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October 26, 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 are writing to file the responses of CANDAS to the interrogatories of Toronto Hydro-Electric System Limited ("**THESL**") in respect of CANDAS' Reply Evidence.

For ease of reference, where we have provided a reference to CANDAS' answers to THESL's first round interrogatories on CANDAS' Application and Written Evidence, we have used the following protocol: *e.g.* CANDAS (THESL)-1, would be a reference to CANDAS responses to THESL's question #1 on CANDAS' Application and Written Evidence.

Where we have provided a reference to CANDAS' answers to THESL's second round interrogatories on CANDAS' Reply Evidence, we have used the following protocol: *e.g.* CANDAS (THESL) REPLY-1, would be a reference to CANDAS' response to THESL's question #1 on Tormod Larsen's Reply Evidence.

We will file two paper copies of the responses as soon as possible.

Yours very truly,

(signed) H.T. Newland

HTN/ko
cc: Mr. George Vinyard
All Intervenors

EB-2011-0120

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.

RESPONSES TO INTERROGATORIES OF

TORONTO HYDRO-ELECTRIC SYSTEM LIMITED

(on the Reply Evidence of the Applicant, CANDAS)

October 26, 2011

A. Written Evidence of Tormod Larsen[1]

Question:

1. *Reference: Larsen Reply Evidence, p.1, para. 1. 2*

Mr. Larsen discusses the use of DAS and other small-cell and WiFi access alternatives to provide cellular coverage.

(a) Please list and describe each outdoor DAS network that provides "blanket (outdoor and indoor) and seamless cellular coverage over wide (>10 sq. km) geographic areas" in Canada.

(b) Please list and describe all outdoor DAS deployments used to improve coverage and/or capacity in conjunction with macrocell deployments in Canada.

(c) Please list and describe all other outdoor DAS networks deployed in Canada.

Response:

(a) A description of other outdoor DAS networks in Canada is provided in the July 26, 2011 LYA Report entitled, "The Deployment of Distributed Antenna Systems (DAS) on Utility Poles" at pages 26 to 28 inclusively.

(b) See (a) above.

(c) See (a) above.

[1] As filed October 11, 2011.

Question:

2. *Reference: Larsen Reply Evidence, p. 3, Section B*

Does Mr. Larsen believe that when the Board is assessing allegations of abuse of market power and other related matters, the alternatives being discussed (e.g., macrocells and femtocells) to outdoor DAS are in the same "product market" as DAS when the market is delineated using the approach of the Ontario Energy Board in pages 31 to 34 and following of its NGEIR Decision (i.e., Natural Gas Electricity Review Decision with Reasons dated November 7, 2006 which is provided as Volume II, Exhibit 4 in THESL motion/evidence)? Please explain the reasoning for your response.

Response:

Please see response to CANDAS(Energy Probe)REPLY – 2.

Question:

3. *Reference: Larsen Reply Evidence, p. 5, Table 1*

(a) Please define and describe the phrase "single technology/single band." In particular, please describe how the phrases "single technology" and "single band" are intended to be understood.

(b) Please list by manufacturer name and model number each Femtocell Mr. Larsen considered when stating Femtocell "Output Power Per Node" is limited "Up to 250mW."

(c) Is it Mr. Larsen's opinion that that there are not any Femtocells that have a power output greater than or equal to 250mW?

i. Where the answer to (c) above is yes or no, please provide the basis for Mr. Larsen's opinion.

ii. Please also provide all studies, reports, documents and other relevant facts upon which Mr. Larsen's opinion is based.

(d) Please list by manufacturer name and model number each Femtocell Mr. Larsen considered when stating "Typical Coverage Range Per Node (in Metres)" on femtocells is "<100m."

(e) Is it Mr. Larsen's opinion that that there are not any outdoor Femtocells that have a maximum coverage range greater than or equal to 100m? Please provide all studies, reports, documents and relevant facts upon which Mr. Larsen's opinion is based.

(f) Please define the term "fill-in" as used in the evidence.

(g) Please define the term "hotspot" areas" as used in the evidence.

(h) Please list by manufacturer name and model number each Femtocell Mr. Larsen considered when stating Femtocell "Number of Typical Max. Users" is limited to "4-32 users per node."

(i) Is it Mr. Larsen's opinion that that there are not any Femtocells that are capable of supporting more than to 32 users?

i. Where the answer to (i) above is yes or no, please provide the basis for Mr. Larsen's opinion.

ii. Please also provide all studies, reports, documents and other relevant facts upon which Mr. Larsen's opinion is based.

(j) Please list by manufacturer name and model number each Pico Cell Mr. Larsen considered when stating Pico Cell "Typical Coverage Range Per Node (in Metres)" is "<200m."

(k) Is it Mr. Larsen's opinion that that there are not any outdoor Pico Cells that have a maximum coverage range of greater than or equal to 200m?

i. Where the answer to (k) above is yes or no, please provide the basis for Mr. Larsen's opinion.

ii. Please also provide all studies, reports, documents and other relevant facts upon which Mr. Larsen's opinion is based.

(l) Please list by manufacturer name and model number each Pico Cell Mr. Larsen considered when stating Pico Cell "Number of Typical Max. Users" is limited to "16-64 users per node".

(m) Is it Mr. Larsen's opinion that there are not any Pico Cells that are capable of supporting more than to 64 users?

i. Where the answer to (m) above is yes or no, please provide the basis for Mr. Larsen's opinion.

ii. Please also provide all studies, reports, documents and other relevant facts upon which Mr. Larsen's opinion is based.

(n) Please list by manufacturer name and model number each Micro Cell Mr. Larsen considered when stating Micro Cell "Typical Coverage Range Per Node (in Metres)" is "<500m."

(o) Is it Mr. Larsen's opinion that that there are not any outdoor Micro Cells that have a maximum coverage range of greater than or equal to 500m?

i. Where the answer to (o) above is yes or no, please provide the basis for Mr. Larsen's opinion.

ii. Please also provide all studies, reports, documents and other relevant facts upon which Mr. Larsen's opinion is based.

