Summary of Initial Review by Stephen L. Barreca

Newfoundland & Labrador Hydro

2004 Capital Budget Documents

(Revised June 23, 2003)

BCRI Inc. was retained by counsel for the Island Industrial Customers to review and comment on the proposed 2004 Capital Budget documents of Newfoundland & Labrador Hydro (Hydro), specifically in regards to Information Systems and Telecommunications projects. The objective of the review is to determine if the budget documentation contains sufficient information for a regulatory body or intervener to determine the economic prudence of the budget proposal, and to a lesser extent, comment on the economic justification of the major budget projects.

To date, BCRI has reviewed the 2004 budget submission Section A and Section B (starting on page B59) and related attachments. Additionally, BCRI has reviewed Hydro's IT Technical Architecture Strategy report, dated Dec 17, 2001. Due to the very tight time constraints imposed by the 2004 budget approval process, our review is more qualitative and quantitative. There is insufficient time to undertake an in-depth analysis of various budget projects.

We recognize the difficult challenge the Board must overcome. On the one hand, it would serve no one to micro-manage Hydro, and on the other hand, the Board must meet its

legislative responsibility to review and approve Hydro's capital program and provide regulatory oversight. In this review, I strived to avoid second-guessing Hydro's decisions and limit my comments to issues relating to the Board's responsibility for informed judgment.

Summary of Findings

Capital expenditures for Information Systems and Telecommunications (IS&T) projects are a major portion of Hydro's 2004 capital budget. There are 12 separate projects that make up $14M (or 40%) of the $34M total capital program. Some of the 12 projects consist of several smaller related (and in some cases unrelated) capital initiatives.

In summary, I found that the project documentation (including the technical reports) does not provide sufficient detail to support independent evaluation. The projects are broadly described and principally justified via subjective argument. There is little or no objective economic analysis. For the few projects where economic analysis is given, the analysis is often suspect or lacking proper consideration of viable alternatives. For example, none of the projects included the *status quo* alternative in its economic analysis – it is common practice to include an analysis of the cost of maintaining the *status quo* as the base-line alternative for all discretionary projects.

Project Classification & Justification

Hydro's budget projects lack structure and discipline. Initiatives that have significant differences in terms of business need, safely, reliability and/or security are group together as a single project. For instance, the project to replace the Operational Data & Voice networks (pg. B79) combines SCADA needs with voice and other network communications needs. While the proposed solution may or may not be the most prudent (there is no economic consideration of viable alternatives), this lack of structure impairs the ability of independent review, and makes it virtually impossible to evaluate the prudence of the expenditures. Combining critical SCADA functionality with non-critical voice and network needs, without detailed description and analysis, allows safety concerns to carry potentially unnecessary expenditures.

In other instances, routine-type ongoing projects are lumped with unrelated non-routine capital purchases, again allowing prudent projects to carry potentially non-prudent ones. Consider the Application Enhancements project (pg. B60). This project includes three initiatives: 1) an ongoing routine-type initiative – "the unforeseen modification, enhancements & additions to software to address the required changes to business processes"; 2) a somewhat new initiative – "the continuing design, build and implementation to Hydro's Internet/Intranet"; and 3) a non-routine new purchase – "an Enterprise Project Management Software Application". Initiative 2 includes both ongoing routine work as well as non-routine expenditures. Maintaining Hydro's internet/intranet is an ongoing effort, however, implementing enhancements is not. For this project, it seems that initiative-1 is carrying the others. Initiative-1 is a typical routine capital

expenditure which should be funded each year; whereas initiatives 2 & 3 should be funded only after economic justification is provided. In this case, we do not know how much of the proposed $463,200 is for which initiative.

Lumping nonessential spending together with spending needed to support critical business functions involving safety, reliability and/or security creates two problems. The most serious problem with this tactic is not one of economic prudence. The problem is that security and reliability issues are not presented in a cohesive manner conducive of proper consideration and regulatory oversight. For example, there is no single project in the entire budget in respect of which one can conclude that Hydro's 2004 budget adequately satisfies crucial safety and security needs.

A second problem with this tactic is that it circumvents identification and consideration of alternatives. Critical security and reliability concerns must be separately identified, quantified, and evaluated. Without such analysis it is impossible to ensure that safety and security concerns are met, and impossible to evaluate the economic prudence of the expenditures.

Everyone favors higher reliability and safety. We might all agree that it is prudent for Hydro to spend $1M if it increased reliability 10%. What if it cost $50M for a 10% improvement? In that case, if the current reliability were below accepted industry standards or causing undue safety concerns, we would likely approve the project. On the

other hand, if the reliability of the system were currently higher than industry standards, we would likely reject the project as excessive and unnecessary.

Because non-essential expenditures are combined with initiatives involving safety, reliability and security concerns, the responsibility for safety and security shifts from Hydro to the Board. With insufficient documentation regarding the implied risk, inappropriate pressure is put on the Board to approve the budget as is; otherwise the Board could be blamed if any problems were to surface.

