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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 the intervenor evidence of the Canadian Electricity Association.

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

Yours very truly,

(signed) H.T. Newland

HTN/ko

cc: Mr. George Vinyard
Mr. Robert Malcolmson
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

Canadian Electricity Association

(LCC, Inc. Report)

September 12, 2011

Interrogatory 1

Reference: LCC Report, Executive Summary, page 2 of 39

Topic: Role of ODAS

Preamble: The LCC Report states:

> Outdoor Distributed Antenna Systems (ODAS) of the type discussed by CANDAS are but one of a new set of tools intended to supplement capacity and coverage requirements for wireless communications.

Questions:

(a) State in what way is an ODAS a tool.

(b) State to whom or what type of entity is an ODAS a tool.

(c) Define "capacity requirements for wireless communications" as referred to in the above-noted citation.

  (i) Describe the instances in which additional capacity requirements for wireless communications may arise.

(d) Define "coverage requirements for wireless communications" as referred to in the above-noted citation.

  (i) Describe the instances in which additional coverage requirements may arise.

Interrogatory 2

Reference: LCC Report, Executive Summary, page 2 of 39

Topic: Role of ODAS

Preamble: The LCC Report states:

> ODAS may become a complement to more traditional wireless technologies, in part because of their flexibility of design and because key components, including antennas, can be located at a broad range of sites.

Questions:

(a) Define "more traditional wireless technologies" as referred to in the above-noted citation.

Interrogatory 3

Reference: LCC Report, Executive Summary, page 2 of 39

Topic: Role of ODAS

Preamble: The LCC Report states:

> Manufacturers understand that new antenna systems (including ODAS and others) must be flexible in terms of where they are placed and how they interact with core network components.

Questions:

(a) Define "core network components" as referred to in the above-noted citation.

Interrogatory 4

Reference: LCC Report, Executive Summary, page 2 of 39

Topic: Role of ODAS

Preamble: The LCC Report states:

> This report provides an overview of the wireless industry, and specifically the historical and current deployments of wireless networks using macro cells and microcells and how ODAS fits into this landscape.

Questions:

(a) Define "wireless industry" as referred to in the above-noted citation.

(b) Are there any restrictions as to the types of wireless networks discussed in the LCC Report or does the LCC Report purport to relate to all types of wireless networks?

Interrogatory 5

Reference: LCC Report, Executive Summary, page 2 of 39

Topic: Other fill-in technologies

Preamble: The LCC Report states:

> Instead, ODAS and multiple other technologies (e.g., WiFi, pico-, femto-) will be used to "fill in" areas of high demand and/or unique terrain characteristics.

Questions:

(a) What spectrum frequency ranges are used to provide WiFi service in Canada?

(b) What spectrum frequency ranges are used to provide public mobile wireless communications services in Canada?

(c) In Canada, is WiFi To LCC's knowledge, does any mobile wireless network operator in Canada use WiFi spectrum to provide a mobile wireless communication service to the public?

Interrogatory 6

Reference: LCC Report, Section 1, page 3 of 39

Topic: Other fill-in technologies

Preamble: The LCC Report states:

> … LCC has performed technical services for the largest wireless operators in North and South America, Europe, the middle East Africa and Asia.

Questions:

(a) Are there any restrictions as to the types of wireless operators referred to in the above-noted citation or does the LCC Report purport to relate to all types of wireless operators?

Interrogatory 7

Reference: LCC Report, Section 1, page 3 of 39

Topic: Other fill-in technologies

Preamble: The LCC Report states:

> The Company has worked with all major access technologies (including LTE, WiMAX, HSPA, EV-DO, CDMA, EDGE and GSM) …

Questions:

(a) In the above-noted citation, different access technologies are listed.

(i) Define "access" as referred to in the above-noted citation.

(ii) Define "access technologies" as referred to in the above-noted citation.

(b) Confirm that the access technologies listed by LCC are major access technologies for mobile wireless networks. If LCC does not agree with the foregoing statement, state the type(s) of networks for which the listed access technologies are major access technologies.

(c) State whether WiFi is a "major access technology" in LCC's experience? If so, state in relation to what kind of network WiFi is a major access technology.

Interrogatory 8

Reference: LCC Report, Section 1, page 3 of 39

Topic: Other fill-in technologies

Preamble: The LCC Report states:

> LCC has been involved in the design and optimization of networks utilizing virtually every major transport technology ranging from traditional microwave and leased line to advanced technologies.

Questions:

(a) In the above-noted citation, different transport technologies are listed.

(i) Define "transport" as referred to in the above-noted citation.