(p) Please list by manufacturer name and model number each Micro Cell Mr. Larsen considered when stating Micro Cell "Number of Typical Max. Users" is limited to "32-200 users per node".

(q) Is it Mr. Larsen's opinion that there are not any Micro Cells are capable of supporting more than to 200 users?

i. Where the answer to (q) above is yes or no, please provide the basis for Mr. Larsen's opinion.

ii. Please also provide all studies, reports, documents and other relevant facts upon which Mr. Larsen's opinion is based.

(r) Please indicate whether Mr. Larsen believes there are not any Femtocells that support "hand-in" from macrocell sites into femtocell sites. Please indicate whether Mr. Larsen believes all Femtocells are "hand-out" only.

i. Where the answer to (r) above is yes or no, please provide the basis for Mr. Larsen's opinion.

ii. Please also provide all studies, reports, documents and other relevant facts upon which Mr. Larsen's opinion is based.

Response:

(a) "Single technology" means a single wireless technology, *e.g.* GSM, UMTS, CDMA or LTE.

"Single band" means a single frequency band, *e.g.* cellular (824-859MHz), PCS (1845-1900MHz) or AWS (1710-2170MHz).

(b) See the response to 3(c) below.

(c) Products with an output power of greater than 250mW are considered to be picocells.

Products with an output power per node of greater than 2W and up to 20W are considered microcells. This conclusion is consistent with the classifications provided by the 3rd Generation Partnership Project ("3GPP"), an international standardization body, which in its white paper, *Femtocells and Health*, defined the output power of femtocells to be less than 100mW.

See Femtocells and Health at p.2 accessed online at: http://www.mmfai.org/public/docs/eng/MMF_Femtocells_and_Health.pdf on October 24, 2011. The following table lists a number of femtocell vendors, their corresponding product models and the maximum output power of each:

Femtocells				
	Models	**Output Power**	**# of users**	**Typ. Range**
Airvana	NubBub	max 100mW	max 6	80m
Airwalk	Edgepoint	max 100mW	max 6	80m
Airwalk	Edgepoint PRO	max 200mW	max 32	95m
Alcatel Lucent	9363	max 100mW	16	100m
Cisco	Cisco 3G Femto	max 5mW	max 4	37.5m
iPAccess	nano3G C-class	max 20mW	max 8	53m
iPAccess	nano3G S-class	max 20mW	max 8	53m
Nokia Siemens		up to max 250mW	4 to 24	100m
Samsung	Ubicell	max 20mW	max 4	53m
SpiderCloud	SpiderCloud	max 100mW	max 16-32	53m
Ubiqusys		max 250mW	8 or 16	100m
ZTE	ZXWR H8901	max 20mW	max 4	53m

Notes: Typical range is based on COST 231 propagation model assuming maximum power.

Pilot power is not considered

1900 MHz

Min RX Lev assumed to be -85dBm

(d) See response to 3(c) above.

(e) See the response to 3(c) above. A transmitter with an output power of 250mW will typically have a range of less than 100 metres in an urban environment.

(f) ”Fill in” means to provide enhanced wireless coverage for an existing network which either has a small coverage gap or does not have sufficient capacity over a small area.

(g) ”Hotspot” means a small coverage area with a relatively high demand for network capacity.

(h) See the response to 3(c) above.

(i) Mr. Larsen classifies products capable of supporting more than 32 users as picocells or microcells.

(j) See response to 3(k) below.

(k) Mr. Larsen classifies products with a maximum coverage range of more than 200 metres as microcells.

Products with coverage ranges of greater than 1000 metres are considered macrocells.

Picocells typically have an output power of 250mW. However, a picocell with a maximum transmit power of 1W has a maximum range of only 142m. The following table lists a number of picocell vendors, their corresponding product models and the key specifications of each:

Picocells				
	Models	**Output power**	**# of users**	**Typ. Range**
Airwalk	AW 100	max 200mW	max 32 or 64	95m
Alcatel Lucent	9363	max 250mW	16	100m
iPAccess	nano 3G	max 250mW	16 to 24	100m
ZTE	ZXSDR BS8802	max 1W	up to 31 or 64	142m

Notes: Typical range is based on COST 231 propagation model assuming maximum power.

Pilot power is not considered

1900MHz

Min RX Lev assumed to be -85dBm

(l) See the response to 3(k) above.

(m) Products supporting more than 64 simultaneous users are classified as either microcells or macrocells.

(n) The following table lists a number of microcell manufactures of microcells their corresponding product models and the maximum output power of each:

Microcells				
	Models	**Output Power**	**# of users**	**Typ. Range**
Airwalk	OneRAN	50mW/20W	max 96	50m/450m
Alcatel Lucent	Type M	Up to 20W*	max 200	max 450m
Ericsson	RBS 2302	5W	max 48	max 320m
Nokia Siemens	FlexiLite	Up to 5W	max 200	max 320m
ZTE	ZXC10 CBTS	Up to 20W*	max 96	max 450m

Notes: Typical range is based on COST 231 propagation model assuming maximum power.

Pilot power is not considered

1900MHz

Min RX Lev assumed to be -85dBm

* assumed external cable loss of 3dB and antenna gain of 10dBi

Assuming a 20W output power and a 10dBi antenna, the typical range of a microcell, calculated using the COST 231 propagation model, is less than 500m.

(o) See the response provided to 3(n). Mr. Larsen classifies products with a maximum range of greater than 500m as macrocells.

(p) See the response to 3(n) above.

(q) Mr. Larsen classifies products capable of supporting more than 200 simultaneous users as macrocells.

