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September 12, 2011

Ms. Kirsten Walli
Board Secretary
Ontario Energy Board
2300 Yonge Street
PO Box 2319, 27th Floor
Toronto, ON
M4P 1E4

Dear Ms. Walli:

RE: Application by Canadian Distributed Antenna Systems Coalition ("CANDAS");
Board File No.: EB-2011-0120

We represent CANDAS in connection with its application to the Board regarding access to the power poles of licensed electricity distributors for the purpose of attaching wireless telecommunications equipment ("**Application**").

In accordance with Procedural Order No. 1, CANDAS is filing interrogatories in respect of the written evidence of Mr. Michael Starkey on behalf of Toronto Hydro-Electric System Limited.

CANDAS will file two paper copies of the above-noted interrogatories as soon as possible.

Yours very truly,

(signed) H.T. Newland

HTN/ko

cc: Mr. George Vinyard
All Intervenors

ONTARIO ENERGY BOARD

IN THE MATTER OF the *Ontario Energy Board Act, 1998,* S.O. 1998, c. 15 (Schedule B);

AND IN THE MATTER OF an Application by the **Canadian Distributed Antenna Systems Coalition** for certain orders under the *Ontario Energy Board Act, 1998.*

Interrogatories of CANDAS

to

Toronto Hydro-Electric System Limited

(Michael Starkey)

September 12, 2011

Interrogatory 1

Reference: Starkey, page 4, paragraph 2

Topic: Meaning of CCTA Order

Preamble: Mr. Starkey states that "[t]he Board's determination that 'power poles are essential facilities' was based on the unique characteristics of wireline attachments."

Questions:

(a) Mr. Starkey is referring to the CCTA Order in the above-noted citation from his Affidavit. Identify any Federal Communications Commission ("FCC") rulings in which attachments to hydro poles and other types of utility poles for purposes of providing wireless services or of establishing a wireless network has been considered. In each case, state the FCC's conclusions and briefly describe the basis of same.

(b) If the FCC came to a conclusion that is different than Mr. Starkey's above-referenced view concerning the CCTA Order, explain the discrepancy identify anything specific to the US electric distribution market or wireless market that is inherently different from the corresponding Ontario markets that would explain such discrepancy.

Interrogatory 2

Reference: Starkey, page 4, lines 20 to 22

Topic: Necessity of Utility Poles for Wireless Carriers

Preamble: In Mr. Starkey's conclusions, he states that "Other carriers, including Public Mobile, rely on extensive networks already deployed throughout Toronto without the need for power poles to support DAS."

Questions:

(a) Confirm whether it is Mr. Starkey's contention that current macrocell deployments are in all cases sufficient to meet current and future coverage and capacity needs of mobile wireless providers in terms of:

(i) Delivering adequate coverage for voice and data services

(ii) Meeting throughput demands of customers

(iii) Efficient and necessary spectrum reuse

(iv) Cost efficiency

(v) Other business and technical requirements.

(b) Confirm whether in Mr. Starkey's view, DAS or other small cell deployment solutions constitute a direct substitute for macrocell sites.

(c) Confirm whether Mr. Starkey agrees that limiting new entrant wireless carriers that are likely to have fewer or constrained spectrum assets as compared to the large incumbent carriers (*i.e.* Bell, Telus, Rogers), to macrocell site deployment, would in turn limit the former's ability to compete against incumbent carriers.

(d) Given the experience in the United States with the establishment of DAS networks over the past several years, confirm whether Mr. Starkey agrees that the single largest impediment to the establishment of a functioning DAS network in the City of Toronto is THESL and THESI's refusal to permit wireless and wireline attachments on their existing pole infrastructure?

Interrogatory 3

Reference: Starkey, page 4, lines 27 to 29

Topic: Role of Different Cell Structures in Wireless Networks

Preamble: In Mr. Starkey's conclusions, he states that "A functioning market for the placement and maintenance of wireless equipment on stand-alone towers, rooftops and other non-power pole structures exists and is growing".

Questions:

(a) Confirm whether it is Mr. Starkey's contention that DAS networks on utility poles effectively compete with other wireless networks (including DAS) that may be located on towers, rooftops and non-power pole structures? If this is not Mr. Starkey's contention, Mr. Starkey is to provide a detailed justification for his answer.

(b) Confirm whether it is THESL's position that maintaining competition in the wireless market is not in the public interest.

(c) Confirm whether it would be Mr. Starkey's contention that economic practicability is not a factor in determining whether mandated access to a given good, service or facility is required.

(d) Assuming that DAS networks are established in Canada, clarify whether it would be Mr. Starkey's view that the rate of growth in the establishment of macrocell sites would stop, slow down, reverse or remain unchanged? Provide relevant statistics, reports or other evidence that supports Mr. Starkey's conclusion.

(e) State whether in Mr. Starkey's view, the same holds true for the United States. Provide relevant statistics, reports or other evidence that supports Mr. Starkey's position.

(f) Can Mr. Starkey explain why the Canadian government imposed mandated antenna tower sharing rules on all Canadian mobile carriers as a Condition of Licence to support the entry of new entrant mobile wireless carriers?

Interrogatory 4

Reference: Starkey, page 5, lines 20 to 22

Topic: Meaning of CCTA Order

Preamble: Mr. Starkey states that "[b]oth definitions [of “attachment” and “communications space” and the way they are used by the Board in its CCTA Decision, help make clear that wireless antennae and supporting structure were not considered, especially as it relates to the attachment rental rate."

Questions:

(a) Clarify Mr. Starkey’s understanding of the term “Canadian carrier” and in particular, whether it would be Mr. Starkey’s understanding that the term includes wireless carriers?

(b) State whether in Mr. Starkey’s view, wireless carriers existed at the time of the CCTA Order?

(c) Confirm whether it would be Mr. Starkey’s view that the CCTA Order extends only to the attachment of technologies and equipment of Canadian carriers that existed at the time that the CCTA Order was rendered?

Interrogatory 5

Reference: Starkey, page 6, lines 15 to 16

Topic: Space on Poles

Preamble: Mr. Starkey states that "Communications Space means a vertical space on the pole, usually 600 mm in length, within which Telecommunications Attachments are made."

Questions:

(a) The term "usually" is used in the definition. Describe instances where the communications space may be larger than 600 mm in length.

(b) Explain the discrepancy between Mr. Starkey's references following the above-referenced citation (*I.e.* page 7, lines 1-2), which refer to "typical" poles and the estimate in the CCTA Order of approximately 2 feet of communications space on a typical distribution pole.

(c) Assuming that applicable ESA and safety clearances are maintained, confirm whether in Mr. Starkey's experience, there are instances where equipment is placed in the unused space below the communications space. Describe these instances as well as Mr. Starkey's prior experience with matters concerning the placement of equipment of utility poles.

Interrogatory 6

Reference: Starkey, page 8, lines 1 to 2 and Figure

Topic: Space on Poles

Preamble: Mr. Starkey refers to the definition of "joint pole" as found in the 2002 edition of Newton's Telecom Dictionary.

Questions:

(a) Indicate whether wireless carriers' attachments on poles were common in 2002, at the time of publication of this definition in the Newton Telecom Dictionary?

(b) Confirm whether one or more mobile carriers or the FCC is using the 2002 edition of the Newton Telecom Dictionary as a source of reference to define communications space on a pole?

Interrogatory 7

Reference: Starkey, page 9, lines 3 to 25

Topic: Meaning of CCTA Order

Preamble: In including a reference to Donald Ford's evidence, Mr. Starkey states "Mr. Ford's evidence clearly demonstrates that the "communications space" he was describing for the Board's benefit was a finite vertical space (2 feet) within which wireline attachments could be made".

Questions:

(a) Provide specific references to Mr. Ford's evidence or testimony where Mr. Ford expressly states that his use of the term 'communications space' corresponds to a finite, vertical, 2 foot space.

Interrogatory 8

Reference: Starkey, page 9, lines 26 to 29

Topic: Meaning of CCTA Order

Preamble: In regards to Mr. Starkey's entire response related to the question of, "Is it surprising the Board would not have considered wireless attachments….." Mr. Starkey answers, No.