(ii) Define "transport technologies" as referred to in the above-noted citation.

(b) Provide a sketch or diagram clearly depicting the access and transport portions of a mobile wireless communications network.

(c) In a mobile wireless communications network, why are different technologies used in the access portion of the network and in the transport portion of the network.

Interrogatory 9

Reference: LCC Report, Section 1, page 3 of 39

Topic: Other fill-in technologies

Preamble: The LCC Report states:

> By providing increased capacity with various solutions including indoor and outdoor Distributed Antenna Systems (DAS), data off-loading and mobility services are using both licensed radio and unlicensed (WiFi) radio service solutions.

Questions:

(a) Define "data off-loading" as referred to in the above-noted citation.

(i) List examples of data off-loading services.

(ii) List North American providers of data off-loading services.

(b) Define mobility services as referred to in the above-noted citation.

Interrogatory 10

Reference: LCC Report, Section 1, page 3 of 39

Topic: Other fill-in technologies

Preamble: The LCC Report states:

> Wireless carriers … are looking at various technology solutions to support the ever increasing demand for bandwidth.

Questions:

(a) Provide the rate of growth of demand for bandwidth on public mobile wireless communications networks, identifying relevant sources, justifying the above-noted citation.

(b) Describe the causes of the ever increasing demand for bandwidth as referred to in the above-noted citation.

(c) Describe the causes of increasing demand for bandwidth on public mobile wireless communications networks?

Interrogatory 11

Reference: LCC Report, Section 1, page 3 of 39

Topic: Other fill-in technologies

Preamble: The LCC Report states:

> Each solution plays a role in meeting our clients [*sic*] demand to get the wireless signal closer to where the actual users are.

Questions:

(a) State the relationship, if any, between getting "the wireless signal closer to where the actual users are" and

(i) Increasing capacity

(ii) Increasing coverage

(iii) both.

Interrogatory 12

Reference: LCC Report, Section 2, page 4 of 39

Topic: Wireless Industry Overview

Preamble: The LCC Report states:

> From the inception of mobile communications systems, stand-alone cell towers have been the dominant way to illuminate service areas with radio signals.

Questions:

(a) Define "mobile communications systems" as referred to in the above-noted citation.

(b) Indicate whether, for purposes of the LCC Report, a "mobile communications systems" is a synonym for a mobility service.

(c) State the relationship between stand-alone cell towers and macro cells as referred to in the Executive Summary.

(d) Identify the average diameter of the geographic area that is "illuminated" using a stand-alone cell tower.

Interrogatory 13

Reference: LCC Report, Section 2, page 4 of 39

Topic: Wireless Industry Overview

Preamble: The LCC Report states:

> The confluence of end-user demand and proliferation of devices with advanced media capabilities is putting pressure on traditional macrocell deployment and its ability to provide necessary capacity and coverage in areas of high use. … Wireless Carriers are therefore being forced to (i) develop smaller cell sites to increase the reuse of available spectrum; and (ii) deploy alternative wireless strategies such as using unlicensed WiFi to reduce the strain on capacity.

Questions:

(a) Describe the way in which increased demand puts pressure on traditional macrocell deployments.

(b) Describe the way in which this pressure alleviated through the use of smaller cell sites.

(c) In the context of outdoor coverage, indicate how far apart or at what intervals these smaller microcell sites are spaced in order to be effective in alleviating the pressure on traditional macrocell deployment.

(d) Indicate whether an ODAS is an example of a microcell deployment. If not, identify the distinguishing characteristics of an ODAS as compared to a microcell deployment.

(e) Provide examples of actual outdoor mobile wireless communications deployments that have established microcell sites using

  (i) Exclusively utility poles, streetlight or other street furniture

  (ii) Exclusively on buildings and rooftops

  (iii) A combination of the two

  (iv) In each case, state the geographic coverage area and the role of such deployment in the mobile wireless carrier's overall network.

Interrogatory 14

Reference: LCC Report, Section 3, page 6 of 39

Topic: Wireless Industry Overview

Preamble: The LCC Report states:

> One technology that has emerged in this drive toward smaller, more focused antenna sites, is ODAS. ODAS uses a distributed set of small antennas fed by one radio transmitter. This use of a single transmitter sharing multiple antennas is somewhat unique, in that more conventional systems assign a single transmitter to each antenna.

Questions:

(a) Provide the coverage and capacity characteristics of a micro-cell deployment.

(b) Provide coverage and capacity characteristics of an ODAS deployment.

(c) Provide the coverage and capacity characteristics of a pico-cell deployment.

