STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS
PUBLIC UTILITIES COMMISSION

In re: Issuance of Advisory Opinion to Energy Facility Siting Board Regarding :	Narragansett Electric Company d/b/a National Grid's Application to Construct and Alter Major Energy Facilities
	Docket No. 3732

PREFILED TESTIMONY OF
Gregory L. Booth
President, Gregory L. Booth, PLLC
On Behalf of Rhode Island Division of Public Utilities and Carriers

WITH THE FOLLOWING EXHIBITS:

Divider	Exhibit	Description
1	GLB-1	Curriculum Vitae
2	GLB-2	Construction Cost Estimates - 115 kV Transmission
3	GLB-3	Construction Cost Estimate - 115 kV Substation and Distribution Options
4	GLB-4	Evaluations of Plans
5	GLB-5	PPI for Metals and Metal Products Indices and Distillate Fuel Oil
6	GLB-6	Present Worth Analysis

Prepared by:
Gregory L. Booth, PE

GREGORY L. BOOTH, PLLC
Engineering and Management Services

1609 Heritage Commerce Court
Wake Forest, NC 27587
(919) 453-1758 or (919) 441-6440
booth1909@earthlink.net

Gregory L. Booth, President
Gregory L. Booth, PLLC
On Behalf of Rhode Island Division of Public Utilities and Carriers

RIPUC Docket No. 3732

Southern Rhode Island Transmission Project

Prefiled Testimony
June 7, 2006

PRE-FILED TESTIMONY OF GREGORY L. BOOTH, PE

INTRODUCTION

Q. Please state your name.

A. Gregory L. Booth

Q. Please state the name and business address of your employer.

A. Gregory L. Booth, PLLC (Booth, PLLC) and PowerServices, Inc., both located at 1609 Heritage Commerce Court, Wake Forest, North Carolina 27587.

Q. On whose behalf are you testifying in this matter?

A. I am testifying on behalf of the Rhode Island Division of Public Utilities and Carriers.

Q. What is your position with Booth, PLLC and PowerServices, Inc.?

A. I am president of Booth, PLLC, an engineering firm and I am also president of PowerServices, Inc., a management services firm. As such, I have the responsibility for the direction, supervision and preparation of engineering projects and management services including the corporate involvement in engineering design and construction management, and testimony for clients.

Q. Would you please outline your educational background?

A. I graduated from North Carolina State University in Raleigh, North Carolina in 1969 with a Batchelor of Science Degree in Electrical Engineering. I am a registered professional engineer in thirteen states, as well as the District of Columbia. I am also a registered land surveyor in North Carolina. Furthermore, as a matter of maintaining my engineering registrations and as part of staying abreast of all the current engineering and management services issues, I have

generally averaged between 50 to 100 hours of continuing education every year and have since 1972. I am also registered under the National Council of Examiners for Engineering and Surveying.

Q. Are you a member of any professional societies?

A. I am an active member of the National Society of Professional Engineers, the Professional Engineers of North Carolina, The Institute of Electrical and Electronics Engineers, American Public Power Association, American Standards and Testing Materials Association, and the Professional Engineers in Private Practice.

Q. Do you actively participate in engineering seminars?

A. Since 1972, I have attended and participated in numerous seminars each year on engineering matters, rates and regulations, construction matters and construction management and management services matters. I have also prepared engineering manuals and text for instruction, seminars and courses. I have provided instruction in numerous engineering matters, including providing courses and seminars on the National Electrical Safety Code, Power System Protective Coordination, Long-Range Planning, and Asset Management Strategic Planning. My seminars, instructions, courses and speaking has been before state and national organizations across the United States.

Q. Have you attached to your testimony a copy of your curriculum vitae?

A. Yes. I have attached my curriculum vitae as *Exhibit No. GLB-1*, which includes an overview of my experience since beginning my work in 1963 on projects for

electric utilities. A detailed list of some of my publications and seminars and testimony is available upon request.

Q. Please briefly describe your experience with electric utilities.

A. I have worked in the area of electric utility engineering and management services since 1963. This initially included surveying transmission lines and distribution line design and substation design together with engineering analysis for electric utilities, industries, commissions, and private businesses. Since my graduation from North Carolina State University and since becoming a registered professional engineer, I have been actively involved in system planning, and protective coordination and stability studies, including detailed analysis of all components of distribution and transmission systems for electric utilities in 38 states. My experience includes all phases of consulting engineering, engineering design and management services from generation through transmission and substation design and distribution of power on electric utility systems. I have been actively involved in cost-of-service studies, rate studies, and rate design, both retail and wholesale. My involvement has also included the planning, design and construction management of generation, transmission, substation and distribution line facilities. This involvement has included the inspection of these facilities and the evaluation of service reliability. I have been extensively involved in the application and utilization of the National Electrical Safety Code (NESC) regarding its design and safety parameters, as associated with transmission, substation and distribution facilities. I have performed hundreds of long-range and short-range plans, and cost estimates for electric utilities across

the United States. I was involved in the management of all of the divisions of Booth & Associates, Inc. for some 30 years, including transmission, substation, and distribution facilities design and construction management of approximately $100 million dollars per year in plant value additions. My involvement included electric utility systems in rural and urban areas as well as coastal, plain and mountain areas predominantly throughout the eastern United States with some clients as far west as Arizona, Washington State, and Alaska, along with design and construction in light, medium and heavy loading districts as defined in the NESC.

Q. Do you have other involvement and experience with companies that provide you with additional extensive experience relevant to this docket?

A. Yes. I have been involved with other company affiliates, including two years with C. W. Wright Construction Company in Richmond, Virginia, which constructs approximately $40 million a year in transmission, substation and distribution facilities, and now PowerSecure, Inc., which constructs some $50 to $70 million in distributed and standby generation per year. My experience with all my past and present companies and past use of those resources assisted me in assessing the construction options and cost estimates for the transmission overhead and underground line facilities, duct bank, under river facilities, and substation and distribution lines, as being considered in this docket and outlined as alternatives.

Q. Have you previously testified and been recognized as an expert by state commissions and other regulatory agencies?

A. Yes. I have testified on several occasions before the Federal Energy Regulatory Commission, including pre-filed testimony in both wholesale rate matters as well as in electric utility reliability complaints. I have also testified before the Board of Public Utilities of New Jersey, the Delaware Public Service Commission, Virginia State Corporation Commission, the Pennsylvania Public Utilities Commission and the North Carolina Utilities Commission on multiple occasions together with this Commission as recently as Docket No. 3564.

Q. Have you previously testified before any commission or other regulatory agencies regarding service reliability and infrastructure construction?

A. Yes. I have testified before the North Carolina Utilities Commission and the Delaware Public Service Commission together with filing pre-filed testimony in a complaint before the Federal Energy Regulatory Commission and before this Commission.

Q. Has your testimony been accepted before any courts in regard to the matter of electromagnetic fields (EMF)?

A. Yes. I have filed testimony including exhibits and calculations and been accepted as an expert before courts in the state of North Carolina in the area of electromagnetic fields as generated by transmission lines, including 115 kV transmission lines and their proximity to the public. This includes being accepted as an expert and having my filed calculations in testimony accepted before the court.

Q. Please provide a list of typical clients with whom you would provide consulting engineering and management services.

A. The clients for whom I have been and am directly involved in engineering and management services include rural electric cooperatives, electric municipalities, investor-owned utilities, utility commissions, military bases, universities and industrial customers.

Q. Have you been accepted as an expert before state or federal courts?

A. Yes. I have been accepted as an expert in the area of electrical engineering and electric utility engineering, construction and reliability matters and the NESC including standard and customary construction practices in the electric utility industry and the electric industry before numerous states including New York, Pennsylvania, North Carolina, Virginia, Delaware, West Virginia, Florida, and federal courts.

Q. Have you been accepted as an expert in regard to transmission line siting and construction in other regulatory matters besides those previously discussed?

A. Yes. I was accepted as an expert before the Minnesota Environmental Quality Board and Minnesota Department of Public Services in regard to transmission line facilities including overhead and underground transmission line construction siting and facility routing.

Q. Approximately how many electric utility systems across the United States have you provided engineering and management services?

A. I have provided engineering and management services to more than 300 electric utility clients and clients owning electric utility systems or projects involving electric utilities, including not only electric utilities but military bases and universities owning transmission and distribution electric utility systems.

Q. Would you please provide a brief synopsis of the predominant materials you have reviewed in this matter?

A. I have reviewed the following list of information:

- Southern Rhode Island 115 kV Transmission Environmental Report - Volume I and Volume II Figures
- Southern Rhode Island Transmission Project Visibility and Visual Impact Assessment and Southern Rhode Island Transmission Project - Tower Hill Tap Line Supplemental Visibility and Visual Impact Assessment
- Docket 3732 Procedural Schedule
- Docket 3732 - ISO-NE's Motion to Intervene
- Docket 3732 - Notice of Designation to an Agency to Render an Advisory Opinion - Preliminary Decision and Order
- National Grid Design Philosophy - Power Transformer Secondary Containment
- National Grid Transmission Planning Guide
- National Grid's Responses to the Division's First Set of Data Requests Numbered 1-1 through 1-9
- Docket No. 3732 Testimonies of the following persons:
    - David J. Beron, PE, PMP
    - David M. Campilii, PE
    - Melissa Scott, PE
    - David McIntyre, PE
    - Alan T. LaBarre, PE
- National Grid's Responses to the Division's Second Set of Data Requests

SCOPE OF TESTIMONY

Q. What is the scope of your testimony in this proceeding?

A. My firm and I were retained to act in an advisory role providing a complete review of all materials filed by the parties in Docket No. 3732 to provide advice to the Rhode Island Division of Public Utilities and Carriers (RIDPUC), most specifically in the areas of transmission and substation options and associated costs. I was also retained to provide filed testimony with comments in regard to all testimonies and filings by the parties participating in this docket.