Questions:

(a) In the period leading up to the CCTA Order, was wireless data available (other than for smartphones) in either the US or Canada?

(b) Confirm that Mr. Starkey believes that the Board was unaware of the proceedings taking place at or around the same time in the US dealing with similar attachment issues.

(c) Mr. Starkey is requested to advise whether, in preparing for his Affidavit, he reviewed the record of the proceeding that led to the CCTA Order. If so, can Mr. Starkey independently verify that included in the record of the CCTA Order were US and Canadian precedents that considered the requirement for wireless carriers to access utility poles.

Interrogatory 9

Reference: Starkey, Section II(B), pages 10-13

Topic: Pole access for Wireless Carriers

Preamble: Mr. Starkey states that there are no "typical" or "standard" equipment or attachment process for wireless equipment. Mr. Starkey states that wireless attachments are generally much larger and substantially more complex than traditional attachments.

Questions:

(a) Describe in detail the standard equipment or attachment process for wireline carriers' equipment. For clarity, "wireline carrier" includes both telecommunications carriers and cable (CATV) carriers:

(i) Include all standards, calculations performed, and typical installations that apply to CATV and associated installations including cable facilities and related equipment (e.g. Cable TV boxes or batter units).

A. Specify their size, weight, pole attachment method and location on the pole.

(ii) Include all standards, calculations performed and typical installations that apply to copper and fibre deployments.

(iii) Include all standards, calculations performed, and typical installations that apply to power supplies or similar functions.

A. Specify their size, weight, attachment method and location on the pole.

(iv) Include all standards, calculations performed and typical installations that apply to any other types of attachments.

A. Specify their size, weight and attachment method and location on the pole.

(b) Describe Mr. Starkey's understanding of the type of attachments required for a DAS deployments and how they differ from typical wireline carriers' deployments (including associated equipment attached to poles).

(i) Specifically, compare how a fibre attachment for DAS differs from a wireline carrier's attachment.

(ii) Specifically, compare how a "node" attachment for DAS differs from various wireline carriers' equipment attachments.

(c) Confirm whether Mr. Starkey characterizes an attachment for purposes of providing WiFi as a wireless or wireline attachment?

Interrogatory 10

Reference: Starkey, page 11, pole attachment diagram

Topic: Pole Access for Wireless Carriers

Questions:

(a) On the diagram shown on Page 11 of Mr. Starkey's evidence, clarify whether the equipment box and power meter are depicted in the communications space or in the unused space?

(b) If this is not the case or if Mr. Starkey is unsure,

(i) Describe where THESL or Mr. Starkey would propose to place the attachments

(ii) What is typical of THESL for these attachments.

(iii) What is permitted by THESL for these attachments.

(c) Assuming that the antenna is placed at the pole top, confirm whether it would be Mr. Starkey's understanding that other than the fibre optic cable, there would not be any other DAS component in the communications space.

Interrogatory 11

Reference: Starkey, page 10, line 8 to page 12, line 2

Topic: Pole Access for Wireless Carriers

Preamble: Under the heading 'Wireless Equipment Will Not Fit in the Communications Space,' when asked to 'Please Generally Describe Wireless Pole Attachments', Mr. Starkey states "In today's environment, DAS networks are generally used in combination with more traditional stand-alone wireless tower sites in areas where either high-traffic volumes or terrain (e.g., indoor areas surrounded by concrete and steel, densely populated outdoor venues, etc.) tax the traditional wireless infrastructure causing undesirable service deterioration (i.e. call blockage, dropped calls, low-bandwidth availability, etc.)."

Questions:

(a) Explain the typical permitting, siting and construction process for erecting a macrocell tower in Canada including the timing of each phase of the project.

(i) List any typical or foreseeable difficulties regarding this process such as community pushback, municipal delay, *etc*.

(b) For a residential neighbourhood in Ontario, describe the typical or average

(i) Time frame to permit a macrocell tower

(ii) The cost of the process

(iii) Provide an estimate of the percentage of tower permit applications submitted that are constructed

(iv) Provide the reasons why construction typically does not occur (*e.g.* failure to get approval from the local zoning or planning regulators).

(c) Clarify whether the reference to use of DAS networks "used in combination with more traditional wireless tower sites" means the same thing as the alleged alternatives available for DAS that are referenced throughout this proceeding, such as wireless towers, rooftops, building sides, *etc*.

(d) If so, Mr. Starkey is requested to explain why DAS is used as opposed to using other "suitable alternatives" or "traditional wireless infrastructure".

(e) Clarify how DAS may be effectively implemented if buildings or sides of buildings are

(i) Not available for lease

(ii) Not available in a contiguous pattern that would allow for ubiquitous coverage

(iii) Or the use thereof meets with significant local opposition affecting the ability to secure attachment authorizations or permits

(f) Regarding the use of DAS in "areas where high traffic volumes or terrain … tax the traditional wireless infrastructure," describe how DAS is beneficial in high traffic volume areas.

(i) Does DAS network technology improve network capacity that traditional stand-alone tower sites at elevations higher than utility poles cannot provide or replicate?

(ii) In urban areas where building heights exceed the heights of utility poles, do wireless antennas placed at elevations lower than rooftop or tower sites effect incremental improvements in network capacity and result in permitting more simultaneous calls in a given geography?

(iii) In these same areas, would more or fewer antennas be needed to provide coverage as compared to with traditional sites?

(iv) Assuming that more DAS nodes are needed to provide similar coverage (as opposed to capacity), would "undesirable service deterioration" be increased using the sides of buildings if as stated above "concrete and steel" causes undesirable service deterioration?

(v) Would there be technical advantages that result from using antennas placed on utility poles as opposed to using the sides of buildings that block signal and cause undesirable service deterioration?

(vi) If Mr. Starkey does not agree that there would be technical advantages that result from placement of DAS antenna on utility poles, provide a full technical explanation justifying this conclusion.

(g) Can Mr. Starkey provide examples of the deployment of outdoor DAS systems to provide basic mobile coverage by a wireless carrier in the US or in Canada? Please provide specific information as to which carrier, the size of deployment as well as when the deployment occurred.

(h) Is it the opinion of Mr. Starkey that outdoor DAS technology cannot provide for basic mobile coverage for voice services in urban and suburban areas?

Interrogatory 12

Reference: Starkey, page 12, lines 5 to 7

Topic: Pole Access for Wireless Carriers

Preamble: In response to the question 'How do Wireless Attachments Compare to Traditional Attachments,' Mr. Starkey states "Wireless attachments of the type diagrammed above are generally much larger and substantially more complex than traditional attachments, whether used for telecommunications carriers or CATV companies."

Questions:

(a) Advise as to the types of attachments that are used by telecommunications common carriers or CATV companies (other than the actual wireline attachment) and the location of each attachment type on the pole.

(b) Advise as to specifically what wireline and wireless equipment was used in Mr. Starkey's comparison of traditional attachments of wireless attachments? Provide hardware specifications and manufacturer information that was used for this comparison and the drawings or wireless attachment specifications referred to in reaching this conclusion.

(c) In the proceeding leading up to the CCTA Order, did the Board consider that wireline carriers require equipment to be attached to poles other than simply the wire, co-ax cable and fibre transmission facilities themselves?

(d) If so, is any of the wireline carrier's equipment placed (i) at the pole top, (ii) in the neutral or supply space or in the "unused space" on the pole below the communications space?

(e) Is the 'unusable space' unusable by the LDCs themselves for the placement of their distribution lines and electrical components? If so, state the reasons for this.

(f) Other than the potential placement of wireless 'equipment', what possible uses are there for the unusable space?

(g) If traditional wireline carrier or distribution equipment is placed in the unused space, how is the placement of equipment in the unused space by traditional attachers different from the placement of wireless carriers' equipment in the same space?

(h) Assuming the antenna is installed in the communications space and attached to the same point as the wireline attachment used to host the fibre cable that connects the DAS nodes, would this result in more than one attachment point on the pole.

(i) Is there any reason why it would not be possible or practical to use a single attachment point, *e.g.* in the communications space, to host an antenna bracket and wireline attachment?