(r) There is not a commercially-viable residential femtocell SON solution that effectively supports “hand in” from macrocell sites. Furthermore, handover between femtocells is not supported and thus femtocells are always deployed as a complement to macro cell networks. *See also Creating Flexibility for Small Cells*, ipAccess for additional details available at: http://www.ipaccess.com/uploads/wysiwyg_editor/files/Creating%20flexibility%20for%20small%20cells.pdf

Question:

4. *Reference: Larsen Reply Evidence, p. 7, Table 1*

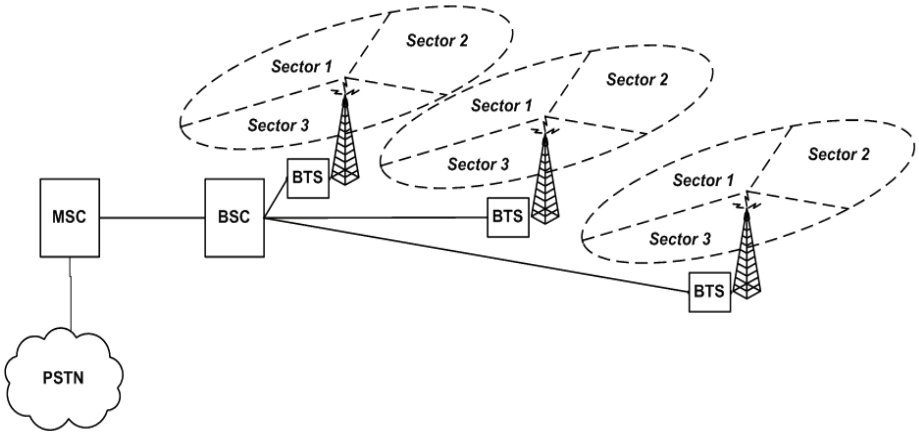
The evidence states that "Macrocell sites are typically deployed in a three-sector configuration."

(a) Please describe a three-sector configuration.

(b) Please discuss how a three-sector configuration compares to a six-sector configuration in terms of "maximum number of users supported" per macrocell site.

Response:

(a) The information requested pertaining to macrocell site deployment, is irrelevant to the issues in this proceeding. However, macrocellular sites are typically deployed in a three-sector configuration. A three sector configuration means that the site has three sets of antennas pointing in three different directions typically offset 120 degrees to each other.



PSTN – Public Switched Telephony Network

MSC – Mobile Switching Center

BSC – Base Station Controller

BTS – Base Transceiver Station

(b) A six sector configuration has six sectors versus the typical three sectors. The offset between each sector is 60 degrees, as compared to 120 degrees for the three sector configuration. While the capacity of a six sector site would theoretically be double that of a three-sector site, due to the reduced off-set, a six-sector site is more susceptible to interference and, as a result, less efficient. In practice, a six-sector site provides less than its theoretical maximum capacity.

Picture of a 3 sector site.

Question:

5. *Reference: Larsen Reply Evidence, page 12, para. 5.1 (also, Larsen Written Evidence, pages 5-6)*

Please state whether Public Mobile's macrocell site deployment is based upon a three-sector configuration, six-sector configuration or some other configuration, and provide all studies, reports, analyses and documents upon which your answers are based.

Response:

The information requested is irrelevant to a determination of the issues in this proceeding. However, Public Mobile advises that it uses a combination of three, four, five and six-sector sites. There are no relevant studies or reports.

Question:

6. *Reference: Larsen Reply Evidence, page 7, Table 1; page 13, para. 5.4; Appendix "B"*

At p.7, Mr. Larsen states with respect to Macro Cell sites that "operators are faced with increasing challenges related to site acquisition."

(a) Please indicate whether or to what extent, public consultation - as described in Section 11 of the City of Toronto Telecommunications Tower and Antenna Protocol (http://www.toronto.ca/planning/telecommunications.htm#protocol) – was required for the DAS nodes included in the Toronto DAS Network described in CANDAS' Application.

(b) Please indicate whether Mr. Larsen, CANDAS and/or its member companies believe operators who intend to deploy Typical Wireless Equipment Attachments Installed on a 35' Common Utility Distribution (LDC) Pole as depicted at p.4 of Appendix B are excluded from the requirement to consult with the LUA and public pursuant to Section 6 of Industry Canada's procedures as described in Radiocommunication and Broadcasting Antenna Systems (CPC-2-0-03).

Response:

(a) and (b):

Please refer to Section 6.4 of the CANDAS application as reproduced below:

> 6.4 In order to construct the Toronto DAS Network, the consent of the City of Toronto was required. The City agreed and entered into a Municipal Access Agreement for Telecommunication Installations with DAScom as of August 6, 2009 (the "**Municipal Access Agreement**"). Copies of this Agreement and the City of Toronto Staff Report ("**Staff Report**") that sought Council approval to enter into the Agreement are included at Tabs 10 and 11 of this Application, respectively. The Municipal Access Agreement is for an initial term of 15 years and gives DAScom access to City roads for the purpose of constructing, installing, operating and maintaining a telecommunications network, including wireless antennas, radios and power supply equipment.

The Municipal Access Agreement signed between DAScom and the City of Toronto (provided at Tab 10 of the original CANDAS Application) also references CPC-2-0-03. This Industry Canada Circular indicates, as noted in Footnote 26 of the LYA Reply Comments, that antenna structures with a height of less than 15 m above ground level are excluded from the public consultation process. This exclusion applies to masts, towers or other antenna-supporting structures, as indicated at Section 6, p. 9 of CPC-2-0-03.

Question:

7. *Reference: Larsen Reply Evidence, page 8, Table 1*

Mr. Larsen states that WiFi is not "a technology that makes sense on a large scale for a licensed mobile wireless carrier."

(a) Please provide the basis for Mr. Larsen's statement.

(b) Please provide all reports, analyses, documents and other facts upon which Mr. Larsen bases this statement.

(c) Please indicate whether Mr. Larsen has any knowledge of large carriers whether in Canada (e.g., Bell Mobility, Rogers, Telus, etc.), the US (e.g., AT&T, Verizon, Sprint, T Mobile, US Cellular, etc.) or elsewhere using WiFi to manage voice and/or data traffic. If so, please provide particulars regarding that knowledge.

Response:

(a) Wireless spectrum is typically acquired by carriers in competitive licensing processes at significant cost. Where a carrier has paid significant sums to gain exclusive access to licensed spectrum, it would not rely on unlicensed, interference-prone, low quality, non-exclusive spectrum, such as WiFi, as the primary method of providing services. Secondly, WiFi does not support circuit-switched, seamless mobile voice communications, which is the defining characteristic of the service provided by a public mobile wireless carrier.

