Financing Municipal Broadband: The Vermont Farmer Approach
Or: "Build the Barn You Can Afford"

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Introduction

The "Last mile problem" for broadband has been the subject of enormous discussion in recent years. The US telecommunications system can, perhaps, be likened to a first-class (if overbuilt) interstate turnpike system, fed by local obsolete dirt roads and donkey carts. Much hand-wringing and lamentation have been expended over this state of affairs. The principle carriers (esp. the Baby Bells) have exploited this situation by: a) milking their obsolete copper plant; while, b) complaining that they do not have "sufficient incentive" to remedy the situation by building modern local broadband networks because of dastardly regulations which require them to lease access to their facilities to outsiders (read: competitors). The remedy they propose, not unsurprisingly, consists of removing such restrictions and, if possible, sweetening the pot with Federal money, tax breaks and the like.

But that puts the question backwards: isn't an open access, non-discriminatory broadband network—much like the local "public road" system—what we want for the Nation? Investor Owned Carriers (IOCs) will never provide this (regulations or not) and will resist, almost to the death, any requirement that they do so—as the lamentable history of "unbundling" has demonstrated.

Monopoly systems with Carrier control over content would seem to be a recipe for monopoly rents and censorship. Why would we want to encourage—let alone subsidize—the creation of such a system? Would we want to give private companies the right to own the nation's local road system—and charge monopoly rents to the homes and businesses located on them, as well as restrict who could deliver services over them? Obviously not.

A better solution for telecommunications would be last mile systems which are built and owned by public entities just like public roads are—with completely open access to all at non-discriminatory prices that are based on Public Utility, cost-recovery principles.

One obvious candidate to build such systems is local government. Quite apart from the self-serving ideological objections which the nation's IOCs will (and do) make to such an idea, local governments themselves are also frightened off by the specter of huge costs and fear of the difficulties in operating technically complex networks. In fact, they need not be. The near infinite capacity of modern Broadband technology (especially, but not solely, fiber) makes publicly-owned, open access broadband local networks entirely feasible—both technically and economically. Operating such networks, while it requires care and organization, is not "rocket science" and is no more difficult than many other complex tasks which modern local governments must, and do, successfully undertake.

On the other hand, the consequences for local communities of not having adequate telecom infrastructure are dire and becoming more so—sufficiently so that a number of communities around the nation have swallowed their fears, tackled the problem, and, despite the obstacles, are engaged in building their own publicly-owned and operated local broadband "last-mile" networks.

Burlington is one of these. As it is still "early days", local governments have taken different approaches to the task. The approach Burlington has taken is certainly not the only one—and we would not be so bold as to claim that it is the best. What we can claim is that it has, so far, worked exceedingly well and that it shows every sign of continuing to do so. As such, the experience of Burlington strongly suggests that local governments can build and operate modern open-access local broadband networks which are technically, operationally, and financially feasible—and which provide a hugely valuable infrastructure for the economic, social and cultural development of their communities.

The following paper spells out in considerable detail how Burlington has gone about this task. We have elaborated the practical details in some depth because, as usual, "the devil is in the details". Our hope is that a detailed, practical acquaintance with Burlington's

experience will embolden other towns and cities to take up this important task—and, thereby, help to give America the truly open telecommunications system that it both needs and deserves for the coming century.

Burlington's Telecom Project: Background and History

Throughout the telecom boom of the '90's, as we all know, telecom strategy was dominated by investment bankers allied to consultants and engineers (shall we call it the "ICE" approach?). The target of the sale was the "investor" rather than the customer. The key parts of the game were: a) design a grand(iose?) edifice; b) get enough seed money to begin it; c) stand in the middle of Wall Street and shout "Telecom Project for Sale!"; d) catch the money that would cascade down on you from on high; e) take the money and run.

The result, of course, was a landscape littered with half-baked, bankrupt white elephants, a few rich investment bankers and entrepreneurs--and a lot of impoverished investors and disappointed customers.