(j) If the antenna was installed in the communications space on the field side (*i.e.* the back, not the road side) of the pole, would this interfere in any material way with the wireline carrier's attachments, if any? If so, explain in detail.

Interrogatory 13

Reference: Starkey, page 13, line 8 to page 14, line 5

Topic: Pole Access for Wireless Carriers

Preamble: Mr. Starkey states:

> It is important to note that while CANDAS discusses primarily DAS antenna attachments in its evidence, its application is not limited only to DAS, but instead, would appear to encompass any wireless telecommunications attachment that its members or, for that matter, any Canadian Carrier may elect to propose at any point in time.

Questions:

(a) Regarding Mr. Starkey's statement objecting to the breadth of CANDAS' application, state whether THESL or Mr. Starkey would change their position on any matter submitted into evidence or opposed in this application if the application was limited specifically to DAS.

(i) If so, describe what positions would change.

Interrogatory 14

Reference: Starkey, page 14, line 11 to page 15, line 2

Topic: Public Opposition to Antenna Tower Sites

Preamble: From Mr. Starkey's observation and statement that "The City of Portland is somewhat unique in its documentation of wireless proliferation given the fact that Portland residents appear to have been particularly vocal about their objection to these types of attachments being located in their neighbourhoods or in close proximity to their homes."

Questions:

(a) Is it Mr. Starkey's understanding that local residents often object to wireless sites including towers, rooftops and other structures?

(i) If it is Mr. Starkey's understanding that local residents do not often object to wireless installations in their neighbourhoods or in close proximity to their homes, Mr. Starkey is to cite studies or other evidence supporting this view.

(b) Mr. Starkey cites the US for various reasons in his Affidavit (e.g. Portland). Does Mr. Starkey believe that the US context is substantially similar to the context in Ontario regarding pole attachments?

(i) If not, explain and include a comparison citing the differences,.

(c) Do new towers generally garner more or less public opposition than DAS deployments, particularly with regard to aesthetics and size of the towers?

(d) Explain whether Mr. Starkey believes that the general public prefers having a macro tower placed near their home or a DAS node.

Interrogatory 15

Reference: Starkey, page 15, line 9 to page 16, line 3

Topic: NYPSC

Preamble: Mr. Starkey states:

> Wireless attachments of the type being discussed by CANDAS use approximately 5 to 8 feet of pole space. For example, Niagara Mohawk Power Corporation (d/b/a National Grid), petitioned regulators in the State of New York to accept an agreement it had reached with its own affiliate National Grid Communications, Inc. for the placement of DAS wireless facilities on its electric transmission facilities.

Questions:

(a) Have either the equipment or attachment methods been improved, reduced in size, made more efficient or otherwise made better for attaching to utility poles since the NY case was decided in 2004?

(i) If so, state how has this been taken into account in Mr. Starkey's testimony?

Interrogatory 16

Reference: Starkey, Section II(B), Page 17

Topic: Communications Equipment on Poles

Preamble: Mr. Starkey states that wireless attachments are not confined to the "communications space" within which wireline attachments are generally found.

Questions:

(a) Describe the location on the pole where wireline carriers' attachments are generally found, including any associated equipment.

(i) With respect to CATV amplifiers, specify

A. their location on the pole and if several different configurations are used, specify all.

B. how the CATV amplifiers are powered

C. how the CATV amplifiers are connected to other facilities *e.g*. coaxial cables

D. any meters or other associated equipment.

(ii) With respect to T1 amplifiers, specify

A. their location on the pole and if several different configurations are used, specify all.

B. how the T1 amplifiers are powered

C. how the T1 amplifiers are connected to other facilities *e.g*. coaxial cables

D. any meters or other associated equipment.

(iii) With respect to power supplies or battery back up units, specify

A. their location on the pole and if several different configurations are used, specify all

B. how they are powered

C. how they are connected to other facilities e.g. coaxial cables

D. any meters or other associated equipment.

(iv) With respect to any other wireline attachments, specify

A. their location on the pole and if several different configurations are used, specify all

B. how the CATV amplifiers are powered

C. how the CATV amplifiers are connected to other facilities e.g. coaxial cables

D. any meters or other associated equipment.

(v) With respect to any WiFi attachments, specify

A. their location on the pole and if several different configurations are used, specify all

B. how the various components are powered

C. how the various components are connected to other facilities *e.g*. coaxial cables

D. any meters or other associated equipment.

(b) Describe the location on the pole where non-distribution equipment is generally found, including any associated equipment.

Interrogatory 17

Reference: Starkey, page 17, lines 18 to 23

Topic: Communication Equipment on Poles

Preamble: Mr. Starkey states:

> Not only do these attachments use portions of the pole heretofore reserved for clearance or distribution facilities, they also require coordination between multiple pieces of equipment attached at varying points on the pole (e.g., pole-top antenna, management equipment below the neutral/separation space, battery back-up, etc.), oftentimes connected to low voltage power and coordinated with wireline attachments (e.g. fiber optics).

Questions:

(a) Provide a specific reference from the ESA standards or other applicable safety standards, if any, which indicates the unused space on the pole is "reserved for clearance."

(b) Is reservation of the unused space reserved by THESL only?

(c) If this space is reserved for clearance, are there any attachments that are allowed in this space?

(d) List all types of attachments on THESL poles in both the unused and useable space, including CATV, ILEC and municipal-owned equipment, signage.

Interrogatory 18

Reference: Starkey, page 18, lines 4 to 12

Topic: Toronto DAS Network, T. Larsen, Exhibit D

Questions:

(a) Did THESL review the "As-built" drawing referenced on page 18 of Mr. Starkey's Affidavit prior to it being built?

(b) Did THESL approve this drawing?

(c) Did THESL allow this equipment to be attached to a THESL pole?

(d) If the answer to (b) or (c) is yes, explain why this structure was acceptable to THESL, particularly in relation to its "substantially larger" size and extension beyond the communications space.

(e) Could the attachment(s) described be minimized on the pole if a pole top antenna was permitted?

(f) Describe whether the attachment configuration simply 'extends 8 feet' on the pole or if it actually occupies 8 feet (line 11), thereby precluding other attachments within that 8 foot space.

Interrogatory 19

Reference: Starkey, page 19, line 1 to page 20, line 10

Topic: Meaning of CCTA Order

Preamble: Under the heading "The CCTA Decision Contemplates Small Attachments Within the Communications Space" in answer to the question Do the wireless pole attachments described by CANDAS appear to be consistent with the pole attachments provided for in the CCTA decision?" Mr. Starkey answers "No".

Questions:

(a) Confirm whether in Mr. Starkey's view, wireline attachments associated with wireless systems, such as DAS, are covered by the CCTA Order.

(b) Explain whether Mr. Starkey's testimony applies to Ontario generally, Toronto proper, or to the greater Toronto area. Specify each instance in which the geographic area referred to is ambiguous, unspecified or incorrectly stated.

(c) Identify statements, if any, in the CCTA Order or in ESA standards to the effect that the power space is to be used exclusively by the LDC?

(d) Confirm that ESA standards define separations needed between supply conductors and other equipment to be attached to the poles.

(e) In Mr. Starkey's view, are all pole top antennas inherently out of compliance with relevant safety code?

(f) Would the placement of pole top antennas increase the range of each antenna and therefore reduce the total number of antenna necessary to cover the same area?

    (i) If not, explain what Mr. Starkey means at page 10, line 20 of his Affidavit, where he states: "The placement of these antenna in relation to the propagation properties of the equipment at issue is an attempt to provide necessary RF signal to as many potential customers as possible".

(g) Mr. Starkey observes that "CANDAS' proposal does not provide any limits, or even expectations, as to the pole space used by any particular wireless attachment."

    (i) Explain how this could be the case since CANDAS provided the drawings of the nodes that were approved by THESL prior to the adoption of their no wireless policy.

    (ii) Were these drawings, in Mr. Starkey's opinion, not representative of the type of equipment DAS companies and wireless attachers would likely place on utility poles? Explain the basis of Mr. Starkey's opinion.

(h) Did the CCTA Order specifically contemplate the addition of CATV power supplies and other similar hardware used by wireline carriers?

(i) Explain and cite references.

