RESPONSE TO UNDERTAKING
INFORMATION REQUESTED BY
THE CANADIAN RADIO-TELEVISION AND TELECOMMUNICATIONS COMMISISON
(Transcript Ref: Vol. 2, paras. 1701-1703)

Q. Suggest a reasonable projection for growth of demand over the next three to five years and comment on the relationship between such forecasts and rate setting exercises.

A. Vice-chairman Katz commented on the connection between rate-setting exercises and growth projections and requested comment on what a reasonable future growth projection may be for the next three to five years.

CIPPIC cannot with any degree of certainty put forward a clear projection of traffic growth for the next 3-5 years. While we believe current estimates for near-term growth are in fact on the *low* side, it has been our position in this proceeding and in previous proceedings that no one can accurately predict future network traffic growth. Indeed, annual traffic growth rates are generally indicative of *past* investment levels, network provisioning costs are not driven by traffic growth predictions but are reactive, as explained below.

To begin with, current annual traffic growth rates have been dropping. From a historical average of approximately 100% annual growth, to a more recent rate of 43% annual growth (2005-2008),[1] to, for Bell, an even more recent rate of 38% in 2009 and 32 % in 2010.[2] In recognition of this many industry projections of future growth have been adjusted downward. CISCO, for example, recently reduced its projections from 46% CAGR 2007-2012 to 34% CAGR 2009-2014.[3] At 34%, this likely underestimates network growth over the next few years. However, there is no

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[1] Telecom Regulatory Policy CRTC 2009-657, *Review of the Internet Traffic Management Practices of Internet Service Providers*, October 21, 2009, CRTC Reference No.: 8646-C12-200815400, <http://www.crtc.gc.ca/eng/archive/2009/2009-657.htm>, para. 5.
[2] Bell, "Initial Comments to TNC CRTC 2011-77", March 28, 2011, para. 33.
[3] See CIPPIC/OpenMedia.ca, "Initial Comments to TNC CRTC 2011-77", March 28, 2011, para. 11.

indication that we are about to face an explosion of traffic growth. Further, it is important to note that network costs are largely driven by peak period usage and peak period traffic rates are growing at faster rates than off-peak, as noted by Bell in its opening comments to this proceeding:

> **Because congestion is, by definition, at its worst during the peak usage period and investments necessary to relieve congestion must target usage as measured during the peak period, the most important measure from a network provisioning standpoint is that of the peak period. Given the nature of video traffic, it is unsurprising that peak traffic is actually increasing at a much higher rate than global traffic. In fact, the Companies' peak traffic increased by 55% in 2009 and 61% in 2010.[4]**

CIPPIC does not dispute that these growth rates are real and require real costs in investment. However, it is our view that these growth rates are being met by steady and declining rates of annual investment at a time when revenues are increasing. Figure 2 on p. 11 of our reply comments, reproduced here for convenience, demonstrates the relationship between incumbent TSP CAPEX (1.6% CAGR 2006-2009), Bell CAPEX (1.0 % CAGR 2006-2010) and traffic growth levels (45% CAGR):

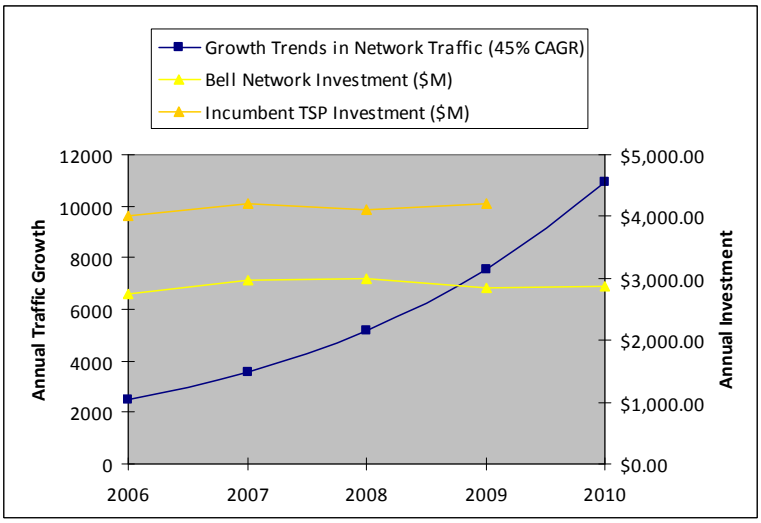

Figure 2: CapEx v. Traffic Growth

Incumbent TSPs and Bell in particular have succeeded in meeting current modest traffic growth levels without any need to increase investment. Indeed, it is notable

[4] Bell, "Initial Comments to TNC CRTC 2011-77", March 28, 2011, para. 33-34.

that TSP incumbents and Bell in particular have succeeded in building new high speed access services while meeting steady traffic growth levels and without any dramatic increase in annual wireline investment levels.