Burlington, Vermont is a town of only 40,000—but, as such, is the largest town in the most rural state in America. It is also remote—the nearest city of note is Montreal, Canada. It anchors a modest "metropolitan area" of 140,000 in a state whose per-capita income is in the lower half of the nation. However, Burlington does have important assets—a magnificent setting on the shores of Lake Champlain and at the foot of the Green Mountains, a spirited social, cultural and intellectual life, superb outdoor recreation, low crime and high "quality of life". As such, it is regularly cited in surveys as one of the most livable and attractive towns in the nation. It would, naturally, like to maintain and improve upon these attributes—and the key to this is strengthening its economic foundation. This means attracting, holding and growing its base of knowledge-based and creative industries. Most research shows that the location decisions for such firms are overwhelmingly influenced by three key things: an attractive place to live (which Burlington definitely has), good transport connections (which, with

the rise of BTV airport[1] and I-89, Burlington also has in reasonable measure) and: excellent telecommunications. This latter, unfortunately, Burlington lacks.

Of course, Burlington shares its relatively poor telecommunications infrastructure with a great many small and medium-sized cities and towns around the nation which don't happen to be in or near the major urban agglomerations. Such markets were always at the end of the queue for new investments by the major IOCs. Now, with money especially tight everywhere, the prospect of significant investment in modern infrastructure by the incumbent carriers in towns like Burlington is even more remote. In Burlington the local cable company, Adelphia, is (emphatically) bankrupt. Verizon, the ILEC, is making few (if any) investments in Vermont. On the contrary, it appears to be milking its old Vermont infrastructure for all it is worth while concentrating investment on LD, mobile and urban markets. This is perfectly rational—and if I were Verizon's CEO I would be doing the same thing. But it leaves northern Vermont in general—and Burlington in particular—with a big problem.

In the late 90's Burlington, which is nothing if not an independent and activist community, decided to take matters into its own hands and build its own modern broadband infrastructure. Burlington owns and operates a large electric utility (complete with its own wood-fired generation facility) which has a long and successful track record. The City saw no reason why it could not do the same with telecom. Two citizen referenda (in the face of strong opposition from the local carriers and the Gannett-owned newspaper) strongly endorsed the idea. However, State regulations prohibit electric utilities, including co-ops and municipals, from using electricity revenues/profits for investment in telecommunications. This restriction puts Vermont in general, and Burlington in particular, at a significant disadvantage relative to many other states.

Nevertheless, the City Council charged Burlington Electric Department with the effort to develop a telecom network. In keeping with the Wisdom Of The Times, the electric department was advised by consultants to pursue the ICE strategy and build a massive, universal, full-service, network all at once. The proposed network would have required

[1] Currently the second fastest growing in the USA, served by United, USAir, Continental, Delta and Jet

$30 – 40 mln and a large strategic partner—in keeping with the interests and fee-generating arithmetic of Investment Bankers, Consultants and Engineers. For two years the electric department, on behalf of the City, pursued this strategy but failed to conclude a satisfactory deal.

Fortunately.

Had it succeeded, Burlington would probably now be saddled with an overbuilt system, large debts, a private sector partner whose interests were drastically different from the City's—and who, quite possibly, would now be bankrupt as well. In short, Burlington would probably now be in the same sort of mess that much of the rest of the telecom sector is.

Instead, Vermont level-headedness prevailed and, in 2001, the Mayor and City Council decided to scrap the grandiose ICE approach for something more in keeping with Vermont caution and parsimony. We call this the "Build the Barn You Can Afford" approach. The formula is simple: start small based on guaranteed markets--if all goes well and you make a bit of money, you can build an addition to the barn, install more cows and go on from there….bit by bit, building from within, making sure that each stage of expansion is economically solid before embarking on the next—and never exposing much of your capital. It is slower, no doubt, but it is also vastly safer; and the resulting edifice is solid--deeply grounded in the revealed needs and economics of the customers and community rather than in the imaginations and models of the I's, the C's, and the E's.

The Project Plan

To develop and implement this approach, the project was put under the City Treasurer. The ultimate goal remained a universal full-service network. But the strategy was to break this down into a series of phases, each of which could be: a) closely targeted on

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Blue with numerous daily flights and connections to virtually everywhere.

verifiable markets; b) tightly costed and controlled, and, c) financed independently. This would enable the Project staff to keep the time gaps between incurred liability, expenditure and resulting revenue very short, while minimizing exposure of, and recourse to, the City's general fund and the taxpayers that support it.

Each phase was designed to be self-supporting and self-sustaining. Thus, the City could proceed as far as it wanted to go toward the ultimate goal, knowing that: a) it could halt or pause the project at any time; and, b) no matter where it might choose to do so, the "boat" which had been built up to that point would "float"—i.e. it would provide valuable services and pay for itself without burdening the City budget or taxpayers.