(ii) If not, explain the basis upon which this equipment is being permitted on utility poles.

(iii) If so, what was the Board's treatment of this equipment?

(iv) Does this equipment differ materially in size or shape from equipment such as battery units and optical converters used to provide wireless services?

(v) Is this equipment more or less aesthetically pleasing than wireless equipment?

(vi) Did the CCTA Order allow for attachment of this equipment outside the communications space?

(vii) Are CATV power supplies and other similar hardware used by wireline communications attachers attached on THESL poles outside of the communications space? If so, where on the poles is thus type of equipment permitted?

(i) Confirm whether Mr. Starkey agrees or disagrees with the following: CATV power supplies and other similar hardware used by wireline communications attachers are equivalent or substantially similar, to wireless equipment (e.g. optical converters and battery units) required for DAS in that (a) the equipment is invariably attached to the continuous wireline facilities/cables, (b) it is necessary to fully effectuate and (c) use the wireline facilities/cables and it is at intermittent points along the fibre route. If Mr. Starkey does not agree, explain.

(j) Confirm whether Mr. Starkey agrees or disagrees with the following statement: Therefore, in essence a DAS network is simply a fibre network with intermittent equipment attached to it in order to fully utilize that fibre network. If Mr. Starkey does not agree with this statement, explain the basis of the disagreement.

Interrogatory 20

Reference: Starkey, page 20, lines 13 to 18

Topic: Meaning of CCTA Order

Preamble: Mr. Starkey states "As I have previously discussed, the CCTA's expert described poles as support structures "that are used to carry or contain electrical power and/or communications wires and cables" and that users of poles would "attach a steel strand to the pole, and lash one or more communications cables to the strand." Hence, the CCTA clearly was not contemplating wireless attachments when it filed its original petition with the Board and its expert did not discuss wireless attachments when proposing a pole attachment rate."

Questions:

(a) Does Mr. Starkey rely on anything else in the CCTA Order to justify his conclusion that the Board did not contemplate wireless attachments? If so, provide any other references that may have assisted him in formulating this conclusion.

(b) Referencing Mr. Ford's evidence previously mentioned, was Mr. Ford discussing the wireline elements only? Explain how CATV companies were supposed to attach their equipment to the messenger cable or where they were to place their equipment.

Interrogatory 21

Reference: Starkey, page 21, lines 5 to 9

Topic: Meaning of CCTA Order

Preamble: Under the heading POWER POLES ARE NOT ESSENTIAL TO WIRELESS SERVICES and the question ARE WIRELESS ATTACHMENTS TO POWER POLES ESSENTIAL TO WIRELESS SERVICES AS SUGGESTED IN CANDAS' APPLICATION? Mr. Starkey again says, "No".

Questions:

(a) Does the CCTA Order clearly state that utility poles are "essential facilities" for Canadian carriers and give Canadian carriers access to these poles at the regulated rate of $22.35 per pole?

(b) Has the definition of Canadian carriers changed since the CCTA Order was made?

Interrogatory 22

Reference: Starkey, page 22, lines 1 to 4

Topic: Alternatives to Utility Poles

Preamble: Under the heading, WHY ARE THE ECONOMICS ASSOCIATED WITH WIRELESS ATTACHMENTS LIKE DAS ANTENNAE DIFFERENT FROM TRADITIONAL CABLE ATTACHMENTS? Mr. Starkey's states "The primary difference is the "barriers to entry" that exist with respect to alternatives supporting traditional wireline attachments but are absent for wireless attachments. The primary theory supporting regulated rates, terms and conditions for utility pole attachments is the notion that utility poles represent an 'essential facility.'"

Questions:

(a) Identify the specific barriers to entry that exist for wireline attachers that do not exist for wireless?

(b) Are the cost and timing of securing entitlements, permits and authorizations a factor for wireline attachers when evaluating these barriers to entry?

(c) Is the cost to implement networks using alternate facilities a relevant factor when deciding if and when a barrier to entry is significant enough to classify utility poles as essential facilities?

(d) If cost, timing, approvals are not factors, list what factors are viewed by the Board as decision metrics associated with these barriers to entry.

(e) When deciding to place overhead lines and poles

(i) Did the LDCs have the option to place their facilities underground?

(ii) Did the ILEC and CATV companies have the option to place their facilities underground?

(iii) If the answer to either (i) or (ii) is yes, explain factors that may have contributed to the decision to place lines overhead.

(f) Did either the ILEC or CATV companies attempt to place all new poles instead of using existing facilities owned by LDCs?

(g) Was the addition of new poles contemplated by the Board in the CCTA Order? State the Board's conclusion in this regard.

(h) If wireline companies have options to use these alternate methods of placing their facilities, (*i.e.* installing them below ground), how can overhead lines be essential only for wireline and not for wireless carriers?

(i) Were the expense and timing associated with placing CATV cables underground considered by the Board during the proceeding leading up to the CCTA Order?

Interrogatory 23

Reference: Starkey, Section III, page 22

Topic: Communications Equipment on Poles

Preamble: Mr. Starkey states:

> The primary difference is the "barriers to entry" that exist with respect to alternatives supporting traditional wireline attachments but are absent for wireless attachments. … For example, the right to attach cables to a single utility pole would be of little value to a telecommunications or CATV provider without the right to further extend the cable to additional poles.

Questions:

(a) In relation to a wireline telecommunications network, describe what corresponds to point A and point B in the illustration on page 22.

(b) Are wireline telecommunications and CATV infrastructure always attached to utility poles? If not, to what other structures are they attached?

(c) In an area with existing utility poles, would it be reasonable to force a wireline telecommunications or CATV provider to deploy or augment its network by constructing new underground conduit or ducts, ground furniture, or other structures?

(d) Discuss the factors that will dictate whether in an area with existing utility poles, a wireline telecommunications or CATV provider will deploy or augment its network using the existing network of utility poles, underground conduit or ducts, ground furniture, or other structures.

(e) In the diagram provided at page 22 of Mr. Starkey's Affidavit, could Points A and B be considered representative of DAS nodes?

  (i) If not, explain in detail why.

  (ii) If so, is it equally true that the right to attach wire or cable to a single utility pole in a DAS network would be of little value without the right to further extend the wire or cable to additional poles?

(f) Indicate whether Mr. Starkey agrees that one of the major challenges and barriers to entry for a new wireless carrier is wireline connectivity/backhaul?

  (i) If Mr. Starkey does not agree, describe in detail the basis of this conclusion. Specifically address the issue in any case where several of the competitors are wireline providers.

Interrogatory 24

Reference: Starkey, page 23, lines 1 to 10

Topic: Alternatives to Utility Poles

Preamble: Mr. Starkey continues with his conclusion stating "Likewise, it is this relatively unique contiguous nature of a pole-route's design that creates "barriers to entry" which realistically limits the number of alternative forms of supply, thereby arguably creating market power which regulation is intended to combat. In the case of wireless communication attachments, however, the equipment at issue does not rely to the same extent upon the contiguous nature offered by a pole-route. Instead, wireless attachments rely upon utility poles primarily for elevation, and to some extent, strategically placed right-of-way. However, these attributes can be found in numerous alternative forms, e.g., buildings, stand-alone towers, billboards, commercial signage or nearly any other elevated structure. And, importantly, wireless providers have for some time taken advantage of these other alternatives."

Questions:

(a) Mr. Starkey uses the term "unique" or "unique contiguous nature of a pole route's design". If the pole line is unique, how do buildings, rooftops, towers or other alternative structures represent suitable alternatives to interconnect telecommunications facilities to provide wireless services?

(b) Explain how the *unique contiguous nature of a pole route's design* differs from the required contiguous nature of a Greenfield wireless network design to provide for basic mobile service coverage in a given area.

(c) Can fibre cables be strung overhead, from building rooftop, to towers, to billboards or alternate structures on anything other than utility poles?

(d) Indicate whether Mr. Starkey would agree that the installation of wireless equipment on utility poles within 10 feet of the fibre optic cable is more commercially viable than attempting to attach to buildings, rooftops, towers or other structures, which will inevitably require fibre lateral engineering and construction from the pole line to the building?