More formal classification of budget projects would resolve these problems and enhance the budget approval process. While classifications should be kept to a minimum, they should be sufficient to support the review and approval process. A cursory survey of the capital review policies of other regulatory bodies in Canada[1] shows that most utilize some form of project classification. The most notable, to date, is that of Manitoba. The Manitoba PUB has used the following project classifications:

- **Essential** – projects or acquisitions are those required to meet Government regulations, environmental minimum safety standards, or which are essential to maintain operations.

- **Necessary** – projects or acquisitions are those required to maintain facilities and operations in adequate operating condition to meet anticipated activity levels.

[1] Our findings are attached to this report for the Board's consideration.

Necessary projects would include expenditures for new growth and the normal replacement of equipment that has reached the end of its useful life.

- **Justifiable –** projects or acquisitions are those that improve productivity with a new facility or the upgrade of an existing facility.

Manitoba's classifications are reasonable and consistent with those utilized in the telecommunications industry. Imposing these or similar budget classifications would improve the Board's ability to make informed judgments and mitigate the undue pressure for blanket approval discussed above.

Further improvement in the budget approval process can be achieved by establishing guidelines regarding the economic justification of budget projects.

The standard practice for economic justification is a cost benefit analysis of the viable alternatives. This is typically accomplished using a discounted cash flow model (DCF), whereby future revenues and expenditures are discounted to current dollars. For budget purposes, it is common practice to exclude revenues that are common to all alternatives from the DCF analysis.

An alternative to a DCF analysis is simply a detailed qualitative analysis of customer/business value. This analysis may be limited to just a detailed narrative, or supplemented with historical trends of pertinent factors. For example, the capital budgets

for emergency restoration or other unforeseen events can be fully documented and the budgeted expenditures justified based on past actual expenditures trended forward.

The type of analysis necessary to support budgetary oversight is dependent on the nature and scope of the project, so it is useful to address this issue along the lines of the classifications presented above.

Essential Projects

These types of projects are must do projects. Failure to complete such projects would result in unacceptable safety concerns, non-compliance with regulatory or legal requirements, or pose unacceptable risk to operations or loss of service quality. Where the company has latitude regarding how these projects are accomplished, a DCF analysis of the viable alternatives should be used. Where the dollar values are small or a DCF model is not practical, qualitative analysis may be acceptable.

Necessary Projects

By their very nature, necessary projects are often ongoing. Ongoing normal growth and replacement are likely the bulk of necessary projects, and neither requires DCF analysis for budget approval purposes. An analysis of historical expenditures and retirements along with analysis of company demand forecasts should suffice. Additionally, depreciation studies, which most utilities do on an ongoing basis, can provide reasonable estimates of equipment life cycles and near-term replacement forecasts. This would exclude expenditures for major additions or replacements to the system, e.g. a new power

plant, or new transmission route. Such projects should include an economic analysis of viable alternatives.

Justifiable Projects

These are projects that, while not necessary or essential to the business, add value to the business. Value can be added by improving productivity of workers, decreasing operating cost, increasing revenues, or increasing the quality of service. By their very nature, these warrant a cost benefit analysis; and because these are discretionary expenditures, a DCF analysis should be used. Qualitative justification should be allowed for only small projects or where a DCF analysis is impractical.

Private Ownership of Telecommunications Facilities

Another area of concern is Hydro's strong desire for private ownership of all telecommunications facilities. While private ownership is not part of Hydro's vision or mission statements, the budget documents are replete with statements that clearly establish private ownership as a primary and long-term corporate objective.

Private ownership of communication facilities can be a viable means to an end; but it is not, and should not be, the objective. Like all discretionary expenditures, owning versus leasing should be based on objective analysis of the cost versus the benefits of each project.

Hydro's justification for private ownership is highly subjective. Additionally, as with most projects, communication needs that are critical to the operation and safety of the power system are lumped together with other non-critical communications needs. As submitted, it is not possible to separate the critical communications expenditures from discretionary expenditures within each project.

Hydro's justification for private ownership is based, in large measure, on their critique of common carrier networks. Hydro presents a litany of criticisms, most of which are unfounded and based on uninformed judgment. Consider the two, of many, criticisms addressed below.

- Hydro claims that common carrier networks do not meet their high reliability standards. Unfortunately, the reliability statistics cited appear to be that of a typical public voice network, which is far below that of a carrier's data network and special service circuits. Additionally, examination of the reliability data provided for those communications facilities currently owned by Hydro do not appear to meet the level of reliability they claim to need.

- Hydro assumes that common carriers treat all customers and circuits the same; therefore they conclude that during a communication outage, the carrier would not give priority to restoring Hydro's critical circuits. This is

simply false. Carriers can give priority to critical circuits. In fact, carriers can monitor mission critical circuits.