(b) See response to 7(c) below.

(c) As THESL knows, Mr. Starkey and Ms Lemay have discussed the use of WiFi in indoor hotspot and limited outdoor deployments. Cogeco's One Zone deployment on streetlights is a prime example. While some carriers are using WiFi for so-called data offload, we are not aware of any large carrier providing mobile wireless services to the public by way of WiFi access points alone in any geographic area, let alone in large, contiguous geographic areas. It has been deployed mainly for "hotspot" access to the Internet in coffee shops, stadiums, and airports.

Question:

8. *Reference: Larsen Reply Evidence, page 11, para. 4.6; Appendix "A"*

At page 5 of Appendix "A", Mr. Larsen depicts CATV rectifiers/back up power units placed at approximately every 12th utility pole, or 0.5 km.

(a) Please list and describe all facts supporting the accuracy of Mr. Larsen's assumptions.

(b) Please provide all reports, analyses, engineering diagrams and/or specifications regarding the distance between and/or placement of CATV rectifiers/back up power units Mr. Larsen reviewed or considered during the preparation of his reply testimony and Appendix "A".

Response:

(a) and (b)

The referenced network topology diagram was largely based on information from THESL, provided in responses to OEB Staff interrogatory 21 (THESL(OEB)-21).

In THESL(OEB)-21, THESL states that approximately 2 per cent of the total wireline attachments to THESL poles include power supply boxes that are up to 71 cm in height and are attached ***outside*** of the "communications space".

This percentage could be much higher, if one takes into account, for example, shorter power supply boxes, or boxes attached in the communication space.

We have assumed the average density of poles in a utility network of 240 poles per sq. km.

It follows, therefore, that in areas where the CATV provider has attached its communications network to THESL poles, conservatively speaking, there would be 4 to 5 THESL poles per sq. km that would have CATV rectifiers, battery back-up or similar attachments. This translates to one in 12 utility poles or a pole every 0.5 km.

Question:

9. *Reference: Larsen Reply Evidence, page 13, para. 5.4; Appendix "B"*

Please identify and describe all material differences between the DAS nodes deployed as part of the incomplete Toronto DAS Network discussed in CANDAS' Application in this proceeding as well as Mr. Larsen's supporting Evidence and the Typical Wireless Equipment Attachments Installed on a 35' Common Utility Distribution (LDC) Pole described in Appendix "B" to Mr. Larsen's Reply Evidence.

Response:

There are none.

B. Written Evidence of Dr. Roger Ware[2]

Question:

10. *Reference: Ware reply evidence, p.5 and following, Section III*

Section III is entitled "Pole Networks are a Public Good".

(a) Please provide a precise definition of a "public good" and the relevant academic reference which contains the definition provided.

Response:

(a) The classic textbook, *MicroEconomic Theory*, by Mas-Colell, Whinston and Green, defines a "public good" as follows (p.359):

> A *public good* is a commodity for which use of a unit of the good by one agent does not preclude its use by other agents.

See: Mas-Colell, A., M. Whinston and J. Green. (1995) *Microeconomic Theory*, New York Oxford: Oxford University Press.

[2] As filed October 11, 2011.

Question:

11. *Reference: Ware reply evidence p. 8 para. 12*

The evidence explains Dr. Ware's view that "the efficient way to allocate access to THESL poles is to mandate access at just and reasonable rates"

(a) Is there a risk that a "just and reasonable rates" approach to pricing pole space could result in a rate that is significantly lower than the market rate to access similar space? Would Dr. Ware's view change if the market price for pole space was significantly higher (i.e., more than 100 times higher) than the value that a cost of service rate would yield?

Response:

(a) First, my understanding is that there is no "similar space" to the attachment space that is available on the THESL pole network. The alternative attachment sites are much inferior in quality and are not actual, viable alternatives. This is supported by the fact that Public Mobile did not seek to employ macro cell sites when it initially believed it would have access to the proposed Toronto DAS Network based on the THESL pole network. It is also supported by the existence of the current CANDAS application.

Second, if by "market rate" this question means a market rate charged by a monopolist, then it is likely to be higher than a regulated rate. There is nothing efficient or socially desirable about a market rate if the "market" in question is a monopoly.

Question:

12. *Reference: Ware reply evidence, p. 12, para. 19 c)*

The evidence states that "As traffic expands, the carrier operating at 1900 MHz must add four times as many new antenna sites as a carrier operating in the 800 MHz band."

(a) Please provide the studies or analyses conducted by Dr. Ware or by members of CANDAS which analyze the likely growth in DAS antenna sites over the next decade in order to meet demand for wireless services in THESL's service area.

Response:

(a) This question is confusing. The reference quoted from paragraph 19 c) of my evidence is to the addition of macrocell antenna sites, not DAS antenna sites.

Question:

13. *Reference: Ware reply evidence, p. 12, para. 19 d)*

The evidence states that "In many cases suitable sites might require accessing a rooftop already occupied by a rival carrier, or the construction of a new site for which permission may not be granted or may only be achieved after long delays."

(a) Please explain the circumstances under which the presence of facilities belonging to one carrier on a rooftop or other site precludes access by other carriers.

(b) In the experience of Dr. Ware, how frequently do these kinds of circumstances occur? Please explain.

Response:

(a) While there are clearly impediments to site sharing in Canada (see Section 3.2 of the Reply Evidence of Johanne Lemay), whether there are or not such impediments, was not the principal purpose of the evidence given at paragraph 19 d) of my Reply Evidence. The principal purpose of this evidence was to note the relevant characteristics of utility pole infrastructure and to draw the contrast between utility pole infrastructure and macrocell towers.

(b) Please see the response to (a) above.

Question:

14. *Reference: Ware reply evidence, p. 12, para. 20*

The evidence states that "Moreover, the pole height is ideally suited to the mounting of antenna for carriers restricted to higher frequencies of operation and the need to transmit signals closer to the end-user."

(a) Please explain the basis for Dr. Ware's opinion.

(b) Please provide any studies or analyses that Dr. Ware has conducted upon which he bases his conclusion that power poles are the "ideal height" for such carriers.