(d) Provide the coverage and capacity characteristics of a femto-cell deployment.

Interrogatory 15

Reference: LCC Report, Section 4, page 9 of 39

Topic: Role of ODAS

Preamble: The LCC Report states:

> There are many novel and unique aspects to DAS technology that are captured in this report and their relevance to the question of attachment rights to Utility Poles.

Questions:

(a) List the novel and unique aspects of an outdoor DAS that are captured in the LCC Report.

(b) To the extent not captured by the LCC Report, provide any other distinguishing characteristics of an ODAS deployment in terms of

(i) The topology of a ODAS network

(ii) The capacity benefits of an ODAS network.

Interrogatory 16

Reference: LCC Report, Section 5, page 11 of 39

Topic: Other fill-in technologies

Preamble: The LCC Report states:

> Two examples of advances in mobile communications systems have various trade names such as Liquid Radio (from Nokia Siemens Networks) and Light Radio (from Alcatel Lucent). These technologies differ from ODAS, but can achieve the same purpose: to fill-in coverage and capacity as a supplement to conventional macro and micro cells. …
>
> These miniaturised devices have the ability to integrate the antennas into the box, so they can be installed as one attachment on buildings, towers and utility poles ….

Questions:

(a) Identify which mobile wireless carriers, when, where and on what scale have deployed these technologies.

(b) In each case, describe what services (*i.e.* voice services data services, mobile or fixed) services are being provided and whether services are being offered to the public for compensation or for within private networks.

Interrogatory 17

Reference: LCC Report, Section 5, page 11 of 39

Topic: Other fill-in technologies

Preamble: The LCC Report states:

> In addition, instead of using an antenna with a fixed radiation pattern at a macro cell or microcell, "smart" antenna technologies (also called adaptive antennas) have been deployed commercially.

Questions:

(a) Identify which mobile wireless carrier, when, where and on what scale have deployed these technologies.

(b) In each case, describe what services (*i.e.* voice services data services, mobile or fixed) services are being provided and whether services are being offered to the public for compensation or for within private networks.

Interrogatory 18

Reference: LCC Report, Section 5, page 12 of 39

Topic: Other fill-in technologies

Preamble: The LCC Report states:

> The industry is also moving very rapidly into new areas, such as "heterogeneous networks" where a mobile phone may be on a cellular network, but can seamlessly transition to a low-power WiFi network, to improve battery life and to maximize bandwidth availability.
>
> Most major network operators have announced plans to use WiFi technology (with short range, and typically mounted on the sides of buildings or other fixed structures) to "offload" the traffic from the conventional macro cell and micro cell networks.

Questions:

(a) Indicate whether WiFi offload provides the same functionality as a (i) microcell, (ii) ODAS, (iii) picocell, or (iv) femtocell deployment within a public mobile wireless communications network. Provide a detailed explanation justifying LCC's answers.

(b) Indicate and provide full particulars of any WiFi equipment capable of providing public switched voice services, and if so, whether LCC is aware of any service deployment by a mobile wireless carrier, or any other type of carrier using same, to provide voice services?

Interrogatory 19

Reference: LCC Report, Section 14, pages 27 to 32

Topic: Wireless Industry Overview

Preamble: The LCC Report states:

> Below we identify numerous antenna locations that rely neither on buildings, utility poles or street furniture, but instead, use existing or replacement commercial signage:

Questions:

(a) Of the antenna installations depicted on pages 27 to 32, identify the installations in which LCC has direct knowledge.

(b) LCC is requested to determine, of the antenna installations depicted, the street address of each installation.

(c) To the extent possible, LCC is requested to determine and clearly identify, of the antenna installations depicted, which are:

(i) Micro cell sites;

(ii) pico cell sites;

(iii) femto cell sites;

(iv) WiFi nodes.

Interrogatory 20

Reference: LCC Report, Section 9, page 18

Topic: Differences between wireline and ODAS pole attachments

Preamble: The LCC Report states:

> Before exploring utility pole usage, it is useful to define the physical components of ODAS, and which of these are the subject of attachment rights (i.e. devices that would have to be attached to a utility pole or other structure to make ODAS operational):
>
> - A host base station with a wireline connection to the distributed antenna system
> - Distribution poles upon which DAS equipment can be installed
> - A fiber optic network (typically an existing system) to carry the signals from the base station to the antennas
> - Shared antennas and control boxes
> - Neutral host for different wireless service providers
> - Lightening [*sic*] protection box
> - Connection to a power supply
> - Battery-powered back-up supply in the event of a distribution line loss of service

Questions:

(a) Define the physical components of wireline telecommunications and CATV attachments to poles.