The plan was approved by the City Council on January 21, 2002. Immediately after that, a project group, Burlington Telecom (BT) was created, staffed and set in motion. The approved plan had the following main elements:

1) Phase I: focus on the City government;
2) Phase II: focus on those larger businesses and institutions which could be connected to the network built for the City without significant further network investment;
3) Phase III: focus on extending, and reconfiguring the network to provide service to smaller businesses and institutions;
4) Phase IV: Extend the network to cover all potential users, including residences.

As previously stated, the overall vision remains what it always was: to build a completely open-access, ultra broad-band "public road" system connecting all members of the Burlington Community to each other and to the national/international telecommunications "clouds". This access is to be non-discriminatory and priced on Public Utility principles. The City would prefer that BT confine itself to the provision of the "roadway" alone and leave the supply of actual services to the competitive market place. However, it recognizes that occasions may arise where this is impractical and, in those cases where it proves necessary, BT will step in and provide actual services as well.

The only things ruled out are exclusive agreements with anyone—including (in the event that BT does provide services) the City itself.

Project Implementation

***1) PHASE I*:** focused on the City government. Burlington City government has approximately 500 employees, an annual budget of just under $90 mln per year and 38 significant sites--including public works, water, waste water, police, fire, schools, power generation and delivery, library, parks and recreation etc. Prior to the new project, it spent approximately $380k per year on voice telephony and $30k on data/internet. However, the City was facing a dramatic increase in the latter due to the pressing need to upgrade and integrate its obsolete IT functions. Estimates of the cost to obtain the absolute minimum connections capable of supporting the needed IT upgrades were around $360k per year—and this would almost certainly rise beyond that in the future as needs exceeded the minimal capacity represented by the $360k figure. The challenge for BT, therefore, was to design a network which would save the City enough of these costs to pay for the cost of servicing the debt needed to finance network construction plus operating costs. If successful, such a network would be self-supporting and cost-justified on the basis of the City's own needs-- regardless of what subsequent expansions might or might not be made.

A) Network design: Since the City owned (all or in part) the utility poles and underground duct and since the telecom slump made both material and contractors readily available and cheap, the decision was made for Phase I to be an all fiber network reaching every site with high fiber count (typically 144 strand single mode) optical cable. Network topology would be very flat—with "home runs" from every site back to the hub where they would be run through a level 3 Cisco switch. Simple transceivers would be placed at every site and would hand off Ethernet at whatever speed was appropriate (12 of the sites have gigabit links, the rest have 100mb—but any site can be upgraded easily and cheaply, whenever the need arises). BT would aggregate the (previously dispersed) Internet contracts and bid out for one large pipe whose capabilities and economies would

be passed on to each department. Such a network would be cheap to build and operate, and would service the City's own needs admirably. At the same time it created a high capacity backbone network reaching most of the City—a backbone which could easily be expanded and upgraded to meet almost any future demand that might arise.

Originally, it was intended to connect only the 28 most important City sites. The network design for those sites, involving about 15 miles of fiber cable plus requisite hub and equipment for those sites was costed out at approximately $2.1 mln for everything. In the end, realized economies and efficiencies enabled BT to install approximately 17 miles of cable and connect all 38 sites for this price.

Burlington City government, including school system and the electric department, has about 1000 voice lines of various kinds. After considerable deliberation, BT decided not to purchase a PBX or switch but to bid out for "wholesale switching" services—to be connected to the BT network via a standard Telecordia GR303 interface. Such an approach would save less money on the voice telephony bill—but would involve far less investment, operating cost and risk. At the same time it would also bring control of voice distribution inside the network and make a future purchase of a switch (or change of switching services provider) relatively easy. (The $2.1 mln total cost cited above includes the cost of implementing the voice system.)

B) Financing: In keeping with the philosophy that the telecom project should be self-financing and should put the minimum burden on City taxpayers, it was decided to use a capital lease as the financing vehicle. The facility was concluded with Koch Finance of Arizona, arranged by Advest of Hartford. As a lease, the principal security for the financing facility is the network itself, together with the contract with the City to provide telecom services. The lease does not carry Burlington's "full faith and credit". Instead, recourse is "subject to appropriations". The terms are 15 years @ 5.63%, tax-free.