Q. Are you familiar with Narragansett's Facility Siting Board application dated November 18, 2005 for the project, including the Environmental Report ("ER") prepared by VHB?

A. Yes. I have reviewed these documents together with the pre-filed testimony, as previously stated.

Q. Have you prepared a complete review of the filings and testimony, and is that contained herein in this pre-filed testimony?

A. Yes. This pre-filed testimony includes my opinions, findings, and comments on the filings and testimony of the parties in this matter. It also includes an independent analysis on the "Project" construction cost and options, and cost estimates.

Q. Describe the scope of your testimony in this proceeding.

A. My testimony will include a discussion of my evaluation of the proposed Southern Rhode Island Transmission Project ("Project"), including the Tower Hill Substation and associated projects. I have divided my testimony into sections

dealing with: First, the "No-Build" alternative, including Demand Side Management and Distributed Generation, Second, the Transmission Line project segments, and, Third, the October 2004 Distribution Study and the Tower Hill Substation and associated projects. My testimony also includes independently derived cost estimates and economic evaluations. Furthermore, I evaluated the load projects, regressions analysis, and Cumulative Present Worth Revenue Requirement (CPWRR).

Q. Why did you segment your testimony?

A. It is my opinion that the October 2004 Distribution Study and the preferred plan, including the Tower Hill Substation, stands on its own. The need for additional transmission to distribution substation (T to D Substation) capacity and associated distribution infrastructure upgrade and expansion does not impact the evaluation of the transmission system upgrades. The only transmission line that is impacted by the Distribution Study is the tap line requirements associates with a T to D Substation. The distribution requirements are best evaluated and discussed separately. Furthermore, the distribution study projects have a lower priority than the transmission upgrade projects, since fewer customers are affected by a single contingency outage and some intermediate, short-term solutions could be implemented, even though there would be some decline in reliability. The deferral or delay in solving the transmission overload issues is simply not an acceptable option. Additionally, I intend to discuss the demand side management (DSM) and distributed generation (DG) alternatives as they relate to the distribution project deferrals and alternatives, most notably for

future project evaluations. I have never found DSM to be a viable alternative for transmission capacity requirements. DG has been used as a short-term alternative for transmission congestion most recently in the PJM pool area. Thus, I intend on also addressing DSM and DG separately.

Q. Have you been asked to be available for live testimony as part of your engagement?

A. Yes.

SUMMARY OF TESTIMONY

SOUTHERN RHODE ISLAND TRANSMISSION PROJECT COMMENTS
TOWER HILL ROAD SUBSTATION PROJECT, 115 kV L-190 LINE

Q. Are you familiar with the Narragansett Electric's Southern Rhode Island Transmission Project (Project) and the testimony of Mr. LaBarre concerning the Tower Hill Substation 115 kV L-190 Line to supply this project?

A. Yes. I am familiar with the project, and I have reviewed the filed testimony of Mr. Alan T. LaBarre, PE, including his pre-filed testimony exhibits and the detailed descriptions contained in Chapter 3.0 of the Environmental Report in the South County East Area Supply and Distribution Study, October 2004, which is Appendix B of the Environmental Report. Furthermore, I have reviewed the responses to Division requests.

Q. Would you briefly summarize your opinions concerning the testimony of Mr. LaBarre, the Narragansett Electric filing regarding the preferred plan, including the Tower Hill Road Substation and the 115 kV L-190 Line to supply this station?

A. A. Yes. I support Narragansett Electric Company's preferred plan for providing a new substation and distribution line construction and feeders associated with supporting the distribution load requirements in the areas of the Peacedale Substation, the North Kingstown area, the South Kingstown area, the East and West Greenwich, Exeter, Richmond, and Charleston areas, as evaluated in the October 2004 distribution study. I support the study area planned for the service of the approximately 50,000 customers with a 2003 peak load of 131 MW. I do have some additional comments and concerns relative to this plan.

Mr. LaBarre's testimony addresses distribution system area concerns, including deteriorating feeder health conditions, and emergency service problems in the area based on projected 2004 and 2005 peak loadings. The loads evaluated in the study have already occurred. Mr. LaBarre did not address how the system actually performed through the actual peak loads of 2004 and 2005. There should be some historical system performance to support the October 2004 study predictions through 2005. Absent this available information correlating actual performance to the study prediction, I based my overall assessment on the October 2004 study data and my recently completed March 31, 2006 Final Assessment Report of Narragansett Electric Company Distribution System Reliability, which outlined numerous areas of system reliability enhancement, which would support the preferred plan. The need for increased capacity in the study area, combined with the need for shorter feeders and the re-distribution of load is most effectively accomplished by the addition of a new substation and associated transmission line facilities as proposed by Narragansett Electric.

Q. Would you address what you believe are your concerns and/or areas which have not been addressed by Mr. LaBarre and the study?

A. Yes. First, I believe that the initial plan cost evaluation was substantially dated, and did not appropriately reflect current day cost and the extreme electric utility construction cost volatility that now exists in the market. The responses to data requests clarified that cost estimates originally referred to as 2003 and 2004 were updated to 2005 for the preferred plan and some of the alternative plans. Since mid-2005 the pricing volatility associated with electric utility materials and

construction labor is closely rivaling the volatility of the oil market. In project cost estimates that I have been involved in preparing over the past year, combined with project implementations on both transmission and substation line projects similar to the projects priced by Narragansett Electric in their studies and as proposed, I have found volatilities in pricing exceeding 50%. In recent months, the suppliers of electric utility equipment, including transmission to distribution transformers, substation steel, copper and aluminum cables, insulators and other materials will provide a quote which is only firm for immediate acceptance. We have seen such items as transformers, circuit switchers, breakers, and conductors increase in price just in the last 12 months, ranging from 25% to 100%. It is my opinion, based on closely working with suppliers and discussions with suppliers of electric utility equipment and labor, that this price volatility will continue as long as raw steel prices, petroleum prices, and other raw material prices continue to have extreme volatility and escalating rates. Due to this price volatility and escalation, I have prepared cost estimates based on current 2006 pricing, and I have prepared a price volatility risk assessment which evaluates the likely cost of completion of a project, which will take at least 18 months to complete once approved for proceeding. These cost estimates are *Exhibit Nos. GLB-2 and GLB-3*. Exhibit No. GLB-4 shows the estimated cost for the preferred plan and four of the alternate plans escalated to reflect increased costs through a construction period ending in 2008 (2011 for the 345 kV alternative) The cost estimates I prepared based on current day pricing for June 2006 compare favorably with those of Narragansett Electric

recognizing its estimates are in 2003 and 2005 dollars. Considering, however, the projects will not be completed until near the end of 2008, my cost estimates are higher. This results in a greater spread than reflected in Mr. LaBarre's testimony, and provides further support that the proposed plan, at least from an economic evaluation standpoint, is a better plan choice than the other alternative plans. Thus, an updated cost evaluation provides further support for the preferred plan. My summary of the five transmission alternatives is reflected on Exhibit No. GLB-4.

Q. Do you believe that a "do nothing" option is one that can be considered and implemented?

A. A "do nothing" option is always one that must be considered. Such an option should also have some incremental evaluation, including the implementation of additional sectionalizing equipment and enhanced application of capacitors for power factor correction for short term deferral of substantial project capital investments. I do not believe that a "do nothing" option for a deferral or deferral methods should be applied to this study area. Furthermore, I believe a "do nothing" option would result in the ultimate substantial decline in system reliability and a high likelihood of system outages that become substantially extended and cascading, which are neither acceptable to the customers or the Division. A "do nothing" plan would, in fact, be completely counter-productive to the efforts that have been put forth by the Division and Narragansett Electric as it relates to the Distribution System Reliability Assessment, and a substantial

portion of action items and reliability enhancement programs that are moving forward.

Q. Would you provide a list of what you believe are the benefits of the preferred plan, which have not been enumerated by Narragansett Electric, if you have such a list?

A. The preferred plan appears to be the only reasonable way to provide for long range power supply system reliability and security in this study area. The preferred plan provides for shorter feeders, which will inherently mean less hours outage time associated with any interruption. The preferred plan will clearly result in substantially lower power line losses (I^2R), since the amount of current being supplied by each feeder will be lower due to lower loads on each feeder. Furthermore, a portion of this load will be transmitted back on a 115 kV transmission system, rather than that same load having to be served greater distances over 12.47 kV lines. Additionally, with shorter feeders and less load, there is much greater load transfer capability in the event of any single contingency outages. By providing an additional substation with added transformer capacity, the ability to transfer loads in short periods of time ranging from two to four hours, is significantly enhanced. This substantially reduces restoration and outage time. Although I have established that Narragansett Electric could implement and install mobile transformer capacity in the event of a transformer failure, the moving of such large transformers and their installation often takes in excess of twenty-four hours. To the extent that outages occur not only in the short term due to transformer failures resulting from overload and

loss of life due to overload, such failures and the resulting ability to obtain new capacity while the mobile is in service further reduces system reliability in other areas, due to the mobile being unavailable for other transformer failures where load transfer is also not available. I have also evaluated the preferred and alternate plans, together with a "do nothing" or a plan deferral methodology. Considering the growth rate in this area, and the immediate need for relief of substation transformer overloading and feeder overloading, the preferred plan appears to be the most prudent to implement. Furthermore, with the continued escalation in cost of construction and electric utility equipment, further deferral of actions and the installation of a new substation will only make the deferred plan substantially more expensive in the future than the current cost. This would eventually reflect itself in higher cost to the using and consuming public. On evaluating the ten year and long range planning documents of Narragansett Electric, it is apparent that a new substation in this area is eventually going to be required, regardless of the other deferral methods or plans implemented. The current load growth appears to be exceeding projections. The Tower Hill Substation plan is the lowest cost plan now, and would ultimately be required regardless of alternatives.