(e) Would the cost, increased administrative burdens, disruptive nature of underground construction, road and sidewalk restoration and other factors and costs in building a fibre network to reach an alternative location represent a barrier to entry to wireless carriers if wireless carriers were refused access to utility poles?

If not, provide an economic and operational assessment that demonstrates specifically what barriers to entry exist for wireline carriers that do not exist for wireless carriers having to use alternate structures.

Interrogatory 25

Reference: Starkey, Page 23, lines 15 to 18

Topic: Definition of the relevant product market

Preamble: Mr. Starkey refers to Dr. Yatchew's evidence that the relevant product market is the market for siting wireless attachments.

Questions:

(a) Confirm whether in Mr. Starkey's view, towers and rooftops for the deployment of macro sites for mobile communication services are complete substitutes for wireless pole attachments and vice-versa? Explain how these installations could be substitutes?

(b) Clarify whether Mr. Starkey agree with Dr. Yatchew that the relevant product market encompasses all types of siting for wireless carriers' attachments in the context of the deployment of outdoor DAS systems?

Interrogatory 26

Reference: Starkey, page 25, lines 4 to 14

Topic: Role of Different Cell Structures in Wireless Networks

Preamble: Mr. Starkey states:

> … the predominate [*sic*] method of entering and expanding wireless service coverage in the wireless services market does not rely upon attaching antennae to utility poles. The primary method of providing wireless services in Toronto (and elsewhere) involve self-erected towers at elevation sufficient to serve a substantial geographic region, substantially larger than the region that would be served by a DAS location. These are generally referred to as "macro" sites (whereas DAS and other technologies are often referred to as "small" cell sites). For example, even Public Mobile was able to deploy a macro cell site-based network in which it placed numerous traditional macro cell sites throughout the city as a complete substitute for the DAS network it intended to build utilizing attachments to power poles. Public Mobile apparently uses this macro-site network to offer its wireless services throughout Toronto today."

Questions:

(a) Is Mr. Starkey aware of the proportion of shared towers versus self erected towers by new entrants in the Toronto market or in any other city in Canada or in the US over the last few years? If so, Mr. Starkey to provide the relevant details.

(b) Provide evidence that new entrant carriers primarily relied on erecting their own towers in the Toronto area or in other Canadian or US cities over the last few years?

(c) Focusing on "small" cell sites as referred to in the above-noted citation, define "small".

(d) Does Mr. Starkey include picocells and femtocells in the category of "small" cell sites?

  (i) If not, describe the placement and coverage characteristics that distinguish picocells and femtocells, respectively, from small cell sites.

  (ii) If Mr. Starkey does include picocells and femtocells in the category of small cell sites, justify this conclusion.

(e) Focusing on the relationship between the typical elevation of a "macro" site and service to a "substantial geographic region", would Mr. Starkey agree that the coverage footprint of a macro site or tower, building or rooftop is larger than that of the "small" cell sites relating to "DAS and other technologies"?

(f) If so and assuming a wireless carrier's network needs include these smaller cell sites, without using these macro sites or other "traditional" structures, what other facilities are available at the lower elevations needed to support small cell sites that offer all of the same characteristics of utility poles including:

(i) Density and availability of structures in a contiguous pattern.

(ii) Installations in the established public or utility rights of way.

(iii) Proximity to fibre optic facilities placed on utility poles or nearby man holes.

(g) With increasing use of smart phones and increasing wireless data demand, indicate whether in Mr. Starkey's view, the major challenge for a wireless carrier is coverage or capacity?

(i) Which party, as between the wireless carrier and the owner of public rights of way and support structures, should determine which is the more immediate priority to the business?

(ii) How would that determination be made, *e.g.* what factors are considered?

(h) Does Mr. Starkey agree that macrocell sites and DAS deployments offer different benefits and disadvantages? For example, indicate whether Mr. Starkey agrees

(i) That macrocell sites offer the benefit of covering a larger population, but present the disadvantage of serving more users and traffic on a single antenna?

(ii) That DAS nodes offer improvements and efficiencies in spectrum utilization and network capacity?

(iii) That placement of DAS nodes on utility poles, where available, addresses both wireless and wireline siting needs and wireline transport needs?

(iv) To the extent that Mr. Starkey does not agree with any of the foregoing, Mr. Starkey is requested to provide the technical assessment used to qualify a negative response.

(i) In the specific case of a new entrant wireless carrier with limited spectrum as compared to the incumbent wireless carriers, would Mr. Starkey expect a capacity challenge to be present immediately or in the future?

(i) Would a prudent network operator deploy its network to provide for just enough capacity to meet present demand or rather, for excess capacity to meet future demand?

(ii) If faced with a situation where the options were to not launch service or to deploy with just enough capacity for a few years, which option would Mr. Starkey recommend to a new entrant wireless carrier client?

(j) In the specific case of a new entrant with limited spectrum, is it Mr. Starkey's opinion that given that a macrocell site covers a substantially larger geographic area than a DAS node, a new entrant could meet current and future demand using macrocell sites alone? Provide a detailed justification for the answer.

(k) Does Mr. Starkey accept that there is an inverse relationship between the amount of spectrum available to a wireless carrier and the importance of DAS technology, *i.e.* new entrants with limited spectrum have a much greater need for DAS in order to be competitively viable?

(l) Are macro sites available in all areas or is their availability limited? List any and all factors that constrain the availability of suitable macrocell sites.

(m) List all issues that may be encountered by a new entrant mobile wireless operator when attempting to lease or site a macrocell tower.

(n) Explain the technical constraints or deficiencies associated with a deployment involving macrocell sites alone, particularly as compared to a deployment involving a mixture of macrocell sites and DAS nodes.

Interrogatory 27

Reference: Starkey, page 26, line 18 to page 27, line 5

Topic: Role of Different Cell Structures in Wireless Networks

Preamble: Mr. Starkey states:

> [Industry Canada's national database of radio frequency licenses] demonstrates that there are roughly 4,000 cellular/PCS/AWS antenna arrays currently operating within 25 kilometres of the center of Toronto. Moreover, the database also indicates that there are approximately 1,343 individual physical locations at which one or more radio communication carriers' antenna arrays are currently operating within the city of Toronto. Each of these sites is a direct alternative to placing wireless antennae on a THESL utility pole for purposes of supporting the provision of wireless services. [emphasis in original]

Questions:

(a) Of the "approximately 1,343 individual physical locations" as referred to in the above-noted citation, how many are

(i) Macrocell sites

(ii) Small cell sites as referred to at page 25, line 10 of Mr. Starkey's Affidavit

(iii) Picocell sites

(iv) Femtocell sites.

(b) Is Mr. Starkey aware of any rules, regulations or policies that would be applicable in the City of Toronto that would

(i) Preclude the proliferation of towers or poles for purposes of antenna siting. If so, list and describe same

(ii) Preclude the placement of antennae on or near residential or commercial buildings. If so, list and describe same.

(c) Of the "approximately 1,343 individual physical locations" mentioned, how many have been qualified by Mr. Starkey as being available for lease and occupation?

(d) Does the ability to lease or acquire these sites or the monthly recurring cost create any "barrier to entry" as Mr. Starkey uses that term herein?

Interrogatory 28

Reference: Starkey, page 27, lines 11 to 12

Topic: Alternatives to Utility Poles

Preamble: Mr. Starkey draws a conclusion that "To put this in perspective, there are on average, more than 2 potential co-location sites per square kilometre in the Toronto area."

Questions:

(a) How many collocation sites are actually available

(i) For lease

(ii) Are technically and functionally suitable as DAS node location hosts, and

(iii) Technically and operationally equivalent to a THESL utility pole?

(b) How many DAS nodes are required (per square kilometre) to create an ideally functioning DAS network?

(c) If more than 1-2 nodes per square km are required, identify attachable infrastructure other than utility poles (hydro poles, lampposts and streetlights) that may be utilized to achieve the same technical and operational network.

Interrogatory 29

Reference: Starkey, page 27, lines 6 to 9

Topic: Alternatives to Utility Poles

Preamble: Mr. Starkey states "The City of Toronto maintains a database similar to that managed by Industry Canada that identifies potential sharing sites. At present, the database includes 140 pages of company names, location addresses, city ward numbers and antenna heights. These data identify more than 7,000 antennas operating within the city of Toronto."