C) Economics: Annual debt service (interest + amortization) is approximately $260k per year. Steady-state operation of the network (assuming no further expansion) would

cost approximately $150k per year--a total of about $410k per year. On the "revenue" side, the network provides data services far superior to the minimum services which would have been purchasable for $360k per year[2]. For voice, a bidding process involving 6 potential providers resulted in a contract with TelCove (formerly Adelphia Business Solutions) which saves about 30% compared to the previous voice contracts. Thus, conservatively estimated, the network effectively "earns" a minimum (not counting the advantage of having services far superior to those that the $360k would have purchased from outside vendors) of $470k per year for the City—and, therefore, meets the requirement that it pay for itself on the basis of its City government activities alone. In addition the network gives the City a high degree of control over its future telecom costs—something which, with rapidly growing needs, is vital to long term budget stability.

D) Regulation: As a purely City network, the first phase did not enter the regulatory purview. The only complication proved to be, unexpectedly, pole attachments. The City owns 100% of about 1/3 of the poles required and 55% of the remainder—Verizon being the 45% owner of the latter. The City had the option of using the clause in the City's pole-ownership agreement with Verizon permitting it to place wire for municipal purposes[3]. Such a solution would have bypassed any need for pole attachment agreement with Verizon. But it would not have permitted BT to use such facilities to provide communications services to the public in the future. Since it is the City's intent, if possible, to expand the scope and purpose of the network to that of a public carrier, it was decided to bite the bullet early and seek carrier status pole attachment arrangements. Presumably because it foresaw a potentially potent future competitor, Verizon proved to be quite difficult—causing both delay and significant additional costs. In the end, however, the City succeeded in obtaining the requisite agreements.

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[2] . An effort to find out what it would actually cost to purchase the actual services the network provides to the City—in those markets where they are available (which they are not in Burlington) yielded an astonishing number. The cheapest price we could find was that provided as a bulk contract by ATT to the State government of Texas. It costs $9800/month/site—which would amount to an astromical $…..mln/yr for Burlington. Needless to say, such a sum would be completely beyond the capacity of the City to even contemplate.

[3] In fact, on many of the poles the remains of an old, now defunct open-wire fire alarm system were still attached.

E) Implementation: Although Burlington does not qualify for RUS (Rural Utilities Service) funding, BT decided to utilize RUS contracts, standards, bidding methodology etc. This greatly simplified the process since all aspects have been fully worked out over many years and are highly familiar to the industry. Communication Consulting Services of Pennsylvania, a well established firm specializing in small and rural telcos, was contracted to do the detailed engineering, conduct the bidding, oversee the construction, provide all documentation etc. Syracuse Utilities of New York won the contract for cable construction, but has used a local Vermont subcontractor, Eustis Cable to assist it. Financing was finalized in May 2002 and, with bidding and contracting already complete, construction began immediately. All contractors performed exceedingly well. The first target were the 11 schools who were implementing a major IT upgrade and had to have the new network up and running well before the beginning of the new school year to be able to implement and test the new systems. The drop-dead date was July 7. This deadline was met and the School implemented their IT system on time. Since then, the remaining City sites have been brought on line at the rate of about one every two weeks. The network is now effectively complete and has been providing data and Internet services virtually without hitch. Voice services are currently being migrated over, department-by-department. Again, the schools went first, and were cut over at the end of June. The remainder of the City government will be fully migrated by the end of September (unless there is a Verizon strike, which will delay matters for a time).

2. PHASE II: The first phase is nearly complete and the data aspect of its operations fully proven and stabilized, and the second phase is about to begin. In keeping with the cautious, one-step-at-a-time philosophy of the project, this phase is designed to connect a relatively small group of businesses and institutions to the network and provide them with the same data services that the City receives. Any customer so connected will also be able, should they and the carrier wish, to purchase voice services from TelCove to replace Verizon and have these services delivered over the City's fiber local loop.

A) Market: The targeted final customers for Phase II are businesses and institutions which : a) are physically close to the existing cable infrastructure; and, b) have sufficient need for high speed telecom service to utilize what the BT network provides. The total number of such customers is limited to that which can be accommodated by the flat, "home-run" configuration of the network without having to make significant new investments beyond the actual costs of the hook-up—estimated to be approximately 40 (assuming reasonable geographic distribution). The services which will be offered are: 1) Ethernet connectivity at any desired speed within the City and to the BT hub (where one carrier has a POP, one more is in the process of establishing one and more are anticipated in the coming year[4]); 2) Co-location at the BT hub of servers and other equipment (e.g. for data back-up); 3) shared Internet services based on aggregating needs of the new customers with that of the City and purchase of an appropriate pipe for the number and scale of customers.