Q. Were there any items not discussed or deficiencies in the October 2004 distribution study as you have evaluated it?

A. Yes. I am concerned that the October 2004 distribution study and the testimony of Mr. LaBarre discusses expected events for 2004 and 2005 without discussion of the fact that we have already passed those years and milestones, and

therefore Narragansett Electric and its witness Mr. LaBarre should have discussed whether the anticipated events in fact transpired, and how they impacted system reliability. Additionally, it does not appear there was any discussion associated with the overloading capability of the transformers under the American National Standards Institute (ANSI) C57 Standards, which do result in some loss of transformer life, but do, however, defer capital investment for the short term. Based on the current timeline, and the fact that the October 2004 distribution study is, in fact, nearly 2 years old, it would appear Narragansett Electric has already begun counting on ANSI overload capabilities and feeder overload capabilities in the event of contingency outage, and some emergency rating requirements. Additionally, I believe that the sensitivity analysis and the cost of each plan failed to fully consider price volatility in the marketplace. At the time the plan was being completed, there was a clear understanding of both the volatility of the oil and steel industry, both of which substantially affect the cost associated the construction of substations. Although this cost volatility actually further supports the proposed plan, it would have been preferred for Narragansett Electric to have included a better price volatility and sensitivity analysis of this price volatility in its plan analysis. I have included such evaluation in my analysis of the plans, and have reflected it in *Exhibit GLB-4*.

Q. Would you summarize, in one or two sentences, your position on the October 2004 distribution study, and Narragansett Electric's proposed implementation of its preferred plan?

A. Yes. I fully support the October 2004 distribution study recommendations, and the preferred plan, including the installation of the Tower Hill Substation and the associated distribution construction and transmission line construction necessary to implement this plan. It is my professional opinion that this plan is the most prudent solution for short and long term service in this area, in order to maintain and enhance service reliability consistent with the Divisions' position on Narragansett Electric's distribution system reliability requirements. It is my professional opinion that, if this distribution study plan is not implemented, Narragansett Electric will not be in a position to meet either the reliability requirements and action items, as outlined in the March 31, 2006 Final Assessment Report, nor will it be able to meet the published standards and requirements of the Rhode Island Public Utilities Commission, and those standards as enforced by the Rhode Island Division of Public Utilities and Carriers, at least for this segment of the system.

DEMAND SIDE MANAGEMENT AND DISTRIBUTED GENERATION EVALUATION

Q. Have you reviewed the Narragansett Electric Company discussions of demand side management and distributed generation as alternatives for the proposed projects? If so, do you agree with their assessment?

A. Yes, I have reviewed the brief testimonies of both Mr. Beron and Mr. LaBarre concerning their general dismissal of the value of demand side management (DSM) and distributed generation (DG) as alternatives. I do not find, in their testimonies or filings, that complete evaluation and consideration has been given

to these options as they relate to both deferral of transmission projects and, even more importantly, deferral or elimination of distribution projects.

Q. What is your experience associated with DSM and DG?

A. For more than 20 years, I have been actively involved in assisting my electric utility clients in the implementation of aggressive demand side management projects and distributed generation projects to achieve both power cost savings and capital investment and plant addition optimization. As an example, I was involved in significant distributed generation installations by Old Dominion Electric Cooperative and its members for the purpose of reducing the cost of transmission congestion charges imposed by PJM and, most particularly, Dominion Power and Conectiv. Furthermore, this DG application improved transmission system reliability. These generators were placed on the secondary side of the transmission to distribution substations. I have also been significantly involved in the installation of DSM and DG projects in North Carolina for the purpose of economic benefits, operating these projects against the wholesale generation costs, while also achieving reduction in system losses, improved customer reliability, and reduced transmission to distribution transformation and distribution additions. In North Carolina, the total reductions exceeded 400 MW.

Q. Do you believe DSM or DG projects can eliminate the need for the proposed project?

A. It is my opinion that demand side management is an energy conservation and economic tool that should be used to the maximum extent possible for economy only. I have not found that DSM alone can defer, in particular, transmission

capacity expansion and upgrades, and transmission to distribution substation upgrades. I am of the opinion that DG has a useful place in the total planning and design process for the distribution systems and transmission systems. I would not recommend for the specific transmission projects proposed and required under the evaluation completed and as contained in this Docket filing, that DG could eliminate the transmission upgrades and projects necessary to reinforce the transmission system in the Southern Rhode Island area. Such an analysis would be extremely complicated, involving substantially more environmental issues than are being raised in this docket. Other than the temporary economic application of such generation in areas where air quality issues are not of significant concern, DG has been successfully applied because of the significant time frame associated with the utility's transmission upgrading, particularly in eastern shore areas of the PJM pool. Neither Rhode Island nor these projects fit the customary application for DG for the purpose of transmission capacity addition deferrals. I do not find that Narragansett Electric witnesses have put forth any quantification of their statements related to DSM or DG. Furthermore, they are indicating that the market forces have not resulted in the installation of DG. That may be because the economics simply do not exist, or, even more likely, it may be because the economic analyses have not been performed and the appropriate pricing signals have not been developed to help send the correct pricing signals for DSM and DG. There are, in fact, two distinct components associated with DSM and DG economics. One component is whether such generation can be installed, operated, and maintained at a lower

cost on a distributed basis, and at the customer level, or the distribution system level, than can be implemented on the bulk power supply level. Generally speaking, the application of generation on the bulk power supply level is at a lower cost, both for installation and operation and maintenance than at the DG level when looking at only the cost of power supply. The second element of this, however, is the deferral or complete elimination of capital investment for providing for the capacity of short term peak load requirements combined with emergency back stand and reliability. This is a separate economic component that has to be evaluated in addition to the cost comparisons, with the application of generation at the distributed level, versus the bulk power level. Generally what I find is the studies, pricing signals, and rates in this region have not been developed to cause distribution utilities or individual retail customers to apply DG, because of the lack of a pricing signal. Simply lacking a pricing signal does not mean it is not an item for consideration.

Q. Do you believe DSM or DG is an alternative to the distribution projects such as the Tower Hill Substation and distribution line upgrades?

A. I do not believe that DSM and DG are a replacement for these projects. I am of the engineering opinion that DSM and DG, if part of a long term program, can be economically applied to maximize the utility's assets while affording the appropriate pricing signals to large commercial and industrial customers for the application of DG that could be used for both the purpose of emergency backstand and peak shaving across both the coincident and non-coincident peak times to eliminate the need for high capital investments in substations and

distribution lines to serve loads that have very short peak load durations. There are, in fact, certain customers that install as part of their prudent planning or other regulatory requirements, distributed generation for emergency backstand purposes. One example would be hospitals. To the extent that this generation is predominately installed and applied for backstand and critical loads, the utilization of such generation and its associated fuel to offset the cost of capital investment in a distribution system can be a prudent consideration, and there may be appropriate price signals applied, thus reducing the total capital investment in the electric utility system through the use of customer-owned generation or strategically placed distribution utility generation and DSM programs.

Q. Are you suggesting such programs should be implemented to defer the Tower Hill Project and the distribution circuits?

A. Absolutely not. Such programs are long term in nature, and take a substantial number of years to install the appropriate facilities and proper controls so that they have a meaningful reduction in system demand. I am simply pointing out that, in particular, Mr. Beron and Mr. LaBarre are indicating that the market signals have not resulted in the installation of this generation, which is true, in all likelihood, only because such market signals have not been developed. In this hearing, and at this point, neither DSM nor DG could be implemented in time to defer the need for the recommended projects. That does not mean that Narragansett Electric and Rhode Island shouldn't evaluate the benefits of both DSM and DG on a forward-looking basis in order to be a blended capacity

opportunity to optimize the transmission to distribution substation capacity utilization and distribution system capacity additions.

SOUTHWEST RHODE ISLAND TRANSMISSION SUPPLY STUDY

Q. Are you familiar with Narragansett Electric's Southern Rhode Island Transmission project (Project) and the Southwest Rhode Island Supply Study dated October, 2003 included as Appendix A of the Environmental Report (ER)?

A. Yes, I am. I have also reviewed the pre-filed testimony of the Narragansett Electric Company witnesses including Melissa Scott, PE.

Q. Would you provide us with your general observations, and overview of your opinions concerning the study and the Scott testimony?

A. My professional opinion is that the proposed plan is the most appropriate solution for the impending overload of portions of a 115 kV transmission system. None of the alternative plans which were studied provide for a long term reliable and economic solution. The 345 kV transmission solution could not reasonably be expected to be constructed in a time frame to afford the necessary capacity and reliability when needed. Additionally, this plan is substantially more costly than is necessary in the near term. The 34.5 kV plans do not provide adequate single contingency service and system reliability. I will discuss this in greater detail later in my testimony, however, I have not found the 34.5 kV sub-transmission to be an adequate long term solution for 115 kV or higher voltage transmission requirements. The various other solutions, including application of capacitors, are not only simply stop gap deferral programs, they are, in fact, the type of additions

that are made to systems as part of the normal course of reinforcing capacity and improving voltage and power line energy loss performance. They should not be considered an alternative to reliable transmission capacity construction. I viewed the proposed project as a first step in the continued long range plan associated with securing reliable power supply delivery in Southern Rhode Island and Connecticut. The October 2003 study could have considered a combination of several intermediate steps, including the utilization of capacitors and the operation of the transmission line conductors at higher temperatures, including operating as high as 257°F. These would have been short term solutions to the long term need. We are now nearly three years beyond the study baseline and two years beyond the distribution study baseline. The construction will take at least eighteen (18) months and, in all likelihood, closer to twenty four (24) months, even if all design, material acquisition and construction efforts move forward optimally. That means that this transmission project will be completed in mid to late 2008, at best, or nearly at the end of the 2010 planning horizon. For that reason, intermediate steps which would defer the project a few years are no longer viable, since the transmission system will be operating for several years without adequate single contingency capability until the proposed project is completed. It is also my opinion that the proposed project affords the least amount of adverse impact on the environment, including aesthetics and land utilization. I have evaluated what Narragansett Electric has defined as the "no build" options, which include some of the intermediate deferral programs. I would strongly recommend against any "no build" option at this time. During my evaluation, I was quite concerned that the

cost estimates were all 2003 study grades cost estimates. This means that the project cost and economic evaluation is substantially dated. The final estimates included by Narragansett Electric reflect 2005 costs for the preferred option, and some alternatives, while the "no build" cost appeared to still be in 2003 dollars. If the cost of materials and construction had been progressing in a normal linear fashion, with all costs going by a modest inflation rate, then somewhat dated estimates could be updated simply using inflation rates. However, this is not appropriate because of the recent and continuing volatility in the cost of electric utility materials and construction.