Questions:

(a) Mr. Starkey to advise how many different entities control the 140 pages of the potential sharing sites in the City of Toronto's database.

(b) How many different entities own the utility poles, comprised of hydro poles, lampposts and streetlights with overhead wires (classified as distribution poles) in public right of way in Toronto?

(c) Given the high number of unique owners of all of macro sites on the list, would macro site owners be able to assert monopoly control on these assets?

(d) Would the small number of owners of the utility pole with distribution wires attached be able to assert monopoly control on these assets?

(e) Of all of the owners cited in Mr. Starkey's reference, how many of the total number of sites are owned and/or controlled by the existing wireless service providers or incumbents?

(f) Do Canadian incumbent wireless carriers willingly share their antenna tower sites?

(g) Based on this figure, how many of these sites have been made available for leasing to the new entrant wireless service providers?

(h) Has the OEB, CRTC or any third party initiated any formal actions or procedures to ensure that incumbent carriers share their antenna towers.

(i) Of all of the wireless sites, indicate the number of locations that have spare capacity to host additional wireless carriers?

(j) Can Mr. Starkey explain if the database of sites for wireless siting maintained by the City of Toronto refers or not to the same sites identified in the Industry Canada database? Provide examples.

Interrogatory 30

Reference: Starkey, page 29, line 12 to page 30, line 4

Topic: Public Interest in Efficient Antenna Siting

Preamble: Mr. Starkey states:

> Second, it is clear that Industry Canada and the City of Toronto work diligently to ensure that the wireless services market is as efficient as possible when erecting additional antennae sites. The Board should consider these efforts before providing wireless service providers relative carte blanche in accessing THESL poles for additional sites aimed at supporting a particular technology (DAS) that serves merely as a substitute for technologies already supported by existing sites.

Questions:

(a) Explain the benefits of a public policy that encourages new technologies and technological innovation, such as wireless v. wireline telecommunications and distributed antenna systems v. dedicated antenna systems.

(b) Has the Canadian government, or the Board, or any other Canadian regulatory authority with jurisdiction over telecommunications services ever determined that reduced barriers to entry would promote the development of new technology.

(i) If so, explain.

(ii) State whether in Mr. Starkey's view, there is a correlation between current market rates of macro site leases, which are essentially a barrier to entry for new entrant wireless providers, and maintenance of the status quo favouring traditional wireline technology and incumbent carriers**.**

Interrogatory 31

Reference: Starkey, page 30, lines 10 to 11

Topic: Public Mobile

Preamble: Mr. Starkey identifies information located in the public domain, specifically "[the Industry Canada] database shows Public Mobile has established 125 unique locations within 25 kilometers of the center of Toronto".

Questions:

(a) Indicate whether Mr. Starkey believes that 125 sites are sufficient to support both the coverage and capacity requirements of a wireless carrier in Toronto?

(b) Assuming the 125 site figure is correct, as compared to the 790 nodes that Public Mobile intended to use in its planned DAS network, indicate whether it would be Mr. Starkey's opinion that both the coverage and capacity of the macro sites would be equal to or greater than the coverage and capacity that would have resulted from the successful implementation of the Toronto DAS network?

(i) If so, provide the technical research and analysis that led to this conclusion.

(c) Given the existence of established macrocell sites in Toronto, why in Mr. Starkey's opinion was it Public Mobile's preference to deploy its network using DAS and why in his opinion does Public Mobile continue to pursue it?

Interrogatory 32

Reference: Starkey, page 32, lines 4 to 9

Topic: Role of Different Cell Structures in Wireless Networks

Preamble: In response to the question of ARE MACRO SITES AND SMALL CELLS (e.g., DAS AND OTHERS) OFTEN USED IN COMBINATION TO ENHANCE THE SERVING CAPACITY OF WIRELESS CARRIERS, Mr. Starkey answers, "Yes they are".

Questions:

(a) In addition, Mr. Starkey states (page 32, line15) that "Heterogeneous networks combine the advantages of traditional macro cell sites complimented by additional, lower power network layers or small cells, each of which leverages existing technologies to provide the best possible wireless experience".

(i) Given the correlation between small cell sites and the enhancement of the serving capacity of wireless carriers, does this not entail sites or antennas that are lower to the ground to keep them from propagating like macro sites?

(b) Is it Mr. Starkey's opinion that outdoor DAS technology can only and exclusively be deployed to enhance capacity in a mobile network? Please explain why.

Interrogatory 33

Reference: Starkey, section III, page 33

Topic: Role of Different Cell Structures in Wireless Networks – Rogers

Preamble: Mr. Starkey states:

> Rogers intends that traditional 3G and 4G macro cell sites will comprise the largest portions of its wireless network, with smaller, low powered cells (WiFi and Femtocells in this example) delivering coverage in certain densely populated (or dense demand) areas as a compliment to the larger, more traditional macro sites. Note that Rogers does not indicate that it will reply upon DAS to further its wireless capacity needs, instead, it intends to rely upon WiFi offload and femtocell technology (both of which are direct substitutes for the DAS network CANDAS described below): [diagram omitted]

Questions:

(a) Provide evidence that the Figure reproduced at page 33 actually refers to the network deployment plans of Rogers Communications.

(b) Provide evidence that Rogers Communications does not intend to deploy outdoor DAS systems anywhere.

(c) Provide evidence that Rogers Communications intends to rely on WiFi and femtocells to further its capacity needs, as stated by Mr. Starkey at lines 5 to 7 on page 33.

(d) Would a Heterogeneous Wireless Network deployment look different for an established, incumbent, spectrum-rich carrier versus a new entrant with limited spectrum? Would such a new entrant use more small cells than an established, spectrum-rich incumbent carrier.

(e) Would it exist in high-density areas where it would be a large cluster of small cells? How would these be sited and connected?

(f) Would a wireless carrier that also has a wireline and/or CATV division potentially deploy small cells differently than a carrier without such relationships?

(g) To Mr. Starkey's knowledge, in the last 12 months, has THESL been in discussions or otherwise engaged in any way with any third party, including incumbent wireless carriers, regarding attachments on THESL poles for any purpose?

Interrogatory 34

Reference: Starkey, page 34, line 20 to page 35, line 9

Topic: Experience with Femtocell Deployments

Preamble: Under the heading 'Wi-Fi and Femtocells As Substitutes for DAS' beginning on page 34 of Mr. Starkey's Affidavit, Mr. Starkey describes the use of femtocells.

Questions:

(a) Generally speaking,

(i) Are femtocells capable of supporting multiple technologies?

(ii) Are DAS networks capable of outputting more power than femtocells?

(iii) Is it true that femtocells have no fibre connectivity or do not require fibre connectivity?

(iv) Are there any femtocell technologies that do require, or are capable of using fibre connections?

(v) On page 34, line 25, Mr. Starkey mentions femtocells that utilize a "broadband internet connection". For those femtocells, wouldn't LDC poles represent ideal sites, given the cost of having a wireline broadband connection delivered to each unit, assuming multiple locations are needed in a geographic area?

(vi) Are femtocells passive repeaters that simply amplify carriers' signals in a given area and do not provide any additional capacity?

(vii) Rather than providing additional capacities, do femtocells, in fact consume additional capacity from the macrocell network?

(b) Focusing on indoor femtocell systems, describe

(i) The architecture of a typical indoor femtocell system

(ii) Coverage of a typical individual indoor femtocell

(iii) The number of voice and data users a typical indoor femtocell supports

(iv) Whether it would be possible to cover and if so, how many indoor femtocells would be required to support current and future voice and data needs of users in the dense, urban core of a city like Toronto?

(v) The broadband requirements for a femtocell and confirmation that a femtocell would eventually require fiber to handle the end user bandwidth requirements

(vi) The differences between an outdoor DAS deployment and an indoor femtocell system in terms of coverage and capacity characteristics

(vii) The benefits of an outdoor DAS deployment versus an indoor femtocell system

(viii) The benefits of an indoor femtocell system versus an outdoor DAS deployment.