About 50 potential customers were identified that were thought to meet the first two criteria. BT staff, together with the City's Economic Development staff met with about half of these potential customers to determine the level and nature of possible interest, the pricing constraints etc. Approximately two thirds of those with whom discussions were held indicated strong interest in the services and the acceptability of the rough pricing proposed.

Upstream: A number of LD carriers, ISPs and other service providers have also been approached regarding: a) co-locating in the BT hub; and, thereby, b) utilizing the BT network to approach downstream customers themselves. One such carrier is already co-located (TelCove—as a result of the voice contract and the GR303 interface). Three more have expressed interest.

In this category discussions are also underway with two wireless service providers. The concept is that one or more such carriers would co-locate equipment in the BT hub. BT would assist in obtaining antenna sites (e.g. on City buildings, all of which are reached by the BT network) and then use the BT network to back-haul traffic. Such providers would

[4] BT's hub is located across the street from the Verizon CO. If customer demand justifies the cost, BT

utilize this infrastructure to provide WiFi hotspots as well as higher speed (and more secure) data links to businesses that are not reached directly by the BT fiber.

B) Network design: Phase II requires no significant change to the existing network. Customers will, in effect, appear to the network as though they were simply additional City sites.

C) Regulation: To offer service to the public requires a Certificate of Public Good from the Vermont Public Service Board. Application for such was filed on April 17. Shortly thereafter the division of the State Administration responsible for Telecom policy recommended to the PSB that the CPG be granted. On June 18, in Order CPG-743C, the PSB granted Burlington the requested CPG.

D) Economics and Finance: If all of the potential 40 places were spoken for, BT estimates that it would cost about $500k to hook them up. Allowing for contingencies and for several special projects (e.g. with the local teaching hospital) a target of $750k in new financing is being sought. For such a modest sum, the City has decided to approach local Vermont Banks. In keeping with the overall Project philosophy, this second facility—like the first—will not carry the City of Burlington's full faith and credit but will be secured by, in effect, a second mortgage on the network plus a "subject to appropriations" backstop. The intent is to draw down against the committed sum only as/when individual customers sign contracts. The pricing of the contracts is calculated to provide full coverage for incremental debt service, incremental operating costs plus a contribution to the cost and operation of the main backbone network. Thus, each tranche will be self-financing almost as soon as it is drawn. The facility will remain open for a year, during which time payment will be of interest only, and only on the drawn amounts. At the end of the year any undrawn amounts will be cancelled, and full servicing of principal and interest will begin.

Eight local banks were approached with the proposal. Discussions and negotiations are expected to be concluded soon. Marketing will begin shortly thereafter. (The first two

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can easily establish a POP or other interface with Verizon.

customers have already signed up, prior to any marketing effort.) Implementation is expected to begin seriously in mid-August and ramp up during the fall, just as the voice migration project is winding down.

3. ***PHASE III*:** Expand the network to serve multiple small businesses. This phase will require a substantial change is several aspects of BT's operation.

The most important change will be structural. At this point, the decision to go forward will trigger pressures to reconstitute BT as an independent corporate entity—wholly or majority owned by the City, to be sure, but operating under normal corporate law and constraints. Neither the final decision to do this, nor the exact form of such incorporation have been made; nor has the question of whether to permit outside equity participation (and, if so, in what manner). The principle pressures to incorporate are two: a) the desire to put still further distance between the City taxpayers and the Project by making BT an ongoing business capable of raising finance on its own without any form of recourse to the City; b) the preference of the regulators for a clean financial/transactional boundary between the finances of the City and that of a BT which may easily become one of the larger telecom carriers in the State.

The second important change is technical--the need to reconfigure the network by adding multiplexing technologies in order to accommodate more customers than the initial "flat, home-run" design can handle. At the same time, it will be necessary to rethink the current all-fiber approach—especially by considering the role that wireless could play in reaching certain customers and providing specific types of services that are not efficient for fiber. (Obviously, the success or otherwise of any wireless pilot under Phase II will be an important consideration.) Both of these technical changes will add to the complexity of the network—and the need for expertise. In keeping with BT's cautious philosophy, any such changes will be made slowly and carefully with ample time for trials, pilot applications, etc.