Q. Do you have any generally accepted indices that provide more concrete evidence of these price increases?

A. Yes. The United States Bureau of Labor Statistics tracks a wide range of commodity prices and develops a Producer Price Index ("PPI") for many commodities based on these prices. Using October 2003, the date of the Final Report for the Southwest Rhode Island Transmission Supply Study, as a benchmark, the PPI for iron and steel has increased by 34%, the PPI for refined copper has increased by 211%, the PPI for aluminum has increased by 70%, and the PPI for distillate fuel oil has increased by 128%. *Exhibit GLB-5*, Sheet 1 of 2, shows graphically what the PPI for the conglomerate commodity, metals and metal products, has done from January 2001 through the present, along with a linear projection of future cost increases and market volatility. *Exhibit GLB-5*, Sheet 2 of 2, shows graphically the PPI for distillate fuel oil with projection of future cost increases and market volatility.

Q. Do you have further anecdotal evidence of cost increases and price volatility?

A. I have found, on projects where I have updated cost estimates as recently as six months prior to bids, that the actual bid prices came in even higher than my most recent cost estimates. Furthermore, many of the suppliers will not hold their prices firm unless an order is given within the week of the price quotation. The current price escalations are approaching the type of environment that existed in the mid to late seventies, where all prices contained Bureau of Labor Statistics indices escalators which escalated the bid or quoted price up to a higher level at the time of delivery. To more appropriately evaluate the alternative plans and provide for a reasonable cost analysis, I have re-evaluated the cost estimates providing 2006 study grade cost estimates with an estimated project completion cost utilizing historical and anticipated price escalation. It is imperative to do this in the project evaluation to be assured that a 2006 study grade cost estimate evaluation method reasonably reflects the same selection using a likely 2008 completion date. *Exhibit GLB-4* shows the updated project cost estimates based on the later project completion dates. (Note: The earliest a 345 kV option could be completed is 2011.) Items such as steel, concrete, copper, and aluminum have seen tremendous increases in cost, and the labor rates have escalated dramatically just over the past twelve months. It is my professional opinion a significant level of escalation will continue for at least two more years, and will substantially impact the cost of all of the projects evaluated.

Q. Would you discuss in greater detail why you believe each of the alternatives do not afford a better plan than the proposed preferred plan?

A. Yes. First, each of the proposed alternatives, other than the "no build" plan, is more costly than the proposed preferred plan. Second, the use of static var compensation (SVC) and the FACTS device, with some re-conductoring as proposed under the "no build" alternative, is not an effective or reliable solution. My experience with the limited utilization of static var compensation has indicated that it is not an effective tool, nor a good long term solution for transmission system capacity and voltage problems. Additional static var compensation and similar types of devices have proven to be very unreliable, requiring a great deal of maintenance and not providing for steady reliable operation. The 345 kV alternative, as I briefly mentioned before, is not a viable near term solution. Not only is this a significantly more expensive project, it is my professional opinion this project could not be brought online in less than five (5) years and, in all likelihood, even longer. This would mean if the 345 kV alternative was utilized as a solution for Southern Rhode Island, that the solution could not be brought online before 2011, and likely closer to 2014. That would mean that the retail customers in this area would be subjected to a rapidly declining transmission reliability conditions, with voltage problems and, in all likelihood, numerous single contingency outages which could not be resolved in a timely fashion. One alternative which was not discussed fully in the October 2003 study was the possibility of transmission line design modifications to allow the line to be operated at a maximum thermal loading of 257°F conductor temperature, combined with some capacitor applications. Narragansett Electric did indicate that it had implemented a short term solution for the immediate

thermal loading by operating the conductor at higher temperatures after some vegetation management and structure modifications. This statement as contained by witness Scott on page nine (9) was somewhat alarming, because I would have been of the opinion that there would have been no vegetation allowed to grow up under the 115 kV transmission line, that could be a remote danger for contact under any operating temperature condition. Tree contact with transmission lines should be a major concern and mitigated to the maximum extent possible. Certainly the right-of-way underneath the transmission line should be cleared, and any and all danger trees should be cleared. I would recommend a transmission line design that accommodates the operation at 257°F under extreme emergency conditions. This would not be a planning criteria, but rather a single contingency extreme emergency operating level. The design should include providing for enhanced single contingency fall back opportunities, particularly if new transmission line construction projects are delayed for the large variety of reasons that often cause such delays. Utilization of capacitors to support the transmission system and its voltage and the operating of conductors at higher temperatures can be a short term solution. It must be recognized that capacitors are volatile devices and have relatively low reliability. System overvoltage and spikes, particularly associated with lightning strikes, cause capacitor failures on a regular basis. The 115 kV transmission system needs to be designed and operated with the ability for the loss of a portion of the installed capacitors without adversely affecting voltage or system reliability. All of my above discussion points to the fact that the alternative

solutions to the preferred plan do not afford either the lowest cost or the most reliable means of meeting the needs of Southern Rhode Island. Even though increased operating temperatures on conductors and utilization of capacitors provide some additional flexibility in system operation, the utilization of capacitors should be considered an enhancement to system operation, not a solution for transmission capacity requirements.

Q. Have you evaluated the total cumulative present worth revenue requirement (CPWRR) as submitted by Narragansett Electric, and do you have comments?

A. Yes. I have evaluated the CPWRR as I understand the concept and have several comments. The CPWRR, even by Narragansett Electric's own admission, was deficient due to the failure to include the interest rate. We obtained additional information from responses to Division Data Requests, which allowed for a re-evaluation of the CPWRR. Although I do believe the total CPWRR analysis is appropriate, I also believe it is most appropriate when evaluating alternative plans, that the CPWRR analysis also take into account residual value. Generally speaking, with a transmission system upgrade, you are installing facilities which have a 50 to 80 year life. Performing a 30 year CPWRR evaluation does not reasonably reflect what the residual value is at the end of 30 years of each of the selected plans. I certainly would concur that one does not pick the most expensive plan simply to create the highest residual value. However, you must consider residual value as part of the cumulative present worth evaluation. Otherwise, you can select the plan with the best cumulative present worth and revenue requirement, but it is not the most appropriate long term plan beyond a

30 year evaluation period, since there can be significantly greater residual value associated with a only slightly more expensive plan through the first 30 years. We have completed such an evaluation, and have included it as *Exhibit No. GLB-6*. My evaluation is also summarized on Exhibit No. GLB-4.

Q. Do you have any other comments regarding Narragansett filing and, in particular, the testimony of witness Scott?

A. Yes. I concur with the testimony and comments contained on witness Scott's pages 11 and 12 in regard to special protection system (SPS). This testimony does, however, seem to address a second contingency outage condition, which goes beyond a single contingency outage. Considering the interconnection of lines between Rhode Island and Connecticut, this would appear to be very prudent system engineering design and protective coordination design. I have witnessed, in my over 40 year career in the electric utility industry, collapses of entire transmission grids due to deficient system protection design. The proposed expenditure of $2.9 million in 2003 study grade cost, in my professional opinion will yield substantial enhancement to the transmission system reliability in southern Rhode Island. Certainly, the northeast area is familiar with the transmission system collapse of the First Energy grid, and the blackout of the northeast that resulted. These types of events can be substantially mitigated by enhancements to system protective coordination and the installation of special protective systems, such as the one being proposed by Narragansett Electric.

Q. Have you evaluated the connection from Aquidneck Island as studied by Narragansett Electric in their October 2003 transmission study?

A. Yes, I have.

Q. Would you concur with Narragansett Electric, and do you have additional comments?

A. I certainly concur with the conclusions of Narragansett Electric. I do believe the cost estimates are deficient, again for the same reasons I have commented on before. The cost estimates are an array of 2003, 2004 and 2005 study grade cost estimates, and the cost volatility and pricing through 2006 and beyond result in significantly different cost estimates. Even more importantly, as it relates to these projects and their cost estimates, the costs have escalated significantly more on underground cable and submarine projects than overhead projects. The insulation used for these types of cables is a predominately petroleum-based product. We have seen a nearly 300%, and approaching 400%, escalation in the cost of the insulating materials. Additionally, the conductor material itself has seen a significant escalation. I do concur that the time required to build these projects is significant, and that there would be tremendous technical complexities. These projects would be an absolute last alternative, only if and when they were a required solution due to loads in the area reaching the point where they can only be served by the installation of underground and submarine cables. These projects should not be considered as viable alternatives at this time. I have revised the cost estimates for these projects, and included them in *Exhibits GLB-4 and GLB-6*. I do not see this

project, or its variation A, B, or C, as a solution for the current capacity concerns, both because of the costs and the technical difficulties resulting in a project that would likely not be completed until well beyond 2010. Such delays cannot be reasonably tolerated by the customers served from this portion of the transmission system.