Hydro's superficial criticism of carrier networks suggests that their private ownership objective has not been fully and objectively evaluated. This casts unnecessary doubt on many of Hydro's IS&T projects.

Another justification for private ownership that is cited on several occasions is the generation of non-traditional revenues through the sale of excess communications capacity. Because of the limited information provided, it is not possible to determine the extent to which these potential sales have influenced Hydro's communications initiatives. This too, casts unnecessary doubt on Hydro's IS&T projects. Consider the Power Line Carrier replacement project (pg. B74):

Much of the PLC equipment was, or soon will be, replaced with new high-speed, IP-capable microwave systems (e.g. SONET OC-3 155Mb/s). While PLC is still a viable and cost effective technology, replacing the older obsolete PLC equipment with new high-tech PLC equipment was not a consideration for much of the network. An economic analysis of this alternative was not performed. To what extent was the decision to replace a significant portion of the PLC system with high-speed IP microwave systems influenced by the fact that the new microwave systems will have marketable excess bandwidth?

Over the last five to seven years, many power companies have expanded into the telecommunications business. With shrinking rate-bases due to over-depreciation and available capital, many power companies actively sought out ways to generate non-traditional revenues. Expanding into telecommunications seemed ideal. Typically the power company began by replacing their internal networks with new facilities that were more marketable (and sized to handle more than their internal needs). With their newfound excess capacity, they entered into the telecommunications business. Some of these initiatives have proven to be marginally successful, many are losers, and the really unlucky ones have been successfully sued by ratepayers for misusing their monopoly powers.

Review of Specific Budget Projects

The results of my review of several of Hydro's major projects are briefly summarized below. These projects are provided because they illustrate some of the concerns discussed above.

VHF Mobile Radio System

This project proposes to totally replace Hydro's existing mobile radio system. The existing system consists of a central switch and 29 repeater sites. The new system would replace the switch and the 29 repeater sites in 2004. Additionally, it is desirable to expand coverage of the system to several new areas. Consistent with the primary directive to own all facilities, the project moves all repeater sites not in Hydro-owned facilities to either existing or newly constructed facilities.

Hydro believes this project to be necessary because much of the equipment has exceeded its expected useful life and some of the equipment is manufacturer discontinued. In addition to age, several other justifications were given, these include: call privacy, private ownership, growth, mobile-data communications, switch redundancy, traffic congestion, high incidences of outages, and additional opportunity for generating non-traditional revenues from sales of communications services. As with all major projects, Hydro cites reliability, safety and security.

In addition to my review of the objective analysis, I found Hydro's subjective arguments for this project to be weak and in some cases inaccurate and misleading. Based on my own experiences studying the life of communications equipment, age alone is not a valid justification for replacements. A large percentage of communication equipment lives far beyond its useful life expectancy. The life expectancy is merely an average. Also, based on the findings of Hydro's consultant, it is not imperative that this system be replaced in 2004. Consider the following observations taken from the consultants report:

- NHL doesn't require voice privacy
- The existing system, for the most part, has operated successfully.
- Unanticipated growth can be handled with additional repeaters on the existing network.
- The existing system is a trunking system; and has the necessary features to perform telephone interface functions.
- The existing system is data capable.
- Mobile data's major application is email; requiring 2kbs.
- Traffic congestion problems have been fixed, and are no longer an issue.

Despite the above observations of their consultant, Hydro's proposal calls for the flash-cut replacement of the existing system. The alternatives considered include:

1. Replacing the entire system now (2004)

2. Replacing the switch now (2004), then replacing this new switch and all other equipment three years later, and
3. Replacing the switch now, then replacing this new switch and all other equipment 6 years later.

The present value of the three alternatives is summarized below:

1. $10.8M
2. $12.0M
3. $12.2M

Alternatives 2 and 3 are not rational. It is not necessary to replace the switch twice within a few short years. The cost to replace just the switch is $1.4M (2004) and is common to all of the alternatives considered. Additionally, the replacement of the remaining equipment and expanding area coverage is common to all alternatives as well. The only significant difference is the timing of the replacements.

It doesn't take a new detailed economic study to realize, that if the switch were replaced just once, alternative 2 would be the most attractive. Alternative 3 would be very close in terms of present worth, but it may delay needed replacements for too long. There are two obvious and viable alternatives that should be considered. These are described below.

A fourth alternative, one that seeks the lowest cost, should be considered. This alternative should 1) replace the current switch in 2004, and, given the above findings of the consultant, 2) replace the remaining repeaters and expand the coverage area over the following 3 to 5 years. Additionally, this alternative should not move the existing repeater sites.

Finally, a fifth alternative should be considered. This alternative should be identical to alternative 4, except that the repeater sites should be moved to company owned facilities. A comparison of alternatives 4 and 5 would give valuable insight into the cost/benefit of private ownership in this instance. At present, we have no way to discern how much of the $10M is needed to move the repeater sites to company owned facilities.