A third important change will be the need to introduce a formal "back office" aspect of the operation. Until this stage, the need for "administration"—formal processes for provisioning, billing and customer care,etc.-- has been minimal. With only one customer (Phase I) or only a selected few large customers (Phase II), a limited range of products and a simple network, administration can be, and has been, handled in a relatively informal manner. However, no matter how much the network grows, it remains the intention of the City to concentrate on basic connectivity while leaving the provision of final, and "value-added" services to the private sector (always, on a open-access, non-discriminatory basis). Since it is in the arena of final services that the greatest need for complex provisioning, billing and customer care—not to mention marketing—is concentrated, BT expects to be able to keep its own administrative systems relatively lean. The business model BT is working with involves service providers (ISPs, CLECs, LD companies, Wireless providers etc.) doing most of the active marketing to final customers. Once they make a sale, they will request a hook-up by BT. This is what such providers do now—except that they have to request a copper UNE from Verizon for the final mile. BT will provide an alternative—far superior in quality and capability. Since the customer can then use this connection to obtain many other services besides those of the original marketer, BT would bill the final customer—but only for the pure hook-up and connectivity. All services utilizing this connection would be billed by the service providers. Of course, customers may come directly to BT of their own accord, request, and receive a hook-up. But BT does not expect to engage in significant direct marketing efforts on its own—and, therefore, does not expect to incur the expense of building and managing a marketing department and sales force.

Physical expansion of the network will be carefully broken down into smaller steps: neighborhood by neighborhood, focusing on the densest groups of potential business customers and easiest connections--with each step secured before the next is attempted. Financing will be designed to match this program and may be expanded to include third party equity or quasi-equity mechanisms if these offer attractive opportunities.

4. *Phase IV*: Expand the network to be universal and reach all customers: residential, business and institutional. This phase will, operationally, not involve a major break

from the previous phase—rather a continual expansion of Phase III will "morph" into Phase IV when it is finally decided to extend the network to any customer within Burlington, business or residential, who wants it.

The long term future

Assuming BT actually expands to, and through, Phase IV, what would the likely entity that would result look like?

Burlington City: Burlington has approximately 16,000 households and 2,000 businesses/institutions. Many of the former are passed by Adelphia's cable system, most of which is conventional fiber/coax hybrid. Customers get the normal range of CATV services plus "high-speed" internet via the normal cable modem. TelCove provides voice telephony over its former parent's cable plant, but generally offers this only to businesses. It is also engaged in an extended negotiation/dispute with its former parent over the division of ownership of this cable plant. As a voice provider to large customers, TelCove is making significant inroads on Verizon and has a generally good reputation. By contrast, customer attitudes toward Adelphia's CATV and internet services are less positive. BT's FTTH network would provide a technically superior local access path compared to both Adelphia's network and Verizon's copper. Most important, BT would permit *any* service provider to utilize it. Thus, in principle, residents and businesses could have access to several providers of every form of service--CATV, internet, VPN, voice, and all the permutations thereof--all of which would be delivered over the same BT network at cost-recovery based Public Utility prices. In this scenario, it can be expected that a large percentage of Burlington's residents and businesses would choose to get the BT fiber into their location.

Experience in other communities has shown that a new conventional overbuild can usually expect to get 25% of the locations, even without the advantages which BT would have (the generally positive attitude toward the City and the ultra-high capacity, open access characteristics of the network). Still, if BT only got 25%, that would give it 4000

homes and 500 businesses. In fact, penetration is likely to be significantly higher—possibly approaching 100% eventually. Given that the BT network will have practically limitless potential capacity, would be open to any service provider, and would be priced on a pure Public Utility cost-recovery basis, it is difficult to see why anyone would wish to build a second overbuild: any service provider could reach any customer over the BT network more easily, openly and cheaply than any alternative.

BT's network, should it reach this stage, can be expected to ultimately cost, cumulatively, something like the original estimates of $30 – $40 mln to build—but will have got to that sum by a very different route and will have, therefore, a very different portfolio of liabilities. These will be mostly long-term debt at relatively low rates (no junk bonds here!) and little (if any) common equity other than that held by the City (some of which will be internally generated by BT itself). None of whatever third party equity there is will be venture capital! Revenues of such a network (assuming BT is largely successful in sticking with the pure provision of transmission infrastructure and staying out of services) are likely to be in the $8 – $15 mln per year range. Operations, again assuming concentration on underlying infrastructure and judicious use of contracting and out-sourcing, should be quite lean—perhaps requiring no more than 20 full time employees.

