E's Response to KCTA's First Requests for Information No. 1-16.

Q: What is a base case pole?

A: A base case pole is a hypothetical pole that has all the worst case conditions and tensions that a structure in KU's footprint could have. Using a base case pole is a standard modeling technique that allows engineers to test the loading effects of additional stressors on a hypothetical pole that assumes the worst case conditions that could possibly impact one of KU's structures. This technique saves the engineer from having to inspect each structure individually and running time consuming and burdensome analyses on all actual data. In most cases, it is standard practice to assume that KU's structures meet its specifications and non-conforming poles are the exception, not the rule, so using a base case pole is a conservative approach to understanding loading impacts since the base case pole will always assume more stressful conditions than the average KU structure actually experiences.

To create the base case pole, engineers enter a set of pole criteria and loading conditions into software developed specifically to assess pole loading. These conditions can be manipulated in a variety of ways, depending on the software, and changes to the base case pole, such as testing the hypothetical strain of an additional attachment, can be run through the program to analyze the effect of these changes on pole loading.

Q: How did you develop the KU base case pole?

A: Initially, I developed a typical single circuit distribution pole with one utility circuit and multiple cable and communications circuits model. Consistent with general utility construction specifications, this initial structure was a 40 foot wood pole with a Class 4 designation, designed with utility circuit equipment and wires attached near the top of the pole in the electrical supply space and the cable and communications attachments in the communications space at approximately 21 feet above grade. A pole loading analysis was run using Pole Foreman on this initial case to determine pole loading prior to adding the half inch fiber overlash. To be conservative, this analysis was run using the heavy loading district requirements and Grade C crossing construction.

After the initial 40 foot model was developed, I received the Third Party Pole Attachment Guidelines. *See* LG&E's Response to KCTA's First Requests for Information No. 1-16, Attachment at 26-29. A model similar to the 50 foot case 1 2 circuit pole with streetlight, secondary, and 3 communication attachments was developed to validate our model to the analysis provided in the Third Party Pole Attachment Guidelines. A pole loading analysis in Pole Foremen was run using medium zone loading requirements and Grade C construction. The results of my analysis were within one (1) percent of the KU analysis, validating the model to the KU model.

Q: What loading conditions did you apply to the base case pole?

A: While I understand structures in Kentucky are generally subject only to "medium" loading, I took a conservative approach with respect to loading conditions and applied to the initial model the more stringent "heavy" loading conditions. Under "heavy" loading, the structure is evaluated under conditions in which they are covered in a half inch of ice, compared to only a quarter inch of ice in "medium" loading analyses, and enduring four pound per square foot of wind conditions. Attachments evaluated under "heavy" loading are bigger and have more surface area for wind to push, causing more stress/tension on the structure. Using "heavy" loading in my analyses is a conservative approach because it assumes more tensions than that to which KU's structures are subject in reality.

B. Impact Of Initial Communications Attachments On Loading.

Q: Does your model assess the impact of initial communications on structure overloading?

A: Yes.

Q: Please describe your model for evaluating the impact of initial attachments?

A: The initial model developed included two (2) communications cables in the communication space. The Telco cable was assumed to be a 3" cable weighing

5.26 pounds per foot and the CATV cable was a two inch cable weighing 0.76 pounds per foot. These cables are similar to the communication cables KU has for Case 1 in the Third Party Pole Attachment Guidelines. Case 1 has a 3" Telco cable weighing 2.06 pounds per foot and a 2" CATV cable weighing 0.76 pounds per foot.

Q: What did your analysis show related to initial attachments?

A: In the analysis I conducted, the base case pole (prior to adding the half inch fiber cable) included a standard communications attachment – as well as standard telephone attachments and the utility's own equipment and facilities. Even with all of these attachments, both the horizontal and vertical stress of the base case pole is nowhere near the structure's capacity prior to adding the half inch fiber overlash attachment. To determine the effects of additional utility equipment, a utility transformer was added to a tangent pole. The addition of this transformer only modestly increased the vertical loading. An initial attachment thus clearly does not overload a structure.

Q: Do you have an opinion on whether it is reasonable to require an Attachment Customer to conduct a pole loading analysis as a part of every attachment permit application?