(c) Focusing on outdoor femtocell systems, describe

(i) The architecture of a typical outdoor femtocell system;

(ii) Coverage of a typical individual outdoor femtocell and whether it is affected depending on whether the outdoor femtocell is sited on the side of a building or on pole or other street furniture

(iii) The number of voice and data users a typical outdoor femtocell supports

(iv) Whether it would be possible to cover and if so, how many outdoor femtocells would be required to support current and future voice and data needs of users in the dense, urban core of a city like Toronto?

(v) The differences between an outdoor DAS deployment and an outdoor femtocell system in terms of coverage and capacity characteristics

(vi) The benefits of an outdoor DAS deployment versus an outdoor femtocell system

(vii) The benefits of an outdoor femtocell system versus an outdoor DAS deployment

(viii) On buildings where femtocells are depicted in Mr. Starkey's Affidavit, indicate whether the existence of the building they are attached to dramatically reduces the effective range of the femtocell's in question.

(ix) In theory or in practice, wouldn't utility pole installation for femtocells provide much better coverage than femtocells attached to buildings, due to the 360 degree propagation and line of sight advantages of pole attachment?

A. If Mr. Starkey does not agree with the foregoing, explain the basis for his contrary view and include the technical assessment or engineering data to substantiate his conclusion.

Interrogatory 35

Reference: Starkey, page 35, line 10 to page36, line 13

Topic: Outdoor Femtocell Deployments

Preamble: When questioned "CAN FEMTOCELLS BE DEPLOYED WITHIN LARGE OUTDOOR. OR METRO TYPE, SETTING AKIN TO THE MANNER IN WHICH CANDAS INTENDS TO DEPLOY ITS DAS NETWORK IN TORONTO, Mr. Starkey answers "Yes." In fact Alcatel - Lucent recently reported that its second generation of "metro femtocells" provide a footprint up to 300 meters inner cities and up to 2 km, if positioned high enough"

Questions:

(a) Can a femto cell be deployed on a utility pole?

(b) Is Alcatel Lucent's femtocell and "cube" technology specifically targeting pole installations?

(c) Did Alcatel-Lucent disclose when this equipment would be available for commercial release and testing?

(d) Is this Alcatel-Lucent equipment actively being:

(i) Lab tested?

(ii) Field tested?

(iii) Being tried in small trial deployments?

(iv) Currently enjoying wide commercial deployment?

(e) In relation to the qualification that a wider footprint is possible if the femtocell is "positioned high enough", doesn't this mean that femtocells placed lower on buildings could not produce the result of providing for a 300 meter to 2 km footprint?

(f) Would these new "metro femtocells" benefit from the higher elevation and 360 degree propagation characteristics and contiguous nature of LDC or other utility poles to offer a ubiquitous footprint and the effective range the Alcatel-Lucent femtocell claims are possible when the equipment ready for commercial deployment?

Interrogatory 36

Reference: Starkey, page 35, line 12 to page 36, line 9

Topic: Indoor Femtocell Deployment - SK Telecom

Question:

(a) Does any portion, and if so, what proportion, of SK Telecom's femtocell deployment provides outdoor coverage for both voice and data services. Provide all relevant details.

Interrogatory 37

Reference: Starkey, page 37, lines 3 to 13

Topic: Outdoor femtocells

Preamble: When asked "ARE POWER POLES NEEDED TO MOUNT METRO FEMTOCELLS?, Mr. Starkey answers "No"

Questions:

(a) Even if the technology were identical to DAS equipment, would utility poles be a benefit to installing femtocells?

(b) Mr. Starkey indicates that metro femtocells can be attached to “building walls and street furniture”.

(i) Does Mr. Starkey include lamp standards as part of the definition of street furniture?

(ii) Does Mr. Starkey include hydro poles as part of the definition of street furniture?

(iii) Provide Mr. Starkey’s definition of street furniture.

(c) On page 37 and lines 11 to 13, Mr. Starkey indicates that “they rely on existing broadband infrastructure to backhaul traffic to the necessary network, without the need, or expense, of extending fibre-optic cables to antennae site.” Explain the following in the deployment of an outdoor femtocell network to provide outdoor coverage:

(i) In Mr. Starkey’s view, which type of carrier or organization would own and operate the existing broadband infrastructure referenced in the above citation?

(ii) Provide the specific excerpt from MTS-08 that Mr. Starkey refers to and relies upon in footnote 50 of his Affidavit.

Interrogatory 38

Reference: Starkey, page 37, line 14 to page 38, line 13

Topic: WiFi Offload as Substitute for DAS

Preamble: When asked "IN ADDITION TO FEMTOCELL TECHNOLOGY, ARE THERE OTHER ALTERNATIVES TO DAS NETWORKS, Mr. Starkey answers "Yes" and goes on to describe AT&T's Wi-Fi "hotzones" in New York City.

Questions:

(a) If a wireless broadband (Wi-Fi) connection is used, the spectrum used for Wi-Fi is unlicensed spectrum. Identify the limitations on their effectiveness in areas where there is high Wi-Fi usage competing for broadband access?

(b) Explain how a Wi-Fi Hotzone network using unlicensed spectrum is equivalent to or a reasonable alternative to DAS networks. Specifically address

(i) The technical capabilities and methods of each deployment technology for carrying data and voice communications

(ii) The mobility capabilities of each

(iii) The coverage of each

(iv) The carrying capacity of each

(v) The spectrum efficiency of each

(vi) The use of spectrum of each

(vii) Any other relevant comparisons that relate to Wi-Fi as a viability as an alternative to DAS.

(c) Confirm that Wi-Fi may be used in conjunction with DAS or another wireless technology using licensed spectrum to help use the wireless network more efficiently.

(d) Explain why the vast majority of DAS nodes do not include Wi-Fi capability.

(e) Explain why carriers do not offer a material amount of wireless voice and data coverage to end users using Wi-Fi capability?

(f) Is Towerstream a cellular carrier?

(g) Does Towerstream provide seamless indoor and coverage throughout Manhattan?

(h) What percentage of cellular devices currently in use has WiFi capabilities?

(i) How many of the over one thousand access points in the Towerstream network are located outdoors? And of these outdoor access points, how many are located on utility poles (hydro poles, lampposts and streetlights) or other outdoor furniture?

Interrogatory 39

Reference: Starkey, section III, pages 39-40

Topic: WiFi Offload as a Substitute for DAS

Preamble: Mr. Starkey describes AT&T's planned use of WiFi offload in New York City.

Questions:

(a) Focusing on indoor WiFi systems, describe

(i) The architecture of a typical indoor WiFi system

(ii) Coverage of a typical individual indoor WiFi access point

(iii) The number of voice users a typical indoor WiFi access point supports

(iv) The number of data users a typical indoor WiFi access point supports

(v) Whether it would be possible to cover and if so, how many indoor WiFi access points would be required to support current and future voice and data needs of users in the dense, urban core of a city like Toronto?

(vi) The broadband requirements for a WiFi access point and confirmation that a WiFi access point would eventually require fiber to handle the end user bandwidth requirements

(vii) Whether WiFi access points are capable of supporting multiple technologies

(viii) The differences between an outdoor DAS deployment and an indoor WiFi system

(ix) The benefits of an outdoor DAS deployment versus an indoor WiFi system

(x) The benefits of an indoor WiFi system versus an outdoor DAS deployment

(b) Focusing on outdoor WiFi systems, describe

(i) The architecture of a typical outdoor WiFi system

(ii) Coverage of a typical individual outdoor WiFi access point and whether it is affected depending on whether the outdoor WiFi access point is sited on the side of a building or on pole or other street furniture

(iii) The number of voice users a typical outdoor WiFi access point supports

(iv) The number of data users a typical outdoor WiFi access point supports

(v) Whether it would be possible to cover and if so, how many outdoor WiFi access points would be required to support current and future voice and data needs of users in the dense, urban core of a city like Toronto

(vi) The broadband requirements for a WiFi access point and confirmation that a WiFi access point would eventually require fiber to handle the end user bandwidth requirements

(vii) Whether WiFi access points are capable of supporting multiple technologies

(viii) The differences between an outdoor DAS deployment and an outdoor WiFi system

(ix) The benefits of an outdoor DAS deployment versus an outdoor WiFi system

(x) The benefits of an outdoor WiFi system versus an outdoor DAS deployment

(c) Can a WiFi access point be deployed on a utility pole?