Outside Burlington: As previously stated, the problem of poor telecom infrastructure and low investment by the incumbent carriers is endemic throughout much of Vermont.[5] It is quite possible that other Vermont public entities: e.g municipalities, co-op electrical utilities etc.[6] will attempt to respond to the widespread problem the way Burlington has—by taking matters into their own hands. Conversations are already beginning to take place—some under the auspices of the State government—about possible alliances between these entities in order to share resources, aggregate funding requests (e.g for

[5] The exceptions are the franchise areas of several strong progressive independent telcos, like Vtel and Waitsfield/Champlain. These companies have been far more aggressive and successful in upgrading the infrastructure in their areas than Verizon has. Unfortunately, most of Vermont is in Verizon's territory. And, of course, even in the independent areas the new infrastructure is not available on a completely open-access basis.

[6] Especially those in areas served by Verizon. Some of Vermont is served by local independent telcos, several of which have been much more aggressive and successful in delivering broadband connectivity to their customers.

RUS funds), provide wide-area connectivity etc. Burlington has been active in these discussions and can be expected to continue to be so. Where these developments will lead, in practical terms, is not clear at this time. But it is likely that they will lead somewhere and, when they do, Burlington is likely to be a significant player and partner in whatever develops. Thus, it is only a little far fetched to envision the possibility of a more or less loosely allied network of public, open-access broadband networks slowly stretching across large parts of the entire state—and, who knows?—someday over the nation.

Wouldn't that be a fine thing!!

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RESUME (Brief Summary)

Born: December 11, 1941 New York City

Education: Ph.D. (Economics), Cambridge Univ, England, 1972
B.A. (History), Brandeis Univ, Mass. 1963

Professional Experience: summary

4/01 – present:	Director, Burlington Telecom Project
11/99-2/01:	Deputy CEO, TWRS (Dept of Energy project to clean up the Hanford Nuclear Weapons Site, Washington state)
9/98-11/99:	Senior Advisor to Chief Financial Officer, US Dept. of Energy
9/97-9/98:	Consultant (clients included: World Bank, a major Israeli company, DOE)
4/94-9/97:	CEO, Central European Telecom Investments Ltd. (CETI)
5/85-4/94:	Senior Economist & Senior Project Manager, the World Bank
5/76-2/85:	Chief Economist/Deputy Staff Director for Commerce Committees of the US Senate and House of Representatives.
6/73-5/76:	Research Director and Chief Economist, UAW
9/70-6/73:	Prof. Of Economics, Durham U. & Oxford U., England

References, publications, honors etc. upon request.

Professional Experience: salient details

Deputy CEO, TWRS Project: Project averaged approx. $400mln p.a. during TN's tenure. TN was the sole Deputy CEO. He had full line responsibility for all aspects of the project except technical execution (i.e. finance, budget, HR, govt. & public relations, admin, etc.)

CEO, CETI: CETI was a Venture Capital Operating Company specializing in start-up telecom companies of all sorts (e.g. telephone, data, CATV, paging, mobile etc.) in

Central Europe. The company started with $42mln, ¼ of which came from the World Bank. During TN's tenure it invested $35 million in 11 companies (21, counting subsidiaries) in which it exercised a direct, active management role. At the end of TN's tenure the portfolio was independently valued at $100 mln, yielding (when timing of investments is accounted for) an ROI over 60% p.a.

Senior Economist/Project Manager, World Bank: TN specialized in Telecom (though he did some work in the Power area). During his tenure, TN was responsible for creating and managing 7 major projects (6 in telecom and one in the electronics industry) involving over $700mln of the Bank's funds. (With syndication, the projects involved approx. $2.6bln). In these projects, TN, as the representative of the principle financier, exercised a major, active management role including project policy, design, financing, administration and execution. In addition to managing the above projects, TN was one of two senior economists responsible for developing the World Bank's policies regarding the telecom, electronics and IT sectors. He also participated in teams working on other projects, notably regarding electric power.

Chief Economist/Deputy Staff Director, US Congress Commerce Commitees: In these positions (with the Senate from '76-80, House 80-84), TN was responsible for the substance (as opposed to the legislative technicalities) for all matters before the Committees. Many of these matters were handled by various specialists on TN's staff. However, TN's own specialties were Telecommunications, Energy&Power, and International Trade. During his tenure, Telecom issues were extremely important in Congress and fell within the purview of the Commerce Committees. Thus, in his role with the Committees, TN was the principle and most senior Congressional Staff member dealing with Telecom issues.