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HFC CABLE SYSTEM REVIEW

PREPARED FOR THE
TOWN OF MOORESVILLE, NC

REPORT DATE: AUGUST 13, 2007



ICON BROADBAND TECHNOLOGIES

Transmittal Letter

August 13, 2007

Ms Maia Setzer
Director of Administration & Finance
Town of Mooresville
P. O. Box 878
Mooresville, NC 28115

Subject: Review of HFC Cable System

Dear Ms Setzer:

Attached are the results of our review of the financial model and associated documents relating to the purchase of the formerly Adelphia cable system in Mooresville, Davidson, Cornelius and surrounding areas.

Please call me if I can answer any questions or be of additional assistance. Thank you for allowing us to help you with this matter.

Sincerely,

Michael Bowers
President
Icon Broadband Technologies



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Executive Summary

In response to your request, Icon Broadband Technologies (IBT) conducted a review of the financial model related to your proposed purchase of the former Adelpia cable system in Mooresville, Davidson and Cornelius (the Consortium).

In furtherance of the requested task, the following work has been completed:

1. A review of the expected costs to upgrade the existing hybrid fiber coax (HFC) cable system;
2. A review of the expected costs to operate and maintain the HFC system
3. A review of the expected costs to extend cable systems beyond the current service territory using an all fiber optic cable fiber-to-the premises (FTTP) network;
4. A review of the assumptions concerning the expected growth rate in homes passed within and around the three communities;
5. An examination of the expected market penetration for services within the expected service territory;
6. An examination of the competitive environment around the three communities and the potential for impact on the market penetrations;
7. A general review of other model assumptions that would impact a successful financial deployment, and
8. Testing of the sensitivity of the model to changes in market penetration.

The evaluation was based on information provided by consultants Doug Dawson with CCG, David Randolph with Columbia Telecommunications Corporation (CTC) and independent research by IBT. Generally we were provided with a financial model of operations, and testing and inspection related information on the existing HFC system. No "on-the-ground" evaluation was made of the existing system or outside plant.

Based on the work completed to date, our findings are as follows:

1. The costs of upgrading the existing plant from a 625 MHz HFC system to an 860 MHz system are reasonable as the system was described in the documents provided.
2. The staffing anticipated (through Bristol Virginia Utilities Board) is adequate for proper operation of the system.
3. Expected growth rates in homes passed is in line with what has been observed within the Consortium communities within the current decade.
4. The estimated costs for adding new customers outside of the existing system footprint (all fiber, FTTP customers) are reasonable for new construction in new subdivisions.
5. Estimated market share for video customers in new and existing territories are reasonable for an incumbent cable company not subject to competitive pressures other than direct broadcast satellite (DBS).
6. The penetration rates estimated for business customers are rather conservative, particularly in early years.



7. The financial model does not account for upgrades to the existing HFC system subsequent to those done at time of purchase of the system.

Two of the seven items, in particular, can have potentially negative effects on the model (numbers 5 and 7 above). The first deals with competition from other incumbent providers. Consortium areas include voice providers Windstream Communications and AT&T, cable provider Time-Warner and the DBS providers DirecTV and Dish Network.

Time-Warner has limited capability for increasing competition because of expenditures to purchase the former Adelphia systems and investments on the western US coast. They are unlikely to provide a competitive threat in the immediate future.

AT&T purchased the local exchange carrier (LEC) BellSouth, in 2006. They recently announced an investment of \$350 million dollars over the next several years to upgrade their fiber network in North Carolina. An upgrade of this magnitude could potentially provide FTTP service to approximately 250,000 homes. Specific plans for areas where they might deploy have not been released. AT&T currently serves Cornelius and Davidson as the incumbent phone provider. Their FTTP product, U-verse, will utilize an all fiber passive optical network (PON) in greenfields comparable to what the Consortium plans to deploy in new subdivisions. They also have products designed for existing service territories which are in some ways superior to an upgraded HFC system. Again, the timetable for deployment is unknown.

Windstream Communications, with over three million voice customers nationally, offers bundled services which include Dish Network satellite TV in combination with their voice and DSL data services. They have no currently announced plans for providing FTTP services.