Q. Have you evaluated the Connecticut upgrades as discussed by witness Scott, and as considered in the October 2003 study?

A. I have evaluated both the study and testimony as they relate to upgrades to the 115 kV transmission system in Connecticut. Although this is an alternative solution, I concur that this solution would have greater benefit for southeast Connecticut than southern Rhode Island. More importantly, it should be recognized that such a solution will not ultimately eliminate the requirements for upgrades in southern Rhode Island. Conversely, the upgrades in southern Rhode Island do not ultimately eliminate the need for the upgrades in Connecticut. The issue is more importantly one of timing. It is my opinion that the construction of the projects in southern Rhode Island are the most appropriate way to solve the immediate voltage and capacity concerns, and afford the improved reliability in southern Rhode Island. Ultimately, I would anticipate that the transmission system interconnecting and flowing through southeast Connecticut would also be upgraded.

Q. Do you concur with Narragansett Electric's position concerning DG and DSM?

A. I only agree in part. DSM is a long term program. In the states where I have been involved with utility clients, such programs, even aggressive programs,

have been slow in developing, and generally take 10 years or more before there is a meaningful level of demand side management equipment implemented. Unfortunately, over the past five to ten years, where the environment of generation additions has been predominately peaking generation, with a relatively low capital investment, the application of demand side management and its payback has been modest, at best. It must be recognized that demand side management for the most part is simply a tool for altering the end user's utilization pattern, and hopefully creating greater system diversity, lower peak load demands, and higher load factor. I would agree that such a program needs to be part of the overall economic evaluation, retail pricing signals, and tools utilized by a utility for its total asset management strategic planning and generation and fuel utilization planning in its overall power supply picture. I do not believe demand side management should be used as a mechanism for eliminating needed transmission system capacity and reliability. Conversely, I do believe DG has a very real role. Just as utilities install peaking generation, such as simple cycle gas turbines, to meet the short term peaking load requirements of their customers, DG can be judiciously and economically justified. DG also achieves a secondary benefit. Installing peaking generation on the supply side you are simply meeting the generation demand requirements of the customers. Utilizing DG on the customer side reduces the requirements for peaking capacity in your distribution lines, your substations, and your transmission lines. Furthermore, such additions can also provide for emergency backstand for the customer. There are, in fact, numerous customer loads that already have DG

installed. Although an overall DG program is much like a demand side management program, and requires substantial time to develop, it is a tool that should be evaluated, including evaluating the existing level of DG at large commercial and industrial loads, such as hospitals, that could be utilized to reduce peak load requirements, particularly to defer expensive construction projects. As I have previously indicated in my earlier testimony, I do not agree with Narragansett Electric's statement that there would be more DG if the market dictated. I do not find there have been market studies performed, and it does not appear that there has been any effort to create pricing signals in the retail rates that would encourage either the installation of DG or the utilization of existing DG for the purpose of peak load reduction. DG is certainly not a solution to the proposed transmission project being considered under Docket No. 3732. It is an item which should be included in future Narragansett Electric transmission and distribution studies to provide for meaningful economic evaluation and consideration of future long range capacity expansion needs.

Q. Are you familiar with The Narragansett Electric study process and would comment on your opinion of that process?

A. I am very familiar with the Narragansett Electric study process including its Asset Management Strategic Plan process, study process, and feeder health analysis and screening tools as a result of years of involvement in the reliability assessment project for the Division. Narragansett Electric in its study process followed the customary industry methodology. Additionally, its utilizes screening tools and a feeder health analysis which is superior to most of the electric utilities

with whom I am familiar in the 40 states I have been involved. I would characterize its commitment to reliability and asset management as above average. The study procedures, analysis methods and sensitivity assessment described in this filing and the attached studies is consistent with the comprehensive nature of prior processes I have evaluated. The approach at the analysis was appropriate and evaluated a broad range of alternatives and iterations of each alternative. I have satisfied myself that the studies are correct and complete with the few exceptions I have outlined through out my testimony. The exceptions I note do not however change the final decision on which alternative results in the preferred selected plan.

Q. Would it be fair to summarize your testimony concerning the proposed transmission project and alternatives, by stating that you have evaluated the projects and have some differing opinions with Narragansett Electric in regard to details, however, your final conclusion is that you concur with Narragansett Electric concerning the selection of the proposed plan for the transmission system upgrade and distribution system expansion including the Tower Hill Substation?

A. Yes. I believe a solution is required now, and the transmission upgrades, as proposed by Narragansett Electric, are the appropriate and economical solution to meet the immediate and future needs in southern Rhode Island. It would appear that the load growth in southwestern Rhode Island has historically been higher than that projected in the Final Report of the Transmission Study. Indeed, the 2003 update in the forecast for southwest Rhode Island and

southeast Connecticut shows a significant increase over the estimates provided two years prior, in 2001. Additionally, the Tower Hill Substation and associated projects are the appropriate solution for the needed system capacity and reliability enhancement to the distribution system. I have carefully evaluated the project purpose and need. My analysis of the Narragansett Electric filing and data concludes that the proposed preferred plan is the appropriate plan selection to accommodate the immediate and future needs as identified.

CONCLUSION

Q. Does this complete your testimony?

A. Yes.

EXHIBIT
GLB - 1

CURRICULUM VITAE

GREGORY L. BOOTH, PE, PLS
President
Gregory L. Booth, PLLC

RESUME

Gregory L. Booth is a registered professional engineer with engineering, financial, and management services experience in the areas of utilities, industry private businesses and forensic investigation. He has been representing over 300 clients in some 38 states for more than 41 years.

Mr. Booth has been accepted as an expert before state and federal regulatory agencies. He has been accepted as an expert in both state and federal courts. Investigation and testimony experience includes areas of wholesale and retail rates, territorial disputes, electric service reliability, right-of-way acquisition and impact of electromagnetic fields and evaluation of transmission line options for utility commissions. Additionally, Mr. Booth has extensive experience serving as an expert witness before state and federal courts on matters including property damage, forensic evaluation, fire investigations, fatality, and areas of electric facility disputes and Occupational, Safety and Health Administration violations and investigations together with National Electric Code and National Electrical Safety Code and Industry Standard compliance.

The following pages provided are the education and experience from 1963 through the present. Also included are courses taught, publications and a list of cases from 1981 to present.

Resume

GREGORY L. BOOTH, PE, PLS

Mr. Booth is a Registered Professional Engineer with engineering, financial, and management experience assisting local, state, and federal governmental units; rural electric and telephone cooperatives; investor owned utilities, industrial customers and privately owned businesses. He has extensive experience representing clients as an expert witness in regulatory proceedings, private negotiations, and litigation.

PROFESSIONAL EDUCATION:

NORTH CAROLINA STATE UNIVERSITY; Raleigh NC, Bachelor of Science, Electrical Engineering, 1969

REGISTRATIONS:

Registered as Professional Engineer in Alabama, Arizona, Connecticut, Georgia, Florida, Maryland, New Jersey, North Carolina, Minnesota, Pennsylvania, Rhode Island, South Carolina, Virginia

Professional Land Surveyor in North Carolina

Council Record with National Council of Examiners for Engineering and Surveying

EXPERIENCE:

1963-1967
Technician
Booth & Associates

Transmission surveying and design assistance, substation design assistance; distribution staking; construction work plan, long-range plan, and sectionalizing study preparation assistance for many utilities, including Cape Hatteras EMC, Halifax EMC, Delaware Electric Cooperative, Prince George Electric Cooperative, A&N Electric Cooperative; assistance generation plant design, start-up, and evaluations.

1967-1973
Project Engineer
Booth & Associates

Transmission line and substation design; distribution line design; long-range and construction work plans; rate studies in testimony before State and Federal commissions; power supply negotiations; all other facets of electrical engineering for utility systems and over 30 utilities in 10 states.

1973-1975
Professional Engineer
Booth & Associates
1975-1994
Executive Vice President
Booth & Associates

Directed five departments of Booth & Associates, Inc.; provided engineering services to electric cooperatives and other public power utilities in 23 states; provided expert testimony before state regulatory commissions on rates and reliability issues; in accident investigations and tort proceedings; transmission line routing and designs; generation plant designs; preparation and presentation of long-range and construction work plans; relay and sectionalizing studies; relay design and field start-up assistance; generation plant designs; rate and cost-of-service studies; reliability studies and analyses; filed testimony, preparation and teaching of seminars;

	preparation of nationally published manuals; numerous special projects for statewide organizations, including North Carolina EMC. Work was provided to over 130 utility clients in 23 states, PWC of the City of Fayetteville, NC, Cities of Wilson, Rocky Mount and Greenville are among the utilities in which I have provided engineering services in North Carolina during this time frame. Services to industrial customers include Texfi Industries, Bridgestone Firestone, Inc and many others.
1994-2004 President Booth & Associates	Responsible for the direction of the engineering and operations of Booth & Associates, Inc. for all divisions and departments. The engineering work during this time frame has continued to be the same as during 1974 through 1993 with the addition of greater emphasis on power supply issues, including negotiating power supply contracts for clients; increased involvement in peaking generation projects; development of joint transmission projects, including wheeling agreements, power supply analyses, and power audit analyses. The work during this time frame includes providing services to over 200 utility clients across the United States, including NCEMC and NRECA.
2004-Present President Gregory L. Booth, PLLC	Providing engineering and management services to the electric industry, including planning and design. Providing forensic engineering, product evaluation, fire investigations and accident investigation, serve as an expert witness in state and federal regulatory matters and state and federal court.