(c) Please provide any studies or analyses that Dr. Ware has conducted which document that there do not exist other structures of comparable height to power poles in Public Mobile's service areas.

Response:

(a) Please see the Reply Evidence of Tormod Larsen, para 1.2 (ii).

(b) Please see the response to (a) above.

(c) Please see the evidence of Brian O'Shaughnessy and the Reply Evidence of Tormod Larsen.

Question:

15. *Reference: Ware reply evidence, p. 12, para. 23*

Does Dr. Ware believe that when the Board is assessing allegations of abuse of market power and other related matters, the alternatives being discussed (e.g., macrocells and femtocells) to outdoor DAS are in the same "product market" as DAS when the market is delineated using the approach of the Ontario Energy Board in pages 31 to 34 of its NGEIR Decision (i.e., Natural Gas Electricity Review Decision with Reasons dated November 7, 2006 which is provided as Volume II, Exhibit 4 in THESL motion/evidence)? Please explain the reasoning for your response.

Response:

Please see my response to CANDAS(Energy Probe)REPLY – 2.

Question:

16. *Reference: Ware reply evidence, p. 12, para. 23*

The evidence states that "In reality, the alternatives to power poles that are available for siting are much inferior in quality, and will not allow new entrants such as Public Mobile to grow, to offer service to a larger percentage of the Ontario population and to achieve a critical mass competitively in the long run."

(a) Please list the "new entrants" that are being referred to in this statement.

(b) Please provide the basis for Dr. Ware's opinion.

(c) Please provide any studies or analyses which Dr. Ware has conducted which demonstrate that in the absence of access to power poles, Public Mobile and other "new entrants" will not grow.

(d) Please provide any studies or analyses which Dr. Ware has conducted which demonstrate that in the absence of access to power poles Public Mobile and other "new entrants" will not achieve critical mass.

(e) Please provide any studies or analyses which Dr. Ware has conducted which demonstrate that the services provided by Public Mobile and other "new entrants" are at present inferior to those provided by other carriers, and that this inferiority results from absence of pole-mounted antennas.

Response:

(a) I consider Public Mobile, Mobilicity, WIND Mobile and Videotron to be new entrants. Please also see the definition of "new entrant" utilized by Industry Canada in *Policy Framework for the Auction for Spectrum Licences for Advanced Wireless Services and other Spectrum in the 2 GHz Range* (Industry Canada, November, 2007) available online at: http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf08833.html

(b) Please see the Written Evidence of Brian O'Shaughnessy and the Reply Evidence of Tormod Larsen.

(c) Please see the response to (b) above.

(d) Please see the response to (b) above**.**

(e) This question appears to be based on the premise that Public Mobile's services are at present inferior. I have no knowledge of this premise and, therefore, cannot answer the question as posed.

Question:

17. *Ware reply evidence*

Please provide any studies or analyses which Dr. Ware has conducted on:

(a) U.S. siting markets for wireless facilities.

(b) Canadian siting markets for wireless facilities.

Response:

(a) Please see the Reply Evidence of Johanne Lemay.

(b) Please see the response to (a) above.

Question:

18. *Reference: Appendix 1 (Curriculum Vitae of Roger Ware), p. 9*

Dr. Ware's CV indicates that he was retained in 2010 "by the Ontario Energy Board as a member of the Market Surveillance Panel, an oversight body on electricity pricing."

(a) Is. Dr. Ware still a member of the Board's Market Surveillance Panel? The Board's website[3] suggests that he is.

(b) If the answer to (a) above is no, when did Dr. Ware cease to be a member of the Board's Market Surveillance Panel, and why?

(c) As a member of the Board's Market Surveillance Panel, did Dr. Ware ever investigate market activities and the behaviour of specific market participants (for example, if they are suspected of gaming or abusing their market power) and make recommendations related to the results of those investigations?

(d) Is Dr. Ware aware that CANDAS has alleged at paragraph 2.9 and elsewhere in its Application that distributors could use their market power to unduly discriminate among Canadian carriers?

(e) Is Dr. Ware's evidence being presented in the context of recommendations that he is making in his role as a member of the Board's Market Surveillance Panel?

(f) If the answer to part (e) is yes, did the remainder of the Market Surveillance Panel review and approve Dr. Ware's report before it was filed as evidence in this proceeding?

(g) If the answer to part (e) is no, how does Dr. Ware propose to address parties' legitimate concerns about an actual or apparent bias arising in the Board's decision making process given that the Board is now being asked to consider evidence prepared by one of their own colleagues (another Board Panel member)?

(h) Is it possible that a Board member may have actual or apparent undue influence over the decision making process of their fellow Board colleagues? Please explain the basis for the response.

(i) Did Dr. Ware consult with the Board about compliance with its Code of Conduct and conflict of interest policies before he filed evidence on behalf of CANDAS in this proceeding? Please provide details of any such consultation, including the Board's response.

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[3] http://www.ontarioenergyboard.ca/OEB/Industry/About+the+OEB/Electricity+Market+Surveillance

Response:

(a) Yes, since August 2010.

(b) Not applicable.

(c) The activities described are part of the normal work of the Market Surveillance Panel, and are, of course, confidential, unless reported in the bi-annual reports of the Panel.

(d) Yes.

(e) No, I would not be able to make recommendations on this matter in my role as a member of the Market Surveillance Panel. With that being said, this matter does not fall within the ambit of the Panel's jurisdiction. In addition, CANDAS would never appear before the Panel because CANDAS is not an IESO market participant.

(f) Not applicable.

(g) I do not understand this question as I am not a member of the Ontario Energy Board. I note in this regard that the Board and the Market Surveillance Panel are two separate and distinct entities. Moreover the Panel's jurisdiction is limited to the duties set out in the *Electricity Act*, *1998* at sections 37 and 38 and OEB Bylaw 3.

(h) I do not understand this question as I am not a member of the Ontario Energy Board and do not participate in the Board's decision-making process.

(i) The Board's Code of Conduct and conflict of interest policies provide a complete explanation of the applicable rules. Therefore, consultation with the Board is unnecessary. With that being said, it should be noted, once again, that CANDAS is not an IESO market participant and therefore not subject to the jurisdiction of the Market Surveillance Panel.