Obviously, adding these two alternatives significantly improves the objectivity of this budget project. Additionally, it would yield a dollar cost of private ownership of the repeater sites that can be weighed against the perceived risks of leaving the sites as is. These two alternatives do not, however, answer the questions as to whether this project needs to be started now. A *status quo* alternative that quantifies the risks would be helpful in this regard.

End User & Server Evergreen Program

This project provides for the replacement of user workstations, servers, operating systems, and PC applications. Replacements are based on a 3 to 5 year life cycle

consistent with the typical equipment life cycles. This project is estimated to cost $2.8M. The description provided for this project appears consistent with the long-term strategy detailed in Hydro's IT Technical Architecture Strategy report.

The long-term plan outlined in the IT Strategy report calls for the implementation of a truly state-of-the-art IT infrastructure. The plan is atypical of large utilities, and more typical of smaller high-tech companies that have intensive processing, reliability, networking, and rapid retrieval storage requirements. Because Hydro is a relatively small company, the step up from modern to state-of-the-art is not overly expensive. Additionally, the IT Strategy report lays out a "long-term" vision and not a firm implementation schedule.

What does concern me, however, is the very high capital expenditure. The project proposes to spend $2.8M in 2004. Considering that Hydro identifies 11 office locations totaling roughly 450 office employees, the 2004 capital expenditures come to over $6,200 per office employee. You could give each office employee a state-of-the-art laptop computer with all the software for $1.35M, add 45 servers divided up between just 11 locations for $0.45M and still have $1M left over to spend. If we were to give 30% of the employees a thin-client device instead of a laptop, as suggested, we would have an additional $0.3M ($1.3M total) left over to spend.

The project does not provide any details regarding what the money is being spent on. It doesn't include any economic analysis (DCF) justifying the expenditure; and no

alternatives are considered. Hydro doesn't provide any historical basis for similar expenditures, nor does it quantify any cost savings. In summary, Hydro is asking the Boards to approve $2.8M on good faith.

Power Line Carrier (PLC)

This project provides for the upgrading of Hydro's remaining PLC. A significant portion of Hydro's PLC system was upgraded in 2003 and a significant portion is or will be replaced with microwave equipment as part of Hydro's high-speed digital microwave system. The cost of this project is $0.4M for 2004, not including the cost associated with the microwave systems discussed below.

No economic analysis is provided for upgrading the PLC systems. Given that most of the PLC has already been replaced or displaced, and given the age of the equipment and the critical nature of the circuits, replacement of the PLC appears to be warranted. My concerns regarding PLC are not the upgrading of this equipment, but rather the timing and the shift to microwave in lieu of PLC, neither of which is objectively quantified.

The evolution of PLC technology has mirrored that of carrier technology first deployed in telecommunications networks in the 1940s. Use of analog carrier in power systems began in the 1950's and has proven very effective for teleprotection and control of power systems. Even today, new generations of analog PLC systems are being introduced.

However, analog PLC's days are numbered. Digital PLC systems are commercially available, and significant research is devoted to improving this technology.

The shift from analog to digital represents a shift from a mature technology, where technological advancements are slow and costly to achieve, to a new technology where technological advancements are fast and accelerating. Early implementations of Broadband PLC will likely be on the market in 5 to 7 years.

Given the high potential of digital PLC technology, Hydro's shift to microware may prove to be premature.

West-East Interconnection Microwave System

This project is described in the Telecommunications Plan but was apparently approved in the 2003 Hydro Capital Budget. It is, however, useful to review some aspects of this project which illustrate points being made in respect to current projects.

This project completes Hydro's cross-island telecommunications network by connecting the West Coast Radio system commissioned in 1999 with the East Coast Radio system commissioned in 2001. The project establishes a high-capacity (SONET OC-3, 155Mbps) radio channel between Energy Control Centre, St. John's and the Bay d'Espoir Hydro Plant. The estimated capital cost is $7,106,500.

As with most projects, justification includes Hydro's long-term objective to reduce reliance of leased facilities and cites various deficiencies in telecom carrier networks, especially Aliant Communications, in addition to reliability, safety and security concerns. Additionally, Hydro cites generating non-traditional revenues from sales of communications services as justification for this project.

The project considered 4 alternatives, with Microwave being the lease expensive.

Alternative Considered by Hydro:

1. Aerial Fiber (ADSS)
2. Optical Ground Wire Fiber (OPGW)
3. Microwave
4. Dark Fiber Leasing

My review and analysis concludes that of the four alternatives considered, Microwave is the least expensive. This conclusion is consistent with Hydro's conclusion; however, other potentially more cost effective alternatives were not pursued.

In its consideration of leasing Dark Fiber, Hydro elects to lease the needed fibers on a monthly basis for $390,000 per month. This is perhaps the most expensive way one could secure dark fibers.