(b) Define the physical components of other, non-communications attachments that may typically be found on poles.

Interrogatory 21

Reference: LCC Report, Section 9, page 18

Topic: Differences between wireline and ODAS pole attachments

Preamble: The LCC Report refers to a "filing with the US FCC, dated August 2010" by the Coalition of Concerned Utilities (CCU).

Questions:

(a) Provide a copy of the filing of the CCU as referred to by LCC.

Interrogatory 22

Reference: LCC Report, Section 11, page 22

Topic: San Diego State University ODAS

Preamble: The LCC Report states:

> The DAS includes nodes that are strategically placed on existing utility poles, street lights, traffic signals and other structures every half mile within the coverage area.
>
> …
>
> The nodes connect to a hub via fiber optic-cable. The hub contains American Tower's head-end equipment and the service provider's Base Transceiver Station (BTS)."

Questions:

(a) Indicate whether the San Diego State University ODAS installation makes use of utility poles (including hydro poles, lampposts and streetlights) where such support structures were available.

Interrogatory 23

Reference: LCC Report, Section 12, page 23

Topic: Alternatives to poles

Preamble: The LCC Report states:

> One illustration is the case of Paradise Valley, Arizona, where ODAS was approved for installation and the vast majority of the DAS equipment was deployed on purpose-built structures, …

Questions:

(a) Indicate whether the Paradise Valley ODAS installation makes use of utility poles (including hydro poles, lampposts and streetlights) where such support structures were available.

Interrogatory 24

Reference: LCC Report, Section 13, pages 24-25

Topic: Alternatives to poles

Preamble: The LCC Report states:

> Even when fiber isn't available, many newer technologies can rely upon a more standardized broadband connection for that purpose. The picture to the left below represents the installation of an ADC Systems wireless antenna and supporting equipment on the side of a commercial building. The picture to the right represents similar equipment attached to the structure of a sports stadium.

Questions:

(a) Provide the coverage range of the ADC Systems wireless antenna depicted in the above-referenced pages of the LCC Report.

(b) Indicate whether the ADC Systems wireless antenna operate within and require a network of contiguous nodes or whether they are systems intended to provide wireless communications to a given location only.

(c) Identify the telecommunications service, if any, that is being provided using the ADC Systems (*i.e.* fixed or mobile, voice or data or both, to the public for compensation or for a private radio service)?

Interrogatory 25

Reference: LCC Report, Section 14, pages 27 - 32

Topic: Alternatives to poles

Preamble: The LCC Report identifies "numerous antenna locations that rely neither on buildings, utility poles or street furniture, but instead, use existing or replacement commercial signage…"

Questions:

(a) Please clearly identify and provide the street address of each antenna installation depicted on the above-noted pages of the LCC Report.

(b) For each identified antenna installation, indicate whether the installation is

(i) A macrocell antenna site

(ii) A microcell antenna site

(iii) An ODAS antenna site

(iv) A picocell antenna site

(v) A femtocell antenna site

(vi) A WiFi antenna site.

Interrogatory 26

Reference: LCC Report, Section 15, pages 33

Topic: Role of ODAS

Preamble: The LCC Report states:

> If a carrier is looking at option A as a DAS deployment or option B as something akin to a remote antenna or traditional cell site, option A will cost more.

Questions:

(a) Define “remote antenna” as referred to in the above-noted citation.

(b) List examples of “remote antenna” systems that are referred to or discussed by LCC in its Report.

(c) List the advantages of ODAS deployments over remote antennas from the perspective of a mobile wireless network operator and from the perspective of the subscribers of mobile wireless network operators.

Interrogatory 27

Reference: LCC Report, Section 16, pages 33-35

Topic: About the authors

Preamble: n/a

Questions:

(a) Is the principal author Dr. Shah or Mr. von Schaumburg?

(b) Identify and provide a copy of any written testimony, expert reports, transcripts of live testimony or depositions given by Dr. Nitin J. Shah on access to support structures (i.e. pole, duct, conduit) and rights-of-way.

(c) Identify and provide a copy of any written testimony, expert reports, transcripts of live testimony or depositions given by Dr. Nitin J. Shah on wireless communications networks and services.

(d) Identify and provide a copy of any written testimony, expert reports, transcripts of live testimony or depositions given by Mr. E.J. von Schaumburg on access to support structures (i.e. pole, duct, conduit) and rights-of-way.

(e) Identify and provide a copy of any written testimony, expert reports, transcripts of live testimony or depositions given by Mr. E.J.von Schaumburg on wireless communications networks and services.