While the CISCO estimation of 34% CAGR 2009-2014 traffic growth may ultimately prove to be on the low side, there is no justification for policy decision-making based on an expected oncoming explosion of traffic growth due to video. Dr. Odlyzko explains:

> **Historically, over the last decade and a half, there have been several waves of concern that various disruptive innovations would swamp the Internet and require the introduction of intrusive control mechanisms on customer usage. One such wave came with the arrival of graphics-rich Web browsing. Another came with the appearance of Napster, the first P2P program, which caused a surge in music traffic. Yet in all cases, the actual rise in demand was far more modest than had been feared, and was accommodated largely through deployment of improved technologies, supplemented sometimes with some simple and neutral traffic throttling mechanisms. And this was in an environment where traffic was still growing at 100% per year. Today, growth rates are considerably lower and rapid technological progress is continuing.**[5]

While *ex post* annual growth rates are, to some extent, indicative of provisioning costs, CIPPIC has repeatedly warned against using relying too heavily on such projections as a basis for forward looking policy-making (see, for example, our reply comments to this proceeding, April 29, 2011, paras. 11-15 and our initial comments to this proceeding, March 28, 2011, at paras. 10-14).

It is notable that actual incumbent provisioning appears to be reactive and not proactive. Bell describes its congestion response processes as such:[6]

> **Congestion can occur on multiple links at any given time. Theoretically, to measure congestion perfectly, it would be necessary to record what is happening at each of the thousands of links in the network in every nanosecond. No systems exist for managing the massive amounts of data that would be required to undertake such**

[5] A. Odlyzko, "Attachment A to CIPPIC/CDM, Initial Comments to TPN 2008-19", February 23, 2009, Telecom Public Notice CRTC 2008-19, *Review of Internet Traffic Management Practices of Internet Service Providers*, CRTC Reference No.: 8646-C12-200815400 , <http://www.cippic.ca/uploads/A-Odlyzko2008-19.pdf>, para. 6.

[6] Bell, "Initial Comments to TNC CRTC 2011-77", paras. 43-45, footnotes included in excerpt, underline is mine.

measurements. As a proxy, the Companies take snapshots as to the level of utilization of each link in their network on a regular basis (i.e. every 5 or 10 minutes depending upon the nature of the link).

It is common industry practice in network management to determine thresholds at which the utilization level in a link has a very high probability of producing negative impacts on end-users (utilization thresholds). If a utilization measurement for a given link exceeds the utilization threshold, there is a very high probability that the link has reached 100% utilization at some point during the interval between the two link utilization measurements and therefore packets were dropped during that period. The utilization thresholds used by the Companies were developed by analyzing the plotted latency data for each type of link in its network. Using this method, the Companies are able to determine the specific level of utilization of a link at which congestion increases dramatically such that it would have a noticeable impact on the user experience.

For example, if a utilization threshold for a given link is 90% and link utilization measurements show a utilization of 85% at 1pm, 94% at 1:15pm and 87% at 1:30pm, due to the sporadic nature of Internet traffic and based on the analysis made by the Companies as noted above, there is a very high probability that the link reached 100% utilization at least once (but probably more) sometime between 1pm and 1:30pm. The Companies actively monitor congested links in order to take appropriate action to resolve the problem. For a link to be considered congested by the Companies the threshold must have been exceeded at least 28 times over the course of 7 consecutive days. The Companies' utilization thresholds are below

Figure 4:
Utilization thresholds for congestion in Ontario and Québec

Utilization Threshold in %	
Link[7]	
DS-3	85
OC-3	95
OC-12	95
OC-48	91
Gig-E	90

Proactive provisioning may occur as well, particularly to supply new speed offerings, to support influxes of wireless traffic on wireline networks, or where new customers are expected. But it seems that the majority of congestion-based augmentation is reactive, not proactive, and as such not guided by annual growth projections.

[7] DS-3 and OC-3 links are typically used to feed DSLAMs. OC-3 links can also be used as small Aggregation links. In the case of OC-12 links, these can be used in the Aggregation Network or in the Backbone Network whereas OC-48 links are typically used in the Backbone Network. Gig-E links are typically used in the Backbone Network or to feed more recent DSLAMs.

This is further reflected in the lack of fluctuations in incumbent CAPEX, which has remained steady since 2006 at about 1.6% CAGR.[8]

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[8] CIPPIC/OpenMedia.ca, Reply Comments to TNC CRTC 2011-77, April 29, 2011, para. 17.