A: Yes. It is not reasonable to require pole loading as a component of every attachment application. KU should make a case-by-case determination whether to require pole loading based on its records of the structure for which an Attachment Customer applies for a permit and the type of facilities being installed. Given the loading burdens of KU structures, a cable operator's attachment of a half inch overlashed fiber to a structure will cause minimal increase in loading, and KU should have records of the condition and load of its structures to identify structures already approaching capacity. Given that pole loading studies are generally unnecessary for communications overlash attachments, it is particularly unreasonable to have third party Attachment Customers incur the burden, time, and expense associated with pole loading studies for every proposed attachment since they generally do not have the information required to conduct such studies when they begin their analyses. That approach is needless, wasteful, inefficient, and just serves to slow and increase the cost of communications attachments. Notably, I understand that KU does not require other attachers not subject to the proposed tariff to undertake pole loading studies for each attachment application, further indicating that such studies are not necessary and that it is not reasonable or standard practice to require pole loading studies for each attachment.

Q: Do you have an opinion on a more reasonable and appropriate approach to pole loading for communications attachments?

A: Yes. KU should make determinations about the necessity of a pole loading analysis on a case-by-case basis. Initial attachments do not cause KU's standard structures significant risk of overloading absent some anomalous conditions that should already be known to the utility prior to the submission of any attachment application.

Indeed, because KU is required by the NESC to ensure pole loading requirements are met on its structures, it should know when the structures to which attachers wish to attach are at or near capacity and require pole loading analyses be performed in these circumstances. Even without the NESC requirement, KU and communications attachers can assess through visual inspection and experience whether a structure appears to be at or near capacity and further pole loading should be conducted. Both KU and Attachment Customers employ skilled engineers and construction crews with a great deal of knowledge and experience with utility poles who are capable of making this kind of assessment. This is a far more practical approach because it requires attachers to undertake the time and expense of a pole loading study only where the analysis may reveal a need to replace the existing structure to accommodate the new attachment.

C. Impact Of Overlashing On Pole Loading.

Q: Did you also analyze the impact of overlashing on structure overloading?

A: Yes.

Q: Please describe your model for evaluating the impact of overlashing?

A: Assuming all other factors in the initial base case pole remain the same, I analyzed a category of structures in which an attacher overlashed a half inch fiber on an existing attachment. I then ran the same model with this addition.

Q. What did your analysis show related to overlashing?

A: Based on my analysis, the addition of a half inch of overlashed fiber to both my initial case and the KU Case1 imposes between a two to five percent increase in load. This means that overlashing generally has a minimal impact on pole loading, except where the structure is already overloaded or nearly overloaded.

On the typical 40 foot Class 4 pole, the loading percentage across the three construction types modeled (corner, deadend, tangent) increased, on average, between two to five percent. I also analyzed other, similar poles with slightly different conditions, such as Class 3 and 5 poles and structures that measure only

35 feet in height. These analyses demonstrate the applicability of my results across pole conditions. On slightly stronger Class 3 structures, overlashing does not cause any load bearing concerns as overlash attachments generally increase the overall stress on the structure by only one to two percent, with few exceptions. On slightly weaker Class 5 structures, the poles are prone to overloading even before an overlash attachment is made. Where structures are not already overburdened, the placement of an overlash attachment does not overload the structure.

What is clear from all of my analyses is that the addition of an overlash fiber attachment does not overload the typical KU's structure unless it is already overloaded – or very close to full capacity.

Q: Do you have an opinion on whether it is reasonable to require an Attachment Customer to conduct a pole loading analysis as part of every overlash attachment application?

A: Yes. Given the modest two to five percent impact on the loading of a half inch overlash on a structure, a loading analysis requirement for every instance of overlashing imposes additional time and expense without any meaningful benefit. Unless a pole is at or near capacity, a loading analysis will show that the attachment will not have a material impact on loading. But in any case, my model further shows that overlashing only causes overloading when the structure is already at or near capacity, and it is simply not reasonable to require Attachment Customers to pay to analyze and fix conditions that their attachments did not create or cause, particularly where KU should know, based on its own records of facilities on a structure, if the structure is already overloaded. Forcing communications providers to pay to find out what KU should already know about the load of its structures and the structures' configurations and conditions is simply unreasonable and a poor use of resources. Indeed, confirming this view, I understand that other attachers are not required to conduct pole loading prior to making their attachments.