Of the five providers, AT&T potentially poses the greatest competitive threat. Should they aggressively counter the Consortium plans by introducing a FTTP network in greenfields in northern Mecklenburg County, they would likely reduce the take rate in new subdivisions substantially.

The second item (Number 7) deals with necessary upgrade costs to the existing portion of the purchased plant. HFC systems are traditionally rebuilt on an approximately six to eight year cycle because of inadequate bandwidth as new customers are added, as higher bandwidth applications become available, and as the outside plant ages. The initial rebuild anticipates reducing the number of customers per node (increases bandwidth available), but the model also anticipates a three percent growth rate per year gradually eroding this benefit. Competitive pressures will probably force changes, which will consume the additional bandwidth gained by an upgrade from 625 to 860 MHz (Table 2). Additional bandwidth will be consumed by increases in the number of Internet customers and an increasing use of bandwidth per customer over time. As bandwidth use increases, either more bandwidth must be made available or customers will experience decreasing performance (slower access speeds). This should be budgeted for at least the same level as the current upgrade. No provision was made for this upgrade in the current model.



Review of Assumptions

1. Consortium Growth

One of the major assumptions in the Consortium financial model is the assumption of six percent residential growth over the term of the model. The State of North Carolina (<http://demog.stat.nc.us>) publishes municipal growth both from the standpoint of overall growth, as well as the portion which occurred within the original city limits and the portion annexed into the community. Statistics (Table 1) published for the current decade indicate an average growth rate across the communities of approximately 5 percent. Longer term population estimates (2010 to 2020) are available for both Mecklenburg and Iredell Counties which project growth within the existing county boundaries continuing at a brisk rate (2.2 percent).

Table 1: Population Growth During the Current Decade								
Community	Population					Land Area (Sq. Miles)		
	July 2005	April 2000	Total Growth	Pop. Annexed	Urban Growth	2000 Limits	Annexed 2000-2005	2005 Limits
Mooreville	23,125	18,823	4,302	2,061	2,241	14.7	4.1	18.8
Cornelius	16,856	11,969	4,887	2,264	2,623	8.5	1.7	10.2
Davidson	8,165	7,139	3,093	73	1,652	3.0	1.9	4.9
Total	48,146	37,931	10,212	4,398	6,533	27.01	6.42	34.42

The current growth rate has averaged over three percent within the existing community boundaries (2000 census) and well over two percent additionally based on annexations outside of the 2000 census boundary areas. Only the low population within annexed territory within Davidson reduced the total to less than six percent. At the current rate of growth, the three communities would nearly triple in physical size within the bond period. Other data for the counties as a whole predict continuing rapid growth during the period 2010 to 2020. The growth assumptions used within the financial model are not unreasonable.

2. Upgrade Costs

Hybrid fiber coaxial cable systems work in the following manner. Fiber optic cable carries the video, data and voice signals from the central office or headend to nodes, each one of which serves a group of customers within a common geography. The node, which is electrically powered, converts the signal from a high frequency light wave to an electrical signal. The electrical signal travels from the node along copper, shielded cable called coax connecting to each home receiving service in the area. The information is carried in



frequency bands or channels, traditionally 6 MHz wide. Each band can carry one analog television channel signal. The bandwidth required for digital television channels, data and voice signal vary based on the technology utilized. Commonly, approximately ten standard definition cable channel signals, two high definition cable signals (HDTV) or 30-40 Mbps of data can be transmitted over a single 6 MHz channel. The wider the total bandwidth available, the more information or cable signals that can be transmitted. The fewer customers on each node, the more bandwidth that is available for each user on the node. HFC cable was originally designed to send information only from the headend to the end user, but there is limited upstream bandwidth for data and telephone connectivity in the upstream (user to headend) direction (over the 0-50 MHz bandwidth).