For several years now, the preferred method of securing dark fiber is through an Indefeasible Right to Use (IRU) purchase contract. IRUs are structured such that the purchaser effectively owns the fiber strands and is given full access to the access points (i.e. Remote Terminal sites). The purchaser has complete control of the fiber, thus satisfying Hydro's desire to control its communication facilities. IRU prices per fiber per kilometer averaged $2,494/km[2] in the US in 2000, and prices have dropped considerably in the last two years.

Assuming comparable prices are available in Newfoundland, an IRU for four dark fibers would cost roughly $2.49M. Adding the same cost of electronics, $0.8M, yields a net of $3.3M. This alternative provides for private ownership and control, is significantly less expensive, and provides for unlimited bandwidth.

In addition to my review of the objective analysis, I found Hydro's subjective arguments for this project to be weak and in some cases inaccurate and misleading.

Conclusion

The Hydro 2004 Budget Proposal does not provide sufficient documentation to support independent verification or evaluation. The projects are principally justified via subjective arguments. In those cases where economic analysis is given, often the analysis is suspect and lacking proper consideration of viable alternatives. Contrary to standard

[2] Prices shown are in Canadian dollars. Fiber IRU sale prices typically average less than 180% of the total cost to install the cable on a per strand basis. Thus, it is more economical to purchase IRUs if one only needs a few strands of fiber.

practice, the economic analysis, when provided, did not include the *status quo* alternative. Additionally, in some cases obvious viable alternatives were overlooked.

The budget lacks sufficient structure, discipline and economic analysis to make informed judgments regarding its prudence. Private ownership and the desire to expand into the telecommunications business may have unduly influenced the nature and scope of Hydro's capital program.

The structure of the current budget, its lack of detailed economic analysis of viable alternatives and its over-reliance on security, safety and reliability as justification for approval unduly shifts responsibility in these crucial areas from Hydro to the Board.

Simply stated, budget approval comes down to weighing the cost of the expenditure versus the benefit to be gained. The proposed 2004 Capital Budget does not provide the foundation to weigh the costs and benefits thereby impairing the approval and oversight responsibility of the Board. To improve the budget process, the Board may wish to consider adopting project classifications similar to those discussed in this review, and possibly impose guidelines governing the nature and scope of project justification.

Respectfully Submitted

Stephen L. Barreca

BCRI Inc.

Curriculum Vita, June 2003
Stephen L. Barreca

Stephen L. Barreca is founder and president of BCRI Inc. Mr. Barreca founded BCRI in 1998.

Mr. Barreca has extensive experience in the areas of depreciation and valuation theory and practice. He has conducted or managed valuation and economic life studies of various type of personal property with an aggregate value in excess of $350 Billion dollars. Mr. Barreca's clients include some of the largest corporations in the world as well as state governments and local taxing authorities in both the US and Canada.

Mr. Barreca has been accepted as a legal expert in the areas of personal property valuation, economic life studies, assessment of functional obsolescence, depreciation theory and practice, depreciation table development, technology forecasting, and telecommunications network capital budgeting and engineering/construction practice. He has successfully testified in utility rate cases involving many billions of dollars of revenue, and numerous property tax administration hearings and civil litigation.

Before forming BCRI Inc., Mr. Barreca was Vice President – Communication Technology Strategies for Technology Futures Inc. (TFI) responsible for overseeing and/or conducting TFI's telecommunication research studies. These studies included long-rang strategic planning and assessments of technological change, functional obsolescence of machinery and equipment, economic life studies, as well as depreciation and valuation assessments. Mr. Barreca's duties also included teaching training seminars and providing executive briefings to clients. Prior to joining TFI, Mr. Barreca spent 20 years at BellSouth in various engineering, strategic planning, and regulatory capacities. Mr. Barreca's extensive experience and expertise includes:

- Conducting or managing asset obsolescence & valuation studies involving over half a Trillion dollars in capitalized assets, including Telecommunication Network equipment, Computers and other high-tech equipment, Office Furniture & Equipment, Retail Fixtures & Equipment, Point of Sale equipment, and others.
- Assessing Functional & Technological Obsolescence of various types of property.
- Group depreciation and accounting practice, including the development of vintage retirement unit costs.
- Mass Appraisal techniques for personal property.
- Determining the economic and useful life expectancies of various types of equipment.
- Development of Depreciation and Percent Good Tables.
- Assessing the impact of traditional depreciation forces (i.e., wear and tear, deterioration, chance loss, etc.)
- Development and/or selection of mortality survivor curves (e.g., Iowa and Gompertz-Makeham).
- Forecasting the evolution of emerging technologies, and qualifying the implications of technological change on Marketing & Strategic planning, Capital Budgeting and other business functions.
- Residual Value and Salvage Studies.
- Telecommunications Outside Plant Engineering

Mr. Barreca has presented at numerous industry forums including the International Association of Appraising Officers (IAAO), the annual Wichita Tax Conference, the USTA (United States Telephone Association) Network Planning Conference, the USTA Capital Recovery Conference, the IBC (International Business Communication) Asia Workshop, the International Engineering Consortium's World Forum, the Society of Depreciation Professionals, the American Society of Appraisers, and others. Mr. Barreca has taught training seminars on depreciation, valuation and function obsolescence at industry association conferences, professional society conferences, and public training courses. Additionally, his studies have been published in numerous trade magazines and professional journals. Mr. Barreca has presented to the FCC, State Public Service Commissions, and before the Florida Senate Subcommittee on Telecommunications Reform.