Requiring Attachment Customers to comply with this onerous, time-consuming, and costly exercise is inefficient and wasteful and will delay and deter timely deployment of communications facilities. It also forces Attachment Customers to bear costs of replacing overloaded poles that are properly borne by the utility.

Q: Do you have an opinion on a more reasonable and appropriate approach?

A: Yes. Determinations about the necessity of a pole loading analysis, whether in the case of initial attachments or overlashing, should be made on a case by case basis. Overlashing a half inch fiber adds only two to five percent to the overall loading of a structure. As discussed above, because NESC requires KU to ensure pole loading on its structures meets the NESC loading requirements, KU should know when its structures are approaching capacity and make individualized decisions about the need for pole loading studies. This is a far more practical and efficient approach because it requires attachers to undertake the time and expense of a pole loading study only where the analysis may reveal a need to replace the existing structure to accommodate the new attachment. This approach also ensures that a third party Attachment Customer does not incur costs properly borne by KU.

D. Impact Of Strand-Mounted Wireless Attachments On Pole Loading.

Q: Did you also model the impact of strand-mounted wireless facilities on structure overloading?

A: Yes.

Q: Please describe your model for evaluating the impact of strand-mounted wireless facilities?

A: I understand that cable operators place strand-mounted small cell wireless facilities directly on the strand supporting pre-existing attachments. For the purpose of my analysis, I used a straight bracket analogy to capture the uneven distribution of weight caused by a single small attachment in a fixed location from the pole rather than adding the weight of the component to the overall cable attachment distributed evenly between two poles. I took a conservative approach and assumed a slightly larger and heavier attachment than those actually made by cable operators. My hypothetical attachment weighs 25 pounds, is 11 inches high, 24 inches long, and 15 inches wide. I assumed that my hypothetical attachment is placed 3 to 4 feet off the structure, just like the wireless facilities cable operators actually attach to the structures.

Q: What did your analysis of this hypothetical wireless structure show?

A: Based on my analysis, the addition of a small cell wireless attachment imposes an even more modest increase in load than overlash attachments: The wireless Wi-Fi component added only one percent of loading. Clearly, given the results of my analysis as to overlashing, small cell wireless attachments should not overload a pole that is not at or near capacity.

Q: Do you have an opinion on whether it is reasonable to require an Attachment Customer to conduct a pole loading analysis prior to installing any strand-mounted small cell wireless facility?

A: Yes. As with overlash attachments, given the negligible impact of strand-mounted small cell wireless facility attachments on overloading, my opinion is that a loading study should not be required for every strand-mounted wireless facility installation. Similar to the overlash fiber, the addition of the wireless Wi-Fi device will only be a concern for poles that are already at or near loading capacity.

Q: Do you have an opinion on a more reasonable and appropriate approach?

A: Yes. Just like with overlashing, determinations about the necessity of a pole loading analysis for wireless attachments should be made on a case-by-case bases. Similar to the overlash, KU should have records of what structures they believe are nearing an overloaded condition or are overloaded. These are the only structures that should require additional pole loading analysis.

IV. CONCLUSION

Q: Do you have any final additional opinions?

A: Yes. Third party communications Attachment Customers should not be required to perform pole loading unless KU identifies specific structures for which it believes pole loading may be necessary based on information it has about the existing load on a pole. Pole loading should not be used inappropriately to shift costs and responsibility for overloading to third party Attachment Customers that the NESC requires the utility to address. Because of the marginal impacts of communications attachments, overlashing, and strand-mounted wireless facilities on loading, requiring cable operators like KCTA's members to perform pole loading analyses prior to attaching their facilities makes their deployment of communications facilities needlessly slower and more expensive. KU is required to ensure pole loading of all its structures is within the NESC requirements, and if its records or visual inspections identify a potential loading problem, it can require the attacher to perform pole loading in specific circumstances where it reasonably believes in good faith an attachment will overload a structure. This is a more reasonable and efficient approach, which saves time and resources spent on loading analyses that, based on my modeling, will show that an initial attachment, half inch fiber overlash, and wireless facility will not have a meaningful impact on pole loading. Pole loading for third party communications attachments by Attachment Customers should be the exception, not the rule.