The evaluation of the current hybrid fiber coax network (presented in the excel file 2007 Timetable.xls from CTC) estimates that the Consortium will have five hundred miles of outside plant with thirty-three nodes. At the inception of operation the system will average 704 homes passed per mile of which 293 will be subscribers. Mr. Randolph with CTC indicated that this would be a standard HFC upgrade to 860 MHz (from the current 625 MHz). The upgraded plant will continue to utilize approximately ninety percent of the coax currently installed. The model anticipates spending approximately \$2.25 million dollars to decrease the node size and \$6.23 million dollars to rebuild the outside plant (new fiber, replace coax and other changes). This averages approximately \$17,000 per mile to upgrade the plant. While the cost may vary based on the condition of buried coax, similar recent upgrades have been completed by one of the major cable providers for approximately \$12,000 per mile. The monies allocated to carry out the cable upgrade are adequate for the task described.

3. Operation, Costs of Goods Sold, and Maintenance Costs

Operations are to be handled through an agreement with Bristol Virginia Utilities Board (BVUB) wherein all staffing is provided by BVUB. The financial model for operations of the Consortium's system accounts for the fee arrangement for providing that staffing. Initial operations will provide staff both at the BVUB operations center and at the Mooresville headend. Total staffing includes headend technicians and engineers, customer service, network operations, marketing, sales, warehouse personnel and field technicians. A total of forty staff will be added for the two locations. Field operations will not include the installation of new customers which is handled in the model separately as contract labor. The staffing envisioned is sufficient for initial operations. The agreement (as outlined in 2007.07.11 LGC Office Audit Information.xls) also provides for handling customers on a management fee basis. Staffing and management fees account for approximately forty one percent of the total annual cash outlays for existing operations.

The largest single expense for any cable system is the cost of purchasing programming. The programming is purchased on a per-customer basis with some channels bundled into groups. Direct contracts can be entered into between the cable system and each provider of content. An alternative, particularly for smaller cable systems, is to contract through the National Cable Television Cooperative, Inc. or NCTC. NCTC negotiates master contracts which can be entered into by members with less time and expense than by negotiating



individually. BVUB will utilize this method to purchase content for the Consortium. The model envisions (and accounts financially for) twenty four basic channels, forty three expanded basic channels¹, twenty-nine digital channels and forty-six music channels. Additional premium channel content is also anticipated and accounted for financially. An assumption of a five percent annual increase in these costs is included in the financial model, in line with recent cost increases in the industry. The costs utilized for the channel content is based on current NCTC pricing. Content costs account for almost thirty-nine percent of the total operating revenue outlays for the cable system operation.

The remaining twenty-percent of operating outlays consists of much smaller items including advertising and marketing (three percent), billing (three percent) and network maintenance (two percent). None of the amounts appear unreasonable.

4. Market Penetration Estimates

Market penetrations vary by service, territory and type of customer. Actual customer numbers were available from Adelphia setting the starting market penetrations for both video and data services. In the initial service territory, utilizing an upgraded HFC cable service, the residential video penetrations are expected to rise gradually from 38.4 percent increasing by less than one percent per year to a maximum of approximately fifty-two percent of homes passed in 2014 and remaining constant as a percentage of homes passed thereafter. In new subdivisions the take rate is expected to be approximately fifty-two percent from initial deployment utilizing an all fiber optic cable (FTTP) passive optical network or PON. PON systems deliver higher bandwidth per customer than HFC systems with lower maintenance costs for outside plant. Both market penetrations are conservative for incumbent cable providers operating updated systems with no competition other than satellite cable alternatives.

At the start of Consortium operations, residential numbers of Internet customers is expected to be the same as in Adelphia provided market information. The penetration numbers start at approximately forty percent of the video customers increasing gradually relative to video commensurate with a general trend towards higher percentages of the total population taking high speed Internet services. At the ten year point the estimated take rate is forty-six percent of video customers, a not unreasonable market share projection.

Adelphia did not offer telephone service. The Consortium plans to begin offering voice services in the second year of operation. The projected customer penetrations start at five percent of video customers in the second year, increasing by five percent per year to thirty-one percent at year ten. These numbers are probably conservative, particularly given that FTTP customers have shown a strong tendency to purchase multiple services from a single provider. In other locations these customer penetrations have been closer to fifty percent of video (50 percent of customers who purchased video also purchased telephone service).

¹ The basic channels and expanded basic channels are those that can be displayed on a television without a set-top box. These are also analog channels as discussed elsewhere in this document.