Mr. Barreca is Secretary and past President of the Alabama Chapter of the American Society of Appraisers (ASA), past President of the Society of Depreciation Professionals (SDP) and a member of several industry associations including the International Association of Appraising Officers, the Institute of Electrical and Electronic Engineers, the ASA (Candidate Member), and the Society of Depreciation Professionals. Mr. Barreca is a registered Professional Engineer (PE) and a Certified Depreciation Professional (CDP) from the Society of Depreciation Professionals. He received his BSEE degree from the University of New Orleans.

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Training
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Outside Plant Planning, LP520-30522 ..... Sep 1977
Outside Plant Planning, LP520-30523 ..... Sep 1977
Bachelor of Science Degree, Electrical Engineering, University of New Orleans ..... Jun 1978
FYDP Outside Plant Engineering ..... Mar 1979
Engineering Economics, Outside Plant Engineering ..... Jun 1979
Building Industry Consulting ..... Mar 1980
Modular First Aid ..... Aug 1981
Advance Driver Performance ..... Dec 1982
Capital Recovery/Depreciation – Depreciation Accounting and Data ..... Oct 1983
Digital Equipment Corporation All-in-one Electronic Messaging ..... Mar 1986
Digital Equipment Corporation All-in-one Desk Management ..... Mar 1986
WPS Plus / All-in-one ..... Mar 1986
BellSouth Services Billing Management Responsibility ..... Aug 1987
Managing Personal Growth ..... Mar 1988
Affirmative Action The Next Phase ..... Apr 1988
Excellence In Leadership ..... Jul 1988
Time Management ..... Oct 1989
FOCUS Database Design ..... Oct 1990
FOCUS Application Integration Techniques ..... Oct 1990
Technology Forecasting For the Telecommunications Industry ..... Aug 1990
The Quality Advantage ..... Nov 1990
Fiber To The Home, Technology Overview, ND900B ..... Jan 1991
Fiber To The Home, Overview, CN178F ..... Jan 1991
Synchronous Optical Network (SONET) Overview ..... Apr 1991
Developing Peak Performance ..... Jul 1991
Miscellaneous Vendor Courses ..... Aug 1992
Understanding Emerging Technologies ..... Aug 1992
Personal Financial Education ..... Sep 1992
Intellectual Property Management ..... Nov 1992
Strategic Performance (Manager of Managers) ..... Jan 1993
Performance Management: Making the Connections ..... Aug 1993
Defensive Driving – Smart Moves (IVI) ..... Jan 1994
International Communications Forecasting Conference, various workshops ..... Jun 1994
Capital Recovery/Depreciation Curriculum Development Workshop ..... July 1994
Common Channel Signaling / Signaling System – 7 ..... Sep 1994
Ethics Awareness Workshop ..... Sep 1994
Understanding Local Area Network (LAN) Internetworking ..... Sep 1994
SMDS: A Brief Overview ..... Sep 1994
Engineering Refresher for PE-Electrical – Georgia Tech. ..... Feb 1995
Environmental Compliance – Video Class ..... Feb 1996
Hazard Communication General Awareness Training ..... May 1996
Economic Life Analysis ..... Oct 1996
Depreciation Accrual Calculations ..... Oct 1996
Forecasting in Depreciation (Physical Mortality, Functional Obsolescence, Combining forces of mortality) ..... Oct 1996
Simulated Plant Analysis ..... Oct 1996
Salvage and Salvage Trending ..... Oct 1996
Depreciation Accounting ..... Oct 1996
IEEE Various workshops through the year. 1996
International Communications Forecasting Conference, various workshops ..... Jul 1997
Society of Depreciation Professionals Annual Conference ..... Sep 1997
Economic Life Analysis ..... Sep 1997
xDSL Technology Workshop ..... Sep 1997
Depreciation Accrual Calculations ..... Sep 1997
Forecasting in Depreciation (Physical Mortality, Functional Obsolescence, Combining forces of mortality) ..... Sep 1997
Depreciation Accounting ..... Sep 1997
Simulated Plant Analysis ..... Sep 1997