Q: Does this conclude your testimony?

A: Yes, it does.

[VERIFICATION ON SEPARATE PAGE]

VERIFICATION

COMMONWEALTH OF MASSACHUSETTS)
) SS:
COUNTY OF WORCESTER)

The undersigned, **Thomas J. O'Loughlin**, being duly sworn, deposes and says that he is a Principal Engineer with the Consulting Engineers Group, and that he has personal knowledge of the matters set forth in the foregoing testimony and exhibits, and that the answers contained therein are true and correct to the best of his information, knowledge, and belief.

Thomas J. O'Loughlin

Subscribed and sworn to before me, a Notary Public, in and before said County and State, this 3rd day of March, 2017.

Dawn M. Gaudet-Logan (SEAL)
Notary Public

My Commission Expires:

October 8, 2021

DAWN M. GAUDET-LOGAN
Notary Public
COMMONWEALTH OF MASSACHUSETTS
My Commission Expires
October 8, 2021

Exhibit A

C
E
G

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THOMAS J. O'LOUGHLIN, P.E.

Clarkson University	B.S. in Electrical Engineering
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Professional Affiliations	Institute of Electrical and Electronics Engineers

Mr. O'Loughlin is a Principal Engineer with over 25 years of design, field and operational experience in the utility and nuclear power production industry. Mr. O'Loughlin has a wide variety of experience within the power industry ranging from the design and installation of power plant modification, to overseeing the design and construction of distribution pole lines, underground distribution, and substation projects through 345kV.

Mr. O'Loughlin has been responsible for overseeing and performing various power plant design modifications and electrical studies. He has been responsible for designing and installing modifications to enhance the control circuitry to monitor power plant parameters. Mr. O'Loughlin has also performed various electrical studies such as short circuit analysis, breaker and fuse coordination and battery loading calculations and recommended corrective actions. In addition, Mr. O'Loughlin also developed and wrote test procedures for power plant electrical components to ensure proper operation and calibration in accordance with NRC requirements. He has performed startup commissioning and control and operations modifications for several nuclear power plants. His previous experience was with a defense contractor developing, testing and troubleshooting new electrical and power plant requirements for small nuclear propulsion facilities.

Mr. O'Loughlin also has experience in the design and construction of electric utility power distribution and transmission projects. These projects include the upgrade of 115kV transmission facilities as well as breaker upgrades and replacements of 345kV transmission substation breakers. Mr. O'Loughlin has also been responsible for multiple relay replacement upgrade projects for 115kV and 345kV substations from eletro- mechanical to microprocessor based relays. These upgrades required not only wiring modifications but the development of relay programs and settings for the new microprocessor based relays. Additional distribution and transmission projects included overhead and underground 13.8kV distribution systems, 34.5kV aerial and underground subtransmission design, 8.32kV to 2.4kV step down stations, voltage conversions projects, and various bulk power metal enclosed switching station for 34.5kV subtransmission facilities, synchronizing controls for 115kV generating yards, Mr. O'Loughlin also oversaw the planning, testing and interconnection of a paralleling switching station into a large industrial facility with 30 MW of on site generation. Additionally, Mr. O'Loughlin has worked with cable providers at a FCC hearing regarding level of construction required for communication attachments.

Mr. O'Loughlin was the Electrical Operations & Engineering Manager for a large municipal utility in Connecticut. He was responsible for scheduling, system planning, component specifications, job costing and estimating, and capital improvements. Mr. O'Loughlin was also responsible for developing and approving daily switching orders, and overseeing and coordinating storm restoration, and interfacing with bulk power customers on a variety of issues. His other projects included specifying, purchasing and installing a Geographical Information System (GIS) as well as an automated Outage Management System (OMS). Mr. O'Loughlin assisted in the inspection and make ready work costs and procedures for a new municipal CATV company. He interfaced with the utility, telephone, and other pole attachers on costs, safety, installation and NESC requirements.

Mr. O'Loughlin is a Registered Professional Engineer in Connecticut, Rhode Island, New Hampshire and Massachusetts, and is a member of the Institute of Electrical and Electronics Engineers.