Adelphia had very few business customers. The financial model assumes modest penetrations starting in 2008 (first year for voice service); 1.5 percent in the first year of operations increasing five percent per year over the first few years. Penetration rates for data and video or both are somewhat higher. None are unreasonable.

5. Expansion Costs into Greenfields

The financial model anticipates adding about 500 customers per year in new subdivisions. Assumed costs are \$1000 per customer for additional outside plant fiber, \$480 (in 2009) for the electronics at the home, and \$500 for other electronics and materials. The total is in line with FTTP costs in new municipal builds. If homes other than new subdivisions were targeted, there would likely be additional costs per home for installation, premises wiring or additional electronics. The assumed costs for set top boxes were calculated for standard definition television and are significantly low for any customer taking high definition cable (HDTV). The impact on total costs is modest on the order of approximately \$50k to 100k per year over the first years of operation.

6. Competitive Pressures

The primary premise on which a successful Consortium operation is grounded is the maintenance of an incumbent, near-monopoly position in the three communities and surrounding new subdivisions or annexed areas. Should any major cable or voice provider compete within the targeted service territory, it will have a negative impact on the market assumptions upon which this model was based. The Consortium areas include voice providers Windstream Communications and AT&T, and cable provider Time-Warner. Additionally, there are two DBS (direct broadcast satellite) providers DirecTV and Dish Network, both of whom have made strong inroads into many cable markets.

Of the potential competitors, Time-Warner has limited capability for targeting this market because of expenditures to purchase the former Adelphia systems and because of investments they have made on the western US coast. They are unlikely to provide a competitive threat in the immediate future beyond their existing service territories.

AT&T purchased the local exchange carrier (LEC) BellSouth in 2006. They recently announced an investment of \$350 million dollars over the next several years to upgrade their fiber network in North Carolina. An upgrade of this magnitude could potentially provide FTTP service to approximately 250,000 homes. Plans for areas where they might deploy have not been released. AT&T currently serves Cornelius and Davidson as the incumbent phone provider. Their FTTP product, U-Verse, will utilize an all fiber passive optical network (PON) in greenfields comparable to what the Consortium plans to deploy in new subdivisions.

AT&T plans to introduce more limited offerings within existing residential areas. As a transition plan they offer in some markets a bundle of their voice and DSL data service with DirecTV satellite TV service. On a longer term basis they plan to introduce a lower



bandwidth version of U-Verse distributing fiber optic cable into existing neighborhoods using an architecture often called Fiber-to-the-Curb. In many ways similar to HFC, this architecture places electronics similar to nodes near groups of homes. The final connections are made using the existing copper phone lines. Bandwidth of approximately 30 Mbps per home would make this a product comparable to the existing HFC cable system in the three communities. It has the advantage of being able to offer higher upstream bandwidths for Internet users while being more limited in the number of television signals it can deliver to each home. As in the case of their FTTP product, the timeframe for deployment and targeted areas are not known.

Windstream Communications, with over three million voice customers nationally, offers bundled services which include Dish Network satellite TV in combination with their voice and DSL data services. They have no currently announced plans for providing FTTP services.

The final significant competitors in the cable television market are the DBS providers, DirecTV and Dish Network. Fifteen years ago HFC cable systems controlled 95 percent of the multichannel television market. Today that market share has dropped to 68 percent, primarily because of competition from DBS providers. While they are limited in the data and telephone offerings they can provide, they currently have approximately thirty percent of the Virginia market. They took this market share by improving on customer service while offering many more channels than their competition at similar or lower pricing levels. DirecTV, the more aggressive of the DBS providers, will have 100 channels of high definition programming in place by the end of 2007. Currently they provide HD local channels within this service territory.

Of the three providers, AT&T or AT&T/DirecTV marketed together potentially poses the greatest competitive threat. Should they aggressively counter the Consortium plans by introducing a FTTP network in greenfields in northern Mecklenburg County (AT&T alone), they would likely reduce the take rate in new subdivisions substantially. The introduction of their lower bandwidth product or offering in conjunction with DirecTV would pose substantial competition within existing territories. The timing of their entry into the market, however, is unknown and may be a number of years away. DirecTV alone will have some impact on the cable TV market by offering many channels of HD programming. They will likely force an accelerated movement by the Consortium to offer more channels of this type of programming. This can result in the increased use of available bandwidth and substantial costs for new set-top boxes (\$300-\$600 each) and other equipment.