WORK AND EXPERTISE:

Electric Utilities: (more than 300 clients)

- System studies, including long-range and short-range planning, sectionalizing studies, transmission load flow studies, system stability studies (including effects of imbalance and neutral-to-earth voltage), environmental analyses and impact studies and statements, construction work plan, power requirements studies, and feasibility studies.
- Fossil and hydro generation plan analysis, design, and construction observation.
- Transmission line design and construction observation through 230 kV overhead and underground.
- Switching station and substation design and construction observation through 230 kV.
- Distribution line design and staking, overhead and underground.
- Design of submarine cable installations.

- Supervisory control and data acquisition system design, installation and operation assistance.
- Load management system design, installation and operation assistance.
- Computer program development.
- Load research and alternative energy source evaluation.
- Field inspection, wiring, and testing of facilities.
- Relay and energy control center design.
- Mapping.
- Specialized grounding for abnormal lightning conditions.
- Ground potential rise protection.
- Protective system/relay coordination.

TELECOMMUNICATION: UTILITIES:

- Subscriber and trunk carrier facilities design.
- Stand-by generation and DC power supplies
- DC-AC inverters for interrupted processor supplies.
- Plant design and testing.
- Fiber optics and other transmission media.
- Microwave design.

FINANCIAL SERVICES:

- Long-term growth analyses and venture analyses.
- Lease and cost/benefit analyses.
- Capital planning and management.
- Utility rate design and service regulations.
- Cost-of-Service studies.
- Franchise agreements.
- Corporate accounting assistance.

FORENSIC ENGINEERING:

- Compliance with NESC, NEC, OSHA other codes and industry standard.
- Equipment and product failure and analysis and electrical accident investigation.
- Stray voltage, electrical shocking, and electrocution investigations.
- Building code investigations.
- New product evaluation.

INDUSTRIAL/ELECTRICAL ENGINEERING:

- Building design (commercial and industrial).
- Building code application and investigation.
- Electric thermal storage designs for heating, cooling, and hot water.
- Standby generation and peaking generation design

INSTRUCTIONAL SEMINARS AND TEXT:

- Courses taught on National Electrical Safety Code and National Electrical Code.

- Courses taught on Distribution System Power Loss Evaluation.
- Courses taught on Distribution System Protection.
- Text prepared on Distribution System Power Loss Management.
- Text prepared on Distribution System Protection.
- Seminars taught on substation design, NESC capacitor application, current limiting fuses, arresters, and many others electrical engineering subjects.
- Courses taught on accident investigations and safety.

TESTIMONY AS AN EXPERT:

- Concerning rate and other regulatory issues before Federal Energy Regulatory Commission and state commissions in North Carolina, Virginia, Delaware, New Jersey, Pennsylvania, Rhode Island, and Minnesota.
- Concerning property damage or personal injury before courts in Maryland, Minnesota, North Carolina, Virginia, West Virginia, Wisconsin, New York, South Carolina, Texas and Pennsylvania.

FIELD ENGINEERING:

- Transmission line survey.
- Distribution line staking.
- Property surveying.
- Relay and recloser testing.
- Substation start-up testing.
- Generation acceptance and start-up testing.
- Ground resistivity testing.
- Work order inspections.
- Operation and maintenance surveys.

PROFESSIONAL ORGANIZATIONS:

a. National Society of Professional Engineers
b. Associate Member of the NRECA
c. Professional Engineers of North Carolina
d. The Institute of Electrical and Electronics Engineers (Distribution sub-committee members on reliability)
e. American Public Power Association
f. Municipal Electric Power Association of Virginia
g. American Standards and Testing Materials Association
h. National Council of Examiners for Engineering & Surveying

EXHIBIT
GLB - 2

CONSTRUCTION COST ESTIMATE
115 KV TRANSMISSION

Construction Cost Estimate

Owner: Narragansett Electric Company	**Date:**	**5/31/2006**
Facility: L190 115 kV Transmission Line	**Est. By:**	**GLB**
Project: 5.3 Miles Reconductoring (Kent County to Old Baptist Road Tap)	**Project No.:**	**RIDPUC Docket 3732**
Description: Study Grade Cost Estimate for RIDPUC Docket 3732		

Line Item	Item or Construction Unit	Quantity	Unit of Measure	Labor Cost	Material Cost	Labor & Materials	Extended Cost
1.	**115 kV Installation - Single Circuit**					$0.00	$0.00
2	Poles (Direct Embedded Structures)	23	Each	$840.00	$2,500.00	$3,340.00	$76,820.00
3.	Poles (Structures w/Vibratory Caissons)		Each	$2,840.00	$12,500.00	$15,340.00	$0.00
4.	Poles (Surface Mounted w/ Foundations)		Each	$23,100.00	$35,000.00	$58,100.00	$0.00
5.	Pole Tops - Tangent & Light Angle	19	Each	$715.00	$1,775.00	$2,490.00	$47,310.00
6.	Pole Tops - Double Deadend	2	Each	$3,500.00	$1,500.00	$5,000.00	$10,000.00
7.	Static	11000	Feet	$0.80	$0.40	$1.20	$13,200.00
8.	Conductor	34000	Feet	$2.25	$2.25	$4.50	$153,000.00
9.	115 kV Transmission Switches	2	Each	$35,000.00	$40,000.00	$75,000.00	$150,000.00
10.	Right-of-Way Clearing	2	Acres	$7,000.00	$0.00	$7,000.00	$14,000.00
11.	**115 kV Installation - Double Circuit**					$0.00	$0.00
12.	Poles (Direct Embedded Structures)		Each	$840.00	$2,500.00	$3,340.00	$0.00
13.	Poles (Structures w/Vibratory Caissons)		Each	$2,840.00	$12,500.00	$15,340.00	$0.00
14.	Poles (Surface Mounted w/ Foundations)		Each	$23,100.00	$35,000.00	$58,100.00	$0.00
15.	Pole Tops - Tangent & Light Angle	40	Each	$420.00	$900.00	$1,320.00	$52,800.00
16.	Pole Tops - Double Deadend		Each	$3,500.00	$1,500.00	$5,000.00	$0.00
17.	Static	36600	Feet	$0.80	$0.40	$1.20	$43,920.00
18.	Conductor	55000	Feet	$2.25	$2.25	$4.50	$247,500.00
19.	Conductor	55000	Feet	$3.22	$3.22	$6.44	$354,200.00
20.	115 kV Transmission Switches		Each	$35,000.00	$40,000.00	$75,000.00	$0.00
21.	Right-of-Way Clearing	3	Acres	$7,000.00	$0.00	$7,000.00	$21,000.00
22.						$0.00	$0.00
23.	Removal Costs	1	Lot	$368,000.00	$0.00	$368,000.00	$368,000.00
24.	Access Improvements	1	Lot	$25,000.00	$0.00	$25,000.00	$25,000.00
25.	Environmental Compliance	1	Lot	$25,000.00	$0.00	$25,000.00	$25,000.00
26.	Switching & Grounding	1	Lot	$25,000.00	$0.00	$25,000.00	$25,000.00
27.	Permitting & Licensing	1	Lot	$212,000.00	$0.00	$212,000.00	$212,000.00
28.						$0.00	$0.00
29.						$0.00	$0.00
30.						$0.00	$0.00

Notes:

Estimate assumes no distribution underbuild.

Subtotal - Construction w/o contingencies	$1,838,750.00
Engineering & Project Management (15%)	$275,812.50
Project Subtotal	$2,114,562.50
25 % Contigencies	$528,640.63
Project Total	$2,643,203.13

Construction Cost Estimate

Owner: Narragansett Electric Company	**Date:**	**5/31/2006**
Facility: L190 115 kV Transmission Line	**Est. By:**	**GLB**
Project: 12.3 Mile Extension (Old Baptist Road Tap Point to West Kingston Substation)	**Project No.:**	**RIDPUC Docket 3732**
Description: Study Grade Cost Estimate for RIDPUC Docket 3732		

Line Item	Item or Construction Unit	Quantity	Unit of Measure	Labor Cost	Material Cost	Labor & Materials	Extended Cost
1.	**115 kV Installation - Single Circuit**					$0.00	$0.00
2	Poles (Direct Embedded Structures)	118	Each	$840.00	$2,500.00	$3,340.00	$394,120.00
3.	Poles (Structures w/Vibratory Caissons)	10	Each	$2,840.00	$12,500.00	$15,340.00	$153,400.00
4.	Poles (Surface Mounted w/ Foundations)	20	Each	$23,100.00	$35,000.00	$58,100.00	$1,162,000.00
5.	Pole Tops - Tangent & Light Angle	128	Each	$715.00	$1,775.00	$2,490.00	$318,720.00
6.	Pole Tops - Double Deadend	20	Each	$3,500.00	$1,500.00	$5,000.00	$100,000.00
7.	Static	73800	Feet	$0.80	$0.40	$1.20	$88,560.00
8.	Conductor	209100	Feet	$1.60	$1.60	$3.20	$669,120.00
9.	115 kV Transmission Switches	2	Each	$35,000.00	$40,000.00	$75,000.00	$150,000.00
10.	Right-of-Way Clearing	61	Acres	$7,000.00	$0.00	$7,000.00	$427,000.00
11.	Removal Costs		Lot	$0.00	$0.00	$0.00	$0.00
12.	Access Improvements	1	Lot	$125,000.00	$0.00	$125,000.00	$125,000.00
13.	Environmental Compliance	1	Lot	$185,000.00	$0.00	$185,000.00	$185,000.00
14.	Switching & Grounding	1	Lot	$60,000.00	$0.00	$60,000.00	$60,000.00
15.	Permitting & Licensing	1	Lot	$492,000.00	$0.00	$492,000.00	$492,000.00
16.						$0.00	$0.00
17.						$0.00	$0.00
18.						$0.00	$0.00
19.						$0.00	$0.00
20.						$0.00	$0.00
21.						$0.00	$0.00
22.						$0.00	$0.00
23.						$0.00	$0.00
24.						$0.00	$0.00
25.						$0.00	$0.00
26.						$0.00	$0.00
27.						$0.00	$0.00
28.						$0.00	$0.00
29.						$0.00	$0.00
30.						$0.00	$0.00

Notes:

Estimate assumes no distribution underbuild.