(d) As related to outdoor WiFi, provide any reports or studies that would support the view that buildings are better alternatives or are used more frequently than various utility infrastructures

Interrogatory 40

Reference: Starkey, section III, pages 39-40

Topic: WiFi Offload as a Substitute for DAS

Preamble: Mr. Starkey describes AT&T's planned use of WiFi offload in New York City.

Questions:

(a) Is Mr. Starkey aware of the deployment of WiFi offload networks in Canada by mobile carriers and if so, provide relevant details as to the identity of the carrier, the scale and scope of the WiFi offload network, and whether mobile voice and data connections are handed off seamlessly.

Interrogatory 41

Reference: Starkey, page 43, lines 14 to 15

Topic: Toronto DAS deployment

Preamble: Mr. Starkey states: "CANDAS states that it intended to attach the components of a DAS to 790 power poles in the City of Toronto in support of Public Mobile's wireless network."

Questions:

(a) According to Mr. Starkey, how many of the 790 locations were

(i) Hydro (LDC) poles

(ii) Street lamppost with overhead power lines (classified as distribution poles)

(iii) Streetlight poles.

Interrogatory 42

Reference: Starkey, Section IV, page 46, lines 15 to 21

Topic: Alternative to wireless pole attachments for DAS

Preamble: Mr. Starkey states:

> …in October of 2010 Crown Castle, one of the United States' largest independent owners and operators of shared wireless infrastructure, announced it was constructing a DAS for the Colonial Williamsburg Foundation which "utilizes existing infrastructure for antenna placement, including rooftops, the cupolas of historic buildings" and stealth flagpoles.

Questions:

(a) Describe the scale of the Colonial Williamburg Foundation DAS deployment in terms of the geographic area covered and the number of wireless and wireline nodes.

(b) Is utility pole infrastructure (including hydro poles, lampposts and streetlights) available in Colonial Williamsburg? Why not? Please provide an answer for each of the three types of utility poles listed in the question.

Interrogatory 43

Reference: Starkey, Section IV, page 46, line 21 to page 47, line 2

Topic: Alternative to wireless pole attachments for DAS

Preamble: Mr. Starkey states:

> The company also deployed a 42 node DAS covering 16 square miles in Paradise Valley, AZ without using any utility poles. In this case, the company used a handful of traffic signals and dozens of new, decorative installations that were designed to conceal the wireless antenna equipment.

Questions:

(a) Does Mr. Starkey propose the deployment of fake palm trees as an alternative to wireless pole attachments for DAS in Toronto and in Ontario?

(b) If not, does Mr. Starkey propose the deployment of new, decorative installations?

(c) Were CANDAS forced to deploy in Ontario using new, decorative installations, where does Mr. Starkey propose that the new, decorative installations be placed?

(d) Is Mr. Starkey aware of any rules, regulations or policies that would be applicable to the installation of, for example 790 new, decorative installations in or around the streets of the City of Toronto?

(e) Provide a breakdown by city or location, of outdoor DAS deployments implemented utilizing

(i) Utility poles (including hydro poles, lampposts and streetlights) alone

(ii) Sides of buildings or rooftops alone

(iii) a combination of the two.

(f) In each instance where sides of buildings or rooftops alone were used (if any), state whether utility poles (including hydro poles, lampposts and streetlights) was available and if not, state why utility poles were not available.

(g) In each instance were a combination of utility poles and sides of buildings or rooftops were used, state the proportion of installations placed on utility poles on the one hand and sides of buildings or rooftops on the other.

Interrogatory 44

Reference: Starkey, page 48, line 7 to page 49, line 3

Topic: Chicago DAS deployment – use of alternative public infrastructure

Preamble: When questioned, CAN EXISTING MUNICIPAL INFRASTRUCTURE BE USED TO SUPPORT DAS ANTENNAS? Mr. Starkey answers "Yes it can" and proceeds to discuss the DAS networks established in the City of Chicago.

Questions:

(a) How can a comparison be drawn between the City of Chicago that owns its own streetlights but does not own hydro (LDC) poles (these belong to the utility ComEd, which is unaffiliated with the city) and the City of Toronto, which owns Toronto Hydro, the entity that owns the LDC poles and THESI, which owns and controls both the distribution and non-distribution streetlights?

(b) In Ontario, do any other cities similarly own their Hydro generation, distribution infrastructure and/or streetlights?

(c) Strictly as it relates to the City of Toronto, THESI and THESL, how can Mr. Starkey conclude that municipal infrastructure can be used as an alternative, if access to all of these poles is under the new no wireless policy?

(d) Does Mr. Starkey believe that US wireless markets are substantially similar to Ontario wireless markets?

(i) If not, explain why.

(ii) If not, also explain why Mr. Starkey continues to reference markets in the US for comparison to Ontario (and/or Toronto).

(iii) If so, should both markets be regulated similarly?

(e) Does Toronto have similar ordinances to Chicago?

(f) Do other Toronto area towns have similar ordinances to Chicago?

(g) Do all municipalities in Ontario have similar ordinances to Chicago?

(h) What are the cost differences between 1 km of micro trenching and hanging 1 km of overhead fiber?

Interrogatory 45

Reference: Starkey, page 49, lines 4 to 11

Topic: Alternatives to Utility Poles – New Construction

Preamble: Mr. Starkey states:

> My understanding is that municipalities, in this case the City of Toronto, can elect to permit vendors to install decorative poles and other municipal furniture which can be located near existing fiber conduits and used for wireless attachments and, potentially, for purposes of concealing wireless antenna equipment if requested to do so by the municipality involved.

Questions:

(a) Explain whether Mr. Starkey believes that constructing new poles in the ROW is a viable alternative to use of existing utility poles for wireless attachments.

(i) If not, explain whether a Canadian carrier that has been denied the right to attach to utility poles should also be denied a right to place poles in the ROW.

(ii) Identify relevant rules, regulations or policies applicable in Ontario that articulate the aesthetic, resource efficiency, ROW clutter concerns with the establishment of new pole infrastructure in the public ROW that are mentioned in Mr. Starkey's Affidavit.

Interrogatory 46

Reference: Starkey, page 1, line 21 to page 2, line 10 and Attachment MTS-01

Topic: Relevant work experience

Preamble: Mr. Starkey states:

> Throughout my career I have spent a great deal of time studying telecommunications networks, including substantial time and effort aimed at developing rational, efficient means by which competing communications carriers can effectively access dominant carrier networks for purposes of entering monopolized markets. I have also analyzed the underlying economic characteristics of communications networks and markets and have, on numerous occasions, provided expert testimony regarding the costs of providing various telecommunications functionalities and access, including those associated with wireless networks.

Questions:

(a) Describe in detail, Mr. Starkey's practical or theoretical experience with wireless networks generally including but not limited to

- (i) White papers and research
- (ii) Standards work
- (iii) Wireless network design
- (iv) Wireless network construction and deployment
- (v) Other relevant experience or expertise

(b) More specifically, describe in detail, Mr. Starkey's practical or theoretical experience with

- (i) CDMA network design or deployments
- (ii) GSM or UMTS network design or deployments
- (iii) Wi-Fi network design or deployments
- (iv) DAS network design or deployments
- (v) Femtocell, Picocell or other small cell network design or deployments
- (vi) Macro cell or network design or deployments

(vii) Combination (macro and small cell) network design or deployment

(viii) Design or deployments of wireless networks utilizing a high capacity ("all-you-can-eat") business model

(ix) Design or deployments of wireless networks for carriers who hold limited spectrum or non-ideal spectrum.

(c) Identify and provide a copy of any written work product as well as transcripts of live testimony or depositions given by Mr. Starkey on wireless communications networks.

(d) Identify and provide a copy of any written work product as well as transcripts of live testimony or depositions given by Mr. Starkey on access to support structures (i.e. pole, duct, conduit) and rights-of-way.