7. Future Upgrades

HFC systems are traditionally rebuilt on an approximately six to eight year cycle because of inadequate bandwidth as new customers are added, as higher bandwidth applications become available, and as the outside plant ages. The initial rebuild anticipates reducing the number of customers per node (increases bandwidth available), but the model also anticipates a three percent growth rate per year gradually eroding this benefit. Of more importance is the trend toward HDTV channels. DirecTV has announced that they will have



approximately 100 HDTV channels by years end. When competitive pressures force comparable HDTV content to be added to the Consortium system, the additional bandwidth required will consume the additional bandwidth gained by an upgrade from 625 to 860 MHz (Table 2). Additional bandwidth will be consumed by increases in the number of Internet customers and an increasing use of bandwidth per customer over time. As bandwidth use increases, either more bandwidth must be made available or customers will experience decreasing performance (slower access speeds). VOD bandwidth usage will likely increase over time as well. Original VOD providers anticipated a few premium channels offering new movies as standard definition signals. The larger cable providers are shifting towards much larger portfolios of content with an upcoming shift to more HD content. Since these signals are sent individually to customers rather than broadcast to all customers, there will be a dramatic increase in bandwidth required.

An alternative to rebuilding the HFC system would be a conversion to a FTTP type system which would have higher bandwidth capability and which would remove the need for future outside plant rebuilding. Using US census Tiger files as a basis, there is approximately 225 miles of roads in the Consortium. At an installed cost of approximately \$35,000 per mile for outside plant (aerial), and an estimate of thirty new customers per mile at \$800 per home served, an investment of approximately thirteen million dollars would be required. Underground services and make-ready issues would likely drive the cost somewhat higher. The funding for neither of these alternatives is included in the current financial model.

Table 2: Current versus Estimated Future Bandwidth Requirements for the Consortium HFC Cable System			
		Current System	With 100 Channels HD and VOD
Product	Channels of Video	MHz used	MHz used
Upstream Communications		0-50	0-50
Downstream Communications			
Analog Video	67	54-456	54-456
Digital, non HD	102	456-516	
	60		456-492
Digital, HD	12	456-552	
	100		492-792
VOD, 10% of concurrent usage		N.A.	792-822
Music Channels		552-558	822-828
High Speed Data (remainder)		558-625 (67)	828-860 (32)



8. Model Sensitivity

Sensitivity equates to risk, and sensitivity of a model is the effect of differences in the model’s performance that would occur if various assumptions were changed. A limited amount of such testing was done for this evaluation. The table below shows the effect of two possible changes—no increase in penetration of customers in the existing areas²; and reduction in the number of greenfield customers. The changes were included for operations over the first five year period. While the performance could be presented in any number of ways, it will be presented here simply as the EBIDTA for each year of that period.

By holding the current number of customers static in the existing territory, the overall performance degrades by an increasing amount over time as the number of lost customers accumulates year by year. The overall effect is relatively small, however, and may reflect the relatively small profit margin on cable customers. It is comforting that a reduction in the growth rate of new cable customers does not destroy the basis of the model.

There was an almost identical effect from removing the FTTP component from the model. This was probably produced because the estimates for number of customers from each effect were identical (equal number of new customers assumed for each of these two effects). In neither case is the loss catastrophic.

Table 3: Effect of Changes to Assumptions on Model Performance					
	Assumption Year				
	2008	2009	2010	2011	2012
Current Financial Model (expanded basic customers)	\$976,091	\$3,540,640	\$4,577,668	\$6,295,711	\$7,329,580
No increase in Current Territory	\$976,091	\$3,377,298	\$4,266,313	\$5,752,458	\$6,445,258
No New subdivision Customers	\$976,091	\$3,376,703	\$4,239,651	\$5,719,309	\$6,512,541

² The number of HFC expanded basic customers is reduced to hold constant over the first five years. The number of new subdivision customers (FTTP) is increases by approximately 500 per year as per the current model.