Subtotal - Construction w/o contingencies	$4,324,920.00
Engineering & Project Management (15%)	$648,738.00
Project Subtotal	$4,973,658.00
25 % Contigencies	$1,243,414.50
Project Total	$6,217,072.50

Construction Cost Estimate

Owner: Narragansett Electric Company	**Date:**	**5/31/2006**
Facility: 1870N 115 kV Transmission Line	**Est. By:**	**GLB**
Project: 4.3 Miles Reconductoring (West Kingston to Kenyon)	**Project No.:**	**RIDPUC Docket 3732**
Description: Study Grade Cost Estimate for RIDPUC Docket 3732		

Line Item	Item or Construction Unit	Quantity	Unit of Measure	Labor Cost	Material Cost	Labor & Materials	Extended Cost
1.	**115 kV Installation - Single Circuit**					$0.00	$0.00
2	Poles (Direct Embedded Structures)	80	Each	$840.00	$2,500.00	$3,340.00	$267,200.00
3.	Poles (Structures w/Vibratory Caissons)	20	Each	$2,840.00	$12,500.00	$15,340.00	$306,800.00
4.	Poles (Surface Mounted w/ Foundations)	2	Each	$23,100.00	$35,000.00	$58,100.00	$116,200.00
5.	Pole Tops - Tangent & Light Angle	57	Each	$715.00	$1,775.00	$2,490.00	$141,930.00
6.	Pole Tops - Double Deadend	1	Each	$3,500.00	$1,500.00	$5,000.00	$5,000.00
7.	Static	48000	Feet	$0.80	$0.40	$1.20	$57,600.00
8.	Conductor	72000	Feet	$2.25	$2.25	$4.50	$324,000.00
9.	115 kV Transmission Switches		Each	$35,000.00	$40,000.00	$75,000.00	$0.00
10.	Right-of-Way Clearing	65	Acres	$1,000.00	$0.00	$1,000.00	$65,000.00
11.						$0.00	$0.00
12.						$0.00	$0.00
13.						$0.00	$0.00
14.						$0.00	$0.00
15.						$0.00	$0.00
16.						$0.00	$0.00
17.						$0.00	$0.00
18.						$0.00	$0.00
19.						$0.00	$0.00
20.						$0.00	$0.00
21.						$0.00	$0.00
22.						$0.00	$0.00
23.	Removal Costs	1	Lot	$383,000.00	$0.00	$383,000.00	$383,000.00
24.	Access Improvements	1	Lot	$25,000.00	$0.00	$25,000.00	$25,000.00
25.	Environmental Compliance	1	Lot	$25,000.00	$0.00	$25,000.00	$25,000.00
26.	Switching & Grounding	1	Lot	$25,000.00	$0.00	$25,000.00	$25,000.00
27.	Permitting & Licensing	1	Lot	$172,000.00	$0.00	$172,000.00	$172,000.00
28.						$0.00	$0.00
29.						$0.00	$0.00
30.						$0.00	$0.00

Notes:

Estimate assumes no distribution underbuild.

Subtotal - Construction w/o contingencies	$1,913,730.00
Engineering & Project Management (15%)	$287,059.50
Project Subtotal	$2,200,789.50
25 % Contigencies	$550,197.38
Project Total	$2,750,986.88

Construction Cost Estimate

Owner: Narragansett Electric Company	**Date:**	**5/31/2006**
Facility: 1870 115 kV Transmission Line	**Est. By:**	**GLB**
Project: 3.9 Miles Reconductoring (Kenyon to Wood River)	**Project No.:**	**RIDPUC Docket 3732**
Description: Study Grade Cost Estimate for RIDPUC Docket 3732		

Line Item	Item or Construction Unit	Quantity	Unit of Measure	Labor Cost	Material Cost	Labor & Materials	Extended Cost
1.	**115 kV Installation - Single Circuit**					$0.00	$0.00
2	Poles (Direct Embedded Structures)	90	Each	$840.00	$2,500.00	$3,340.00	$300,600.00
3.	Poles (Structures w/Vibratory Caissons)		Each	$2,840.00	$12,500.00	$15,340.00	$0.00
4.	Poles (Surface Mounted w/ Foundations)		Each	$23,100.00	$35,000.00	$58,100.00	$0.00
5.	Pole Tops - Tangent & Light Angle	45	Each	$715.00	$1,775.00	$2,490.00	$112,050.00
6.	Pole Tops - Double Deadend		Each	$3,500.00	$1,500.00	$5,000.00	$0.00
7.	Static	43500	Feet	$0.80	$0.40	$1.20	$52,200.00
8.	Conductor	65000	Feet	$2.25	$2.25	$4.50	$292,500.00
9.	115 kV Transmission Switches		Each	$35,000.00	$40,000.00	$75,000.00	$0.00
10.	Right-of-Way Clearing	59	Acres	$1,000.00	$0.00	$1,000.00	$59,000.00
11.						$0.00	$0.00
12.						$0.00	$0.00
13.						$0.00	$0.00
14.						$0.00	$0.00
15.						$0.00	$0.00
16.						$0.00	$0.00
17.						$0.00	$0.00
18.						$0.00	$0.00
19.						$0.00	$0.00
20.						$0.00	$0.00
21.						$0.00	$0.00
22.						$0.00	$0.00
23.	Removal Costs	1	Lot	$262,000.00	$0.00	$262,000.00	$262,000.00
24.	Access Improvements	1	Lot	$25,000.00	$0.00	$25,000.00	$25,000.00
25.	Environmental Compliance	1	Lot	$25,000.00	$0.00	$25,000.00	$25,000.00
26.	Switching & Grounding	1	Lot	$25,000.00	$0.00	$25,000.00	$25,000.00
27.	Permitting & Licensing	1	Lot	$156,000.00	$0.00	$156,000.00	$156,000.00
28.						$0.00	$0.00
29.						$0.00	$0.00
30.						$0.00	$0.00

Notes:

Estimate assumes no distribution underbuild.

Subtotal - Construction w/o contingencies	$1,309,350.00
Engineering & Project Management (15%)	$196,402.50
Project Subtotal	$1,505,752.50
25 % Contigencies	$376,438.13
Project Total	$1,882,190.63

Construction Cost Estimate

Owner: Narragansett Electric Company	**Date:**	**5/31/2006**
Facility: Tower Hill Tap 115 kV Transmission Lines	**Est. By:**	**GLB**
Project: 0.75 Miles of Parallel Single Circuit Transmission	**Project No.:**	**RIDPUC Docket 3732**
Description: Study Grade Cost Estimate for RIDPUC Docket 3732		

Line Item	Item or Construction Unit	Quantity	Unit of Measure	Labor Cost	Material Cost	Labor & Materials	Extended Cost
1.	**115 kV Installation - Single Circuit**					$0.00	$0.00
2	Poles (Direct Embedded Structures)	14	Each	$840.00	$2,500.00	$3,340.00	$46,760.00
3.	Poles (Structures w/Vibratory Caissons)		Each	$2,840.00	$12,500.00	$15,340.00	$0.00
4.	Poles (Surface Mounted w/ Foundations)	6	Each	$23,100.00	$35,000.00	$58,100.00	$348,600.00
5.	Pole Tops - Tangent & Light Angle	14	Each	$715.00	$1,775.00	$2,490.00	$34,860.00
6.	Pole Tops - Double Deadend	4	Each	$3,500.00	$1,500.00	$5,000.00	$20,000.00
7.	Static	8400	Feet	$0.80	$0.40	$1.20	$10,080.00
8.	Conductor	12500	Feet	$1.60	$1.60	$3.20	$40,000.00
9.	115 kV Transmission Switches		Each	$35,000.00	$40,000.00	$75,000.00	$0.00
10.	Right-of-Way Clearing	5	Acres	$7,000.00	$0.00	$7,000.00	$35,000.00
11.						$0.00	$0.00
12.						$0.00	$0.00
13.						$0.00	$0.00
14.						$0.00	$0.00
15.						$0.00	$0.00
16.						$0.00	$0.00
17.						$0.00	$0.00
18.						$0.00	$0.00
19.						$0.00	$0.00
20.						$0.00	$0.00
21.						$0.00	$0.00
22.						$0.00	$0.00
23.	Removal Costs		Lot	$0.00	$0.00	$0.00	$0.00
24.	Access Improvements	1	Lot	$25,000.00	$0.00	$25,000.00	$25,000.00
25.	Environmental Compliance	1	Lot	$25,000.00	$0.00	$25,000.00	$25,000.00
26.	Switching & Grounding	1	Lot	$25,000.00	$0.00	$25,000.00	$25,000.00
27.	Permitting & Licensing	1	Lot	$60,000.00	$0.00	$60,000.00	$60,000.00
28.						$0.00	$0.00
29.						$0.00	$0.00
30.						$0.00	$0.00

Notes:

Estimate assumes no distribution underbuild.