C. Written Evidence of Johanne Lemay[4]

Question:

19. *Reference: Lemay Reply Evidence, p. 3*

The evidence states that "the members of CANDAS were planning to build, from the ground up, a brand new mobile network in the City of Toronto, with the objective of achieving blanket coverage for both voice and data mobile services, with future potential for flexible growth and targeted capacity increases."

(a) Setting aside Videotron and CANDAS in Montreal, please list and describe all other outdoor DAS networks deployed in Canada that "provide blanket coverage for both voice and data mobile services" rather than serving as "a complement to a conventional macro cell network."

(b) Please list and describe all outdoor DAS networks deployed in Canada that serve as "a complement to a conventional macro cell network."

Response:

(c) See response to CANDAS(THESL) REPLY -1 (a)

(d) See response to CANDAS(THESL) REPLY -1 (b)

[4] As filed October 11, 2011.

Question:

20. *Reference: Lemay Reply Evidence, p. 3*

The evidence states that "The Starkey Affidavit and the LCC Report create confusion by suggesting that WiFi and femtocells are substitutes to the deployment of outdoor DAS."

(a) Please define "substitute" as used in the statement.

(b) Please define and describe all factors relevant to the determination of whether WiFi and femtocells can be considered substitutes to the deployment of outdoor DAS. For example, are relative cost, voice and data capacities, and reliability characteristics relevant?

(c) Does Ms. Lemay believe that when the Board is assessing allegations of abuse of market power and other related matters, the alternatives being discussed (e.g., macrocells and femtocells) to outdoor DAS are in the same "product market" as DAS when the market is delineated using the approach of the Ontario Energy Board in pages 31 to 34 of its NGEIR Decision (i.e., Natural Gas Electricity Review Decision with Reasons dated November 7, 2006 which is provided as Volume II, Exhibit 4 in THESL motion/evidence)? Please explain the reasoning for your response.

Response:

(a) The sentence quoted above should be read in conjunction with the paragraph that followed. For convenience, both passages are reproduced below:

> The Starkey Affidavit and the LCC Report create confusion by suggesting that WiFi and femtocells are substitutes to the deployment of outdoor DAS.
>
> This is simply not the case. As discussed below, we highlight why technologies such as WiFi and femtocells, in contrast to outdoor DAS, cannot be deployed at the present time for the purpose of providing blanket outdoor and indoor coverage for both mobile voice and data applications.

"Substitute" as used in this context means products that have the same uses or that can provide the same services. Unlike outdoor DAS technologies, WiFi and femtocells cannot be deployed independent of macrocell deployment to provide blanket coverage for mobile voice and data services over a large area.

(b) See response to (a) above.

(c) See Dr. Ware's response to CANDAS(Energy Probe) REPLY-2.

Question:

21. *Reference: Lemay Reply Evidence, p. 3*

The evidence states that "WiFi and femtocells are efficiently deployed on utility poles, similar to outdoor DAS."

(a) Please provide all reports, analyses, documents and facts Ms. Lemay reviewed and relied-upon in making the statement.

(b) Please discuss all potential deployment options/locations considered by Ms. Lemay when making this statement and provide all economic analyses, financial analyses, engineering analyses, reports and documents demonstrating the relative efficiency of the various deployment options/locations considered by Ms. Lemay in making this statement.

Response:

(a) See the Lemay-Yates Associates (LYA) report presented to CANDAS dated October 11, 2011, entitled "Reply Comments on the Evidence presented by THESL and CEA in the OEB Matter Related to the CANDAS Application," ("LYA Reply Comments") at Section 2.1, and in particular, the use of utility poles in the Toronto "One Zone" network.

Other references include the datasheet for the Alcatel Lucent 9364 Outdoor Metrocell (referenced at page 10, footnote 16 of the LYA Reply Comments) and the Strategic White Paper entitled "*Metro Cells: A cost-effective option for meeting growing capacity demands*", available at http://www.alcatel-lucent.com/wireless/femto_small_cells.html.

(b) See response to (a) above.

Question:

22. *Reference: Lemay Reply Evidence, p. 9*

Ms. Lemay describes that certain of AT&T's residential femtocells "will transfer calls seamlessly from a femtocell to a macro cell tower, but no seamless handover is available in the opposite direction, from the macro cell tower to the femtocell." Is it Ms. Lemay's contention that all femtocells, whether deployed in residential, commercial or public locations are similarly restricted in that they do not permit handover from the macro cell tower to the femtocell?

Response:

No. See Alcatel Lucent Outdoor Metrocell 9364 datasheet, referenced in CANDAS(THESL)REPLY-21(a) above.

Question:

23. *Reference: Lemay Reply Evidence, p. 10*

Ms. Lemay describes femtocells as "complementary to and not as a replacement for a macro cell antenna deployment." Does Ms. Lemay consider outdoor DAS deployments as (a) "complementary to" a macro cell antenna deployment, (b) substitute for a macro cell antenna deployment, or (c) both. Please explain fully.

Response:

Outdoor DAS technologies can be deployed to meet ever increasing demand for mobile data as well as to provide blanket coverage in place of a macrocell antenna network. See Section 3 of the LYA Report dated July 26, 2011 presented to CANDAS, entitled "The Deployment of Distributed Antenna Systems (DAS) on Utility Poles." See also CANDAS(THESL)REPLY-1(a).

Question:

24. *Reference: Lemay Reply Evidence, p.11*

The evidence states that outdoor DAS have evolved as full substitutes for traditional coverage with macro and micro cell deployment and that "such deployments have already taken place in a number of urban and suburban centres."

(a) Please identify each such Canadian urban centre.

(b) For the centres listed in response to (a), please provide details including, but not limited to, name of the urban market, geographic area covered, carrier(s) involved, wireless technology involved (2g, 3g, 4g), radio frequencies involved, the number of DAS nodes, and the percent of DAS nodes on utility poles, street lights, street furniture, rooftops, buildings, and special purpose poles, respectively.