Training
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Salvage and Salvage Trending ..... Sep 1997
IEEE Various workshops through the year. 1997
Forecasting, Planning and Managing Technology Change ..... Feb 1998
Forecasting, Planning and Managing Technology Change ..... Apr 1999
International Communications Forecasting Conference, various workshops ..... Jun 1998
Building Industry Consulting Service International (BSCSI), attend various workshops ..... Jun 1998
Society of Depreciation Professionals Annual Conference ..... Oct 1998
Economic Life Analysis ..... Oct 1998
Depreciation Accrual Calculations ..... Oct 1998
Simulated Plant Analysis ..... Oct 1998
Salvage and Salvage Trending ..... Oct 1998
Depreciation Accounting ..... Oct 1998
IAAO, Various workshops ..... Sep 1998
IEEE Various workshops through the year. 1998
Florida Chapter of the IAAO, various conference workshops ..... Jan 1999
Digital Switching Technology: Technology Forecasts, Depreciation, Obsolescence, client workshop ..... Mar 1999
International Communications Forecasting Conference, various workshops ..... Jun 1999
Wichita Annual Tax Conference ..... Aug 1999
Society of Depreciation Professionals Annual Conference ..... Oct 1999
Economic Life Analysis ..... Oct 1999
Depreciation Accrual Calculations ..... Oct 1999
Simulated Plant Analysis ..... Oct 1999
Salvage and Salvage Trending ..... Oct 1999
Depreciation Accounting ..... Oct 1999
IEEE Various workshops through the year. 1999
Society of Depreciation Professionals Annual Conference ..... Oct 2000
Uniform Standard of Professional Appraisal Practice (USPAP), course & examination ..... Jun 2001
International Association of Assessing Officers, various workshops ..... Jan 2001
American Society of Appraisers Annual Conference ..... Jul 2001
Society of Depreciation Professionals Annual Conference ..... Sep 2001
Society of Depreciation Professionals – Depreciation Training ..... Sep 2001
International Association of Assessing Officers Conference ..... Oct 2001
Florida Department of Revenue Training Conference ..... Dec 2001
IEEE Various workshops through the year. 2001
Society of Depreciation Professionals Annual Conference ..... Sep 2002
Society of Depreciation Professionals Depreciation Training ..... Sep 2002
International Association of Assessing Officers Public Utility Conference ..... Mar 2002
Wichita Tax Conference ..... Aug 2002
Wichita Tax Conference – Valuation Principles Courses ..... Aug 2002
Society of Depreciation Professionals Annual Conference ..... Sep 2002
IEEE Various workshops through the year. 2002
Florida Chapter of the IAAO – Tangible Personal Property Valuation Workshop ..... Jan 2003
International Association of Assessing Officers, Public Utilities Workshop ..... Mar 2003
International Association of Assessing Officers, Personal Property Seminar ..... May 2003

Course Instructor or Conference Presenter
Stephen L. Barreca

Forecasting in Depreciation (Physical Mortality, Functional Obsolescence, Combining forces of mortality) ..... Oct 1996
Instructor, Technology Forecasting For the Telecom Industry (Obsolescence & Life Analysis) ..... Apr 1997
Instructor, Technology Forecasting For the Telecom Industry (Obsolescence & Life Analysis) ..... Jul 1997
International Engineering Consortium - Economic Life Analysis..... Sep 1997
International Engineering Consortium - xDSL Technology Workshop ..... Sep 1997
Forecasting in Depreciation (Physical Mortality, Functional Obsolescence, Combining forces of mortality) ..... Sep 1997
Instructor, Technology Forecasting For the Telecom Industry (Obsolescence & Life Analysis) ..... Oct 1997
Instructor, Technology Forecasting For the Telecom Industry (Obsolescence & Life Analysis) ..... Jan 1998
Instructor, Technology Forecasting For the Telecom Industry (Obsolescence & Life Analysis) ..... Apr 1998
Instructor & course developer, Quantitative Technology Forecasting (Obsolescence & Life Analysis) ..... Apr 1998
Instructor, Technology Forecasting For the Telecom Industry (Obsolescence & Life Analysis) ..... Jun 1998
BICSI Workshop on Technology Change and Obsolescence of Telecom Cable Technology ..... Jun 1998
Property Valuation for Physical Depreciation, Functional & Economic Obsolescence, Client workshop ..... Jul 1998
Forecasting in Depreciation (Physical Mortality, Obsolescence, Combining forces of mortality) ..... Oct 1998
Instructor, Technology Forecasting For the Telecom Industry (Obsolescence & Life Analysis) ..... Nov 1998
Instructor, Quantitative Technology Forecasting (Obsolescence & Life Analysis), client workshop ..... Dec 1998
Instructor, Technology Forecasting For the Telecommunication Industry (Obsolescence & Life Analysis) ..... Jun 1999
Florida Chapter IAAO, Instructor: Physical Depreciation, Functional & Economic Obsolescence ..... Jan 1999
Florida Chapter IAAO, Instructor: Developing Percent-Good/Depreciation Tables ..... Jan 1999
Instructor, Technology/Market Forecasting For the Telecom Industry (Obsolescence & Life Analysis) ..... Feb 1999
Digital Switching Technology: Technology Forecasts, Depreciation, Obsolescence, client workshop ..... Mar 1999
Instructor, Quantitative Technology Forecasting (Obsolescence & Life Analysis)..... Apr 1999
Technology & Market Assessments, Client workshop..... Apr 1999
Instr. Assessing Functional Obsolescence in a Rapidly Changing Marketplace, A Cost Based Approach ..... Aug 1999
Instructor, Technological / Functional Obsolescence ..... Oct 1999
Forecasting in Depreciation (Physical Mortality, Obsolescence, Combining forces of mortality) ..... Oct 1999
Instructor, Technological / Functional Obsolescence ..... Oct 2000
International Association of Assessing Officers,
Instructor Development of Economic lives and Life Cycles of Technologies ..... Jan 2001
Florida Department of Revenue
Instructor, Quantifying Technology Obsolescence & Economic Lives of Personal Property ..... Jul 2001
Society of Depreciation Professionals
Instructor: Technology Forecasting & Assessing its impact on the value of personal property..... Sep 2001
International Association of Assessing Officers Instructor: Quantifying the Financial Implications of Technological Change..... Oct 2001
Florida Department of Revenue Training Conference, Instructor: Fundamentals of Developing Depreciation Tables..... Dec 2001
Society of Depreciation Professionals – Instructor Technology Forecasting ..... Sep 2002
International Association of Assessing Officers Presentation
Determining The Value of Rapidly Changing Technology..... Mar 2002
Wichita Tax Conference – Presentation Determining Property Lives From Tax-Roll Data ..... Aug 2002
Society of Depreciation Professionals Instructor: Technology Forecasting ..... Sep 2002
Florida Chapter of the IAAO – Tangible Personal Property Valuation Workshop,
Presenter: "Telecom Technologies - What's Really Happening"..... Jan 2003
International Association of Assessing Officers, Public Utilities Workshop,
Presenter: Using the Cost Approach To Value Utility Properties..... Mar 2003
International Association of Assessing Officers, Personal Property Seminar,
Presenter: An Objective Approach To Quantifying The Depreciation of Telecommunication Equipment..... May 2003