(c) Please discuss whether and to what extent the carrier(s) identified in part (a) above utilize traditional macro cells sites, micro cell sites, picocells, femtocells, and WiFi in their network(s) generally and, specifically, in the areas surrounding the deployment described in part (a).

(d) Please identify each such Canadian suburban centre and provide details including, but not limited to, name of the suburban market, geographic area covered, carrier(s) involved, wireless technology involved (2g, 3g, 4g), radio frequencies involved, the number of DAS nodes and the percent of DAS nodes on utility poles, street lights, street furniture, rooftops, buildings, and special purpose poles, respectively.

(e) Please discuss whether and to what extent the carrier(s) identified in part (c) above utilize traditional macro cells sites, micro cell sites, picocells, femtocells, and WiFi in their network(s) generally and, specifically, in the areas surrounding the deployment described in part (c) above.

Response:

(a) See CANDAS(THESL)REPLY-1.

(b) Refer to response to (a) above.

(c) It is our understanding that Vidéotron Ltée, which has deployed outdoor DAS technologies for coverage in certain geographic areas of the Island of Montreal, has also deployed coverage using conventional macrocell sites in other geographic areas. Also, unlike the Public Mobile experience in Montreal, Public Mobile has deployed a mobile network in the Toronto area using macrocell sites due to its inability to deploy outdoor DAS technology on THESL poles.

(d) Refer to response to (a) above.

(e) Refer to response to (c) above.

Question:

25. *Reference: Lemay Reply Evidence*

Please identify all geographic areas in which Rogers has implemented outdoor DAS for purposes of blanket coverage as that term is used in Ms Lemay's evidence, Mr. Larsen's and Ms. Lemay's responses to interrogatories in this proceeding. For each area identified, please identify the number of DAS nodes and, separately, the percent of DAS nodes on utility poles, street lights, street furniture, rooftops, buildings, and special purpose poles, respectively.

Response:

Ms Lemay commented on Mr. Starkey's characterisation of the Figure at page 33 of Mr. Starkey's Affidavit sworn September 1, 2011 where he purported to describe "how Rogers intends to increase its necessary wireless capacity." The Figure in question does nothing of the sort, for the reasons already provided by Ms Lemay in the LYA Reply Comments at page 13. It would be an exercise in conjecture and speculation to purport to describe "how Rogers intends to increase its necessary wireless capacity," as Mr. Starkey attempted to do. Ms. Lemay is, therefore, unable to answer the question.

Question:

26. *Reference: Lemay Reply Evidence*

Please identify all geographic areas in which Rogers has implemented outdoor DAS for purposes of coverage that complements that of a traditional macro cell site based network. For each area identified, please identify the number of DAS nodes and, separately, the percent of DAS nodes on utility poles, street lights, street furniture, rooftops, buildings, and special purpose poles, respectively.

Response:

Ms Lemay commented on Mr. Starkey's characterisation of the Figure at page 33 of Mr. Starkey's Affidavit sworn September 1, 2011 where he purported to describe "how Rogers intends to increase its necessary wireless capacity." The Figure in question does nothing of the sort, for the reasons already provided by Ms Lemay in the LYA Reply Comments at page 13. It would be an exercise in conjecture and speculation to purport to describe "how Rogers intends to increase its necessary wireless capacity," as Mr. Starkey attempted to do. Ms. Lemay is, therefore, unable to answer the question.

Question:

27. *Reference: Lemay reply evidence*

Identify all geographic areas in which Rogers plans to implement outdoor DAS for purposes of blanket coverage as that term is used in Mr. Larsen' and Ms. Lemay' replies in this proceeding. For each area identified, please identify the number of planned DAS nodes and, separately, the percent of planned DAS nodes that will be placed on utility poles, street lights, street furniture, rooftops, buildings, and special purpose poles, respectively.

Response:

Ms Lemay commented on Mr. Starkey's characterisation of the Figure at page 33 of Mr. Starkey's Affidavit sworn September 1, 2011 where he purported to describe "how Rogers intends to increase its necessary wireless capacity." The Figure in question does nothing of the sort, for the reasons already provided by Ms Lemay in the LYA Reply Comments at page 13. It would be an exercise in conjecture and speculation to purport to describe "how Rogers intends to increase its necessary wireless capacity," as Mr. Starkey attempted to do. Ms. Lemay is, therefore, unable to answer the question.

Question:

28. *Reference: Lemay Reply Evidence*

Identify all geographic areas in which Rogers has planned to implement outdoor DAS for purposes of coverage that complements that of a traditional macro cell site based network. For each area identified, please identify the number of planned DAS nodes and, separately, the percent of the planned DAS nodes that will be placed on utility poles, street lights, street furniture, rooftops, buildings, and special purpose poles, respectively.

Response:

Ms Lemay commented on Mr. Starkey's characterisation of the Figure at page 33 of Mr. Starkey's Affidavit sworn September 1, 2011 where he purported to describe "how Rogers intends to increase its necessary wireless capacity." The Figure in question does nothing of the sort, for the reasons already provided by Ms Lemay in the LYA Reply Comments at page 13. It would be an exercise in conjecture and speculation to purport to describe "how Rogers intends to increase its necessary wireless capacity," as Mr. Starkey attempted to do. Ms. Lemay is, therefore, unable to answer the question.

Question:

29. *Reference: Lemay Reply Evidence, p. 15, footnote number 26*

Ms. Lemay states that "CPC-2-0-03 Issue 4 (released: June 2007), excludes antenna structures with a height of less than 15m above ground from the public consultation process." Is it Ms. Lemay's opinion that the DAS nodes described in Exhibit D to Mr. Larsen's July 26, 2011 Written Evidence (AS-BUILT FIBER OPTIC NODE INSTALLATION - 559 1233 JANE ST, 2nd POLE NORTH OF CORNELL AVE, EAST SIDE, POLE # 253TORONTO, CANADA) are excluded from Industry Canada's public consultation process?

Response:

See response to CANDAS(THESL) REPLY-6.