Valuation Adjustment Board on behalf of Lee County	2002
Expert Witness Property Valuation for Okeechobee Co Florida – FP&L	2002
Expert Witness Property Valuation for Broward Co Florida PA – PrimeCo	2002
Expert Witness Property Valuation for Citrus Co Florida PA - Time Warner	2002
Valuation Adjustment Board on behalf of Lee County – Bank of America	2001
Valuation Adjustment Board on behalf of BellSouth in Broward County, Florida.	2001
Valuation Adjustment Board on behalf of Lee County – Bahamas Breeze Rest.	2001
Valuation Adjustment Board on behalf of Lee County – WFTX TV-4	2001
Valuation Adjustment Board on behalf of Lee County – Various retail stores	2001
Valuation Adjustment Board on behalf of BellSouth in Dade County, Florida.	2000
Expert Witness, Property Valuation for Alachua County, Florida. – WalMart	2000
Valuation Adjustment Board on behalf of BellSouth in St. Lucie County, Florida.	1999
Valuation Adjustment Board, Duval County, Florida for Bellsouth	1999
Expert Witness, Property Valuation for Hernando County, Florida. - WalMart	1999
Expert Witness, Property Valuation for Hillsborough County, Florida. - WalMart	1999
Expert Witness, Property Valuation for Pasco County, Florida. - WalMart	1999
Drafted Pre-filed Testimony FCC TELRIC for U.S. West Arizona	1998
Submitted Affidavit & Drafted Pre-filed Testimony FCC TELRIC for Bell Atlantic VA	1997
Drafted Pre-filed Testimony FCC TELRIC for U.S. West, Wash	1997
Drafted Pre-filed Testimony FCC TELRIC for U.S. West, WY	1997
Drafted Pre-filed Testimony FCC TELRIC for NYNEX Vermont	1997
Drafted Pre-filed Testimony FCC TELRIC for Bell Atlantic MD	1997

Drafted Pre-filed Testimony FCC TELRIC for U.S. West Iowa	1997
Drafted Pre-filed Testimony & Affidavit FCC TELRIC for GTE Oregon	1997
Drafted Pre-filed Testimony FCC TELRIC for NYNEX Maine	1997
Testified before the Louisiana Public Service Commission, docket no. U-17949, sub-docket E, as an expert witness on Technology Forecasting techniques, the evolution of network technologies, economic life expectancies, and BellSouth's long range Network modernization plans.	1996
Testified before the Florida Senate Sub-Committee On Telecommunications Reform.	1995
Testified before the South Carolina Public Service Commission, docket # 92-227-C, as an expert witness on Technology Forecasting techniques, the evolution of network technologies, economic life expectancies, and BellSouth's long range Network modernization plans.	1993
Testified before the Florida Public Service Commission, docket # 920385-TL, as an expert witness on Technology Forecasting techniques, the evolution of network technologies, economic life expectancies, and BellSouth's long range Network modernization plans.	1992