Question:

30. *Reference: Lemay Reply Evidence, p. 15, footnote number 26*

Ms. Lemay states that "CPC-2-0-03 Issue 4 (released: June 2007), excludes antenna structures with a height of less than 15m above ground from the public consultation process." Is it Ms. Lemay's opinion that the DAS nodes described in Exhibit D to Mr. Larsen's July 26, 2011 Written Evidence (AS-BUILT FIBER OPTIC NODE INSTALLATION - 559 1233 JANE ST, 2nd POLE NORTH OF CORNELL AVE, EAST SIDE, POLE # 253TORONTO, CANADA) are excluded from the public consultation process described in Section 11 of the City of Toronto Telecommunications Tower and Antenna Protocol located at the address noted below?
http://www.toronto.ca/planning/telecommunications.htm#protocol

Response:

See response to CANDAS(THESL) REPLY-6.

Question:

31. *Reference: Lemay Reply Evidence, p. 16, Section 3.2*

The evidence states that the Canadian wireless siting market "is not a well functioning competitive market."

(a) Please identify the date on which Public Mobile made its decision to switch to its macro cell site strategy.

(b) Please identify the date on which Public Mobile began to provide services in the city of Toronto based on macro cell sites?

(c) Please identify the number of locations at which Public Mobile's macro cell towers/antennas are located, how many property owners are involved, the initial cost involved with each site and the ongoing monthly expense associated with each site.

(d) Please provide the particulars that demonstrate whether and to what extent the coverage area intended to be supported by the Toronto DAS Network (as originally conceived) differs from the coverage area currently supported by the macro cell sites deployed by Public Mobile, including all reports, analyses, studies, working papers, memoranda, correspondence, and other documents.

(e) Please provide the particulars that demonstrate whether and to what extent the call carrying and data capacities intended to be supported by the Toronto DAS Network (as originally conceived) differs from the call carrying and data capacities supported by the permanent structures – please include with such particulars all reports, analyses, studies, working papers, memoranda, correspondence, and other documents.

(f) Please discuss the extent to which Public Mobile is currently capacity-constrained in that it is unable to provide call carrying capacity and/or data related services to its current customer base in Toronto.

i. Please describe the extent to which such capacity constraints can be resolved by utilizing a six-sector deployment.

ii. Please discuss the extent to which such capacity constraints can be resolved by utilizing a 4G deployment.

iii. Please discuss the extent to which such capacity constraints can be resolved by utilizing a six-sector 4G deployment.

(g) Please provide the particulars that describe the costs (both initial costs and on-- going monthly expenses) Public Mobile would have incurred for its part in the construction of the Toronto DAS Network had it been completed (as originally conceived), including all reports, analyses, studies, working papers, memoranda, correspondence, and other

documents. Please compare such costs to the costs (both initial costs and on-going monthly expenses) Public Mobile has incurred to build and support its macro site based network.

Response:

(a) Ms Lemay has no knowledge of the requested detail. See also CANDAS(THESL)-50(a).

(b) It is public knowledge that Public Mobile launched its service in Toronto on May 26, 2010 as per the Press Release available at http://www.publicmobile.ca/pmconsumer/pressReleases/index?idx=22. This Press Release does not state that mobile coverage was provided using a macrocell network. . See also: CANDAS (THESL)-50(d).

(c) The number of macrocell sites is public knowledge and has been referred to directly by THESL in THESL's evidence and in responses to interrogatories. Ms Lemay does not understand why she is being asked this question regarding Public Mobile's macrocell sites in Toronto. Ms Lemay has no knowledge of the requested details on these sites. See also: CANDAS(THESL) REPLY-32 and CANDAS(THESL)-50(g) and 50(h).

(d) Ms Lemay has no knowledge of the requested detail. See also: CANDAS(THESL)-50(f) and 50(l).

(e) Ms Lemay has no knowledge of the requested detail. See also: CANDAS(THESL)-50(f) and 50(m).

(f) Ms Lemay has no knowledge of the requested detail. See also: CANDAS(THESL)-50(f) and 50(n).

(g) Ms Lemay has no knowledge of the requested detail. See also: CANDAS(THESL)-50(f) and 50(e).

Question:

32. *Reference: Lemay Reply Evidence, p. 16 - 19*

The evidence implies that sharing of towers and antenna sites is difficult in and around Toronto. Please separately identify the number of locations at which Public Mobile's macro cell towers/antennas are located as well as the percentage of those locations which are shared with other carriers.

Response:

Ms Lemay has not conducted an analysis of the antenna sites of Public Mobile in Toronto for the purpose of her Reports in this proceeding. See also the response to CANDAS(THESL) REPLY-31(c) above.

Question:

33. *Reference: Lemay Reply Evidence, p. 16 - 19*

The evidence implies that there are very few third party entities who lease towers, rooftops and/or other locations at which wireless antennae may be located. Please separately identify each location at which Public Mobile's currently operational antennae equipment are located and, for each site, please provide the following:

(a) location address,

(b) type of location (tower, rooftop, utility pole, streetlight, traffic standard, municipal furniture, other (specify),

(c) indication as to whether Public Mobile, or an affiliated corporate entity or person, owns the location,

(d) property owner if other than Public Mobile or an affiliated corporate entity or person,

(e) antennae height(s),

(f) equipment installation date(s),

(g) antennae in service date(s), and

(h) list of other carriers known to locate antennae equipment at that same location.

Response:

Ms. Lemay has no information in her possession regarding the location of antenna sites of Public Mobile in Toronto. See response to CANDAS(THESL)–50(b). In order to be included in the Industry Canada Spectrum Direct database, all antenna locations must be reported by mobile carriers and these locations are in turn included in the Industry Canada Spectrum Direct database. This database does not contain information, such as the type of location, the owner of the property or the equipment installation dates. Ms Lemay has not researched all Public Mobile antenna sites for her Reports as this is not relevant to the issues at hand.

Note that the term "third party" as used in the LYA Reply Comments at Section 3.3, entitled, "The Canadian wireless siting market is characterized by very little third party owned tower sites" at pages 20-21, refers to companies such as U.S.-based ATC, Crown Castle and SBA that own tower sites as opposed to towers being owned directly by mobile carriers and as opposed to buildings or other structures owned by various property owners.

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