Subtotal - Construction w/o contingencies	$670,300.00
Engineering & Project Management (15%)	$100,545.00
Project Subtotal	$770,845.00
25 % Contigencies	$192,711.25
Project Total	$963,556.25

Construction Cost Estimate

Owner: Narragansett Electric Company	**Date:**	**5/31/2006**
Facility: Southern Rhode Island Transmission Improvements	**Est. By:**	**GLB**
Project: Transmission Cost Estimate Summary	**Project No.:**	**RIDPUC Docket 3732**
Description: Study Grade Cost Estimate for RIDPUC Docket 3732		

Line Item	Description of Project	Estimated Project Cost
1.	Reconductor 5.3 Miles of Existing L-190 115 kV Transmission Line from Kent County Substation to the Old Baptist Road Tap	$2,643,203.13
2	Construct New 12.3 Mile Extension of L-190 115 kV Transmission Line from the Old Baptist Road Tap Point to the West Kingston Substation	$6,217,072.50
3	Reconductor 4.3 Miles of Existing 1870N 115 kV Transmission Line from the West Kingston Substation to the Kenyon Substation	$2,750,986.88
4	Reconductor 3.9 Miles of Existing 1870 115 kV Transmission Line from the Kenyon Substation to the Wood River Substation	$1,882,190.63
5	Construct Two New 0.75 Mile Tap Lines to Tower Hill Substation	$963,556.25
Total Transmission Improvement Costs		**$14,457,009.38**

EXHIBIT
GLB - 3

CONSTRUCTION COST ESTIMATE
115 KV SUBSTATION AND
DISTRIBUTION OPTIONS

Gregory L. Booth, PLLC

Construction Cost Estimate

Owner: Narragansett Electric Company	**Date:**	**5/31/2006**
Facility: Tower Hill Substation	**Est. By:**	**GLB**
Project: 33 MVA 115 kV to 12 kV Substation	**Project No.:**	**RIDPUC Docket 3732**
Description: Study Grade Cost Estimate for RIDPUC Docket 3732		

Line Item	Item or Construction Unit	Quantity	Unit of Measure	Labor Cost	Material Cost	Labor & Materials	Extended Cost
1.	Property Purchase		Acre				
2	Clearing	2	Acre	$50,000.00	$0.00	$50,000.00	$100,000.00
3.	Grading+Road entrance	2.3	Acre	$150,000.00	$50,000.00	$200,000.00	$460,000.00
4.	Landscaping	1	Lot	$25,000.00	$25,000.00	$50,000.00	$50,000.00
5.	Fencing	810	Feet	$15.00	$25.00	$40.00	$32,400.00
6.	Foundations	500	Cu. Yard	$250.00	$500.00	$750.00	$375,000.00
7.	Structures and Equipment	1	Lot	$250,000.00	$200,000.00	$450,000.00	$450,000.00
8.	Substation Transformer (3 Ph,33/44/55 MVA)	2	Each	$25,000.00	$990,000.00	$1,015,000.00	$2,030,000.00
9.	Voltage Regulators (1 Ph, 333 kVA)	9	Each	$2,500.00	$10,922.00	$13,422.00	$120,798.00
10.	Bus Breaker (12 kV,2000 A)	2	Each	$1,500.00	$27,000.00	$28,500.00	$57,000.00
11.	Feeder Breaker (12 kV, 1200 A)	4	Each	$1,500.00	$24,600.00	$26,100.00	$104,400.00
12.	Fault Interrupter (115 kV)	2	Each	$1,800.00	$60,000.00	$61,800.00	$123,600.00
13.	Relay Panel	2	Each	$10,000.00	$35,000.00	$45,000.00	$90,000.00
14.	Control House	1	Each	$15,900.00	$56,000.00	$71,900.00	$71,900.00
15.	Cable Trench/Conduit System	1	Lot	$15,000.00	$20,000.00	$35,000.00	$35,000.00
16.	Control Cable & Wiring	1	Lot	$15,000.00	$15,000.00	$30,000.00	$30,000.00
17.	Batteries & Charger	1	Lot	$3,500.00	$12,500.00	$16,000.00	$16,000.00
18.	Station Service Transformer	1	Each	$250.00	$800.00	$1,050.00	$1,050.00
19.	Station Service Panels	2	Lot	$3,800.00	$4,900.00	$8,700.00	$17,400.00
20.	Grounding	1	Lot	$12,000.00	$20,000.00	$32,000.00	$32,000.00
21.	Gravel Cover (3" C/R; 3" W/S)	100000	Sq. Feet	$0.18	$0.49	$0.67	$67,000.00
22.	Oil Containment System	1	Lot	$11,550.00	$16,800.00	$28,350.00	$28,350.00
23.	Circuit Exits to Fence (12 kV, Underground)	3	Each	$50,000.00	$150,000.00	$200,000.00	$600,000.00
24.	6-Way Duct Bank	2600	Feet	$18.00	$45.00	$63.00	$163,800.00
25.	9-Way Duct Bank	600	Feet	$22.00	$60.00	$82.00	$49,200.00
26.	Capacitor Banks (7.2 MVAR Bank)	2	each	$15,000.00	$75,000.00	$90,000.00	$180,000.00
27.	Monitoring Wells	3	Each	$10,000.00	$5,000.00	$15,000.00	$45,000.00
28.	Manholes	2	Each	$15,000.00	$15,000.00	$30,000.00	$60,000.00
29.							
30.							

Subtotal - Construction w/o contingencies	$5,389,898.00
Engineering & Project Management (15%)	$808,484.70
Project Subtotal	$6,198,382.70
25 % Contigencies	$1,549,595.68
Project Total	$7,747,978.38

Construction Cost Estimate

Owner: Narragansett Electric Company	**Date:**	**5/31/2006**
Facility: West Kingston Substation	**Est. By:**	**GLB**
Project: 115 kV to 34.5 kV Substation	**Project No.:**	**RIDPUC Docket 3732**
Description: Study Grade Cost Estimate for RIDPUC Docket 3732		

Line Item	Item or Construction Unit	Quantity	Unit of Measure	Labor Cost	Material Cost	Labor & Materials	Extended Cost
1.	Property Purchase		Acre				
2	Clearing	0	Acre	$50,000.00	$0.00	$50,000.00	$0.00
3.	Grading+Road Relocatin	1.8	Acre	$150,000.00	$50,000.00	$200,000.00	$360,000.00
4.	Landscaping	0	Lot	$25,000.00	$25,000.00	$50,000.00	$0.00
5.	Fencing	650	Feet	$15.00	$25.00	$40.00	$26,000.00
6.	Foundations	350	Cu. Yard	$250.00	$500.00	$750.00	$262,500.00
7.	Structures and Equipment	2	Lot	$85,000.00	$175,000.00	$260,000.00	$520,000.00
8.	Gas Cicuit Breaker (35 kV)	1	Each	$10,000.00	$35,000.00	$45,000.00	$45,000.00
9.	Gas Cicuit Breaker (115 kV)	4	Each	$10,000.00	$75,000.00	$85,000.00	$340,000.00
10.	Disconnect Switches (115 kV)	24	Each	$2,500.00	$7,500.00	$10,000.00	$240,000.00
11.	Motor Operated Switches (115 kV)	2	Each	$4,500.00	$12,500.00	$17,000.00	$34,000.00
12.	Disconnect Switches (35 kV)	9	Each	$1,500.00	$3,000.00	$4,500.00	$40,500.00
13.	Relay Panel	2	Each	$10,000.00	$35,000.00	$45,000.00	$90,000.00
14.	Control House	0	Each	$15,900.00	$56,000.00	$71,900.00	$0.00
15.	Cable Trench/Conduit System	1	Lot	$15,000.00	$20,000.00	$35,000.00	$35,000.00
16.	Control Cable & Wiring	1	Lot	$15,000.00	$15,000.00	$30,000.00	$30,000.00
17.	Batteries & Charger	0	Lot	$3,500.00	$12,500.00	$16,000.00	$0.00
18.	Station Service Transformer	0	Each	$250.00	$800.00	$1,050.00	$0.00
19.	Station Service Panels	0	Lot	$3,800.00	$4,900.00	$8,700.00	$0.00
20.	Grounding	1	Lot	$12,000.00	$20,000.00	$32,000.00	$32,000.00
21.	Gravel Cover (3" C/R; 3" W/S)	100000	Sq. Feet	$0.18	$0.49	$0.67	$67,000.00
22.	Oil Containment System	0	Lot	$11,550.00	$16,800.00	$28,350.00	$0.00
23.	Circuit Exits to Fence (12 kV, Underground)	0	Each	$50,000.00	$150,000.00	$200,000.00	$0.00
24.	6-Way Duct Bank	0	Feet	$18.00	$45.00	$63.00	$0.00
25.	9-Way Duct Bank	0	Feet	$22.00	$60.00	$82.00	$0.00
26.	Capacitor Banks (7.2 MVAR Bank)	0	each	$15,000.00	$75,000.00	$90,000.00	$0.00
27.	Monitoring Wells	0	Each	$10,000.00	$5,000.00	$15,000.00	$0.00
28.	Manholes	0	Each	$15,000.00	$15,000.00	$30,000.00	$0.00
29.							
30.							

Subtotal - Construction w/o contingencies	$2,122,000.00
Engineering & Project Management (15%)	$318,300.00
Project Subtotal	$2,440,300.00
25 % Contigencies	$610,075.00
Project Total	$3,050,375.00

Construction Cost Estimate

Owner: Narragansett Electric Company	**Date:**	**5/31/2006**
Facility: Southern Rhode Island Transmission Improvements	**Est. By:**	**GLB**
Project: Substation Cost Estimate Summary	**Project No.:**	**RIDPUC Docket 3732**
Description: Study Grade Cost Estimate for RIDPUC Docket 3732		

Line Item	Description of Project	Estimated Project Cost
1.	Construct New Tower Hill Substation	$7,747,978.38
2	Expand and Modify West Kingston Substation	$3,050,375.00
3	Equipment additions at Kent County Substation	$100,000.00
4	Equipment additions at Kenyon Substation	$100,000.00
5	Equipment additions at Wood River Substation	$50,000.00
Total Substation Improvement Costs		**$11,048,353.38**

EXHIBIT
GLB - 4

EVALUATIONS OF PLANS

Transmission Alternatives

Exhibit GLB-4

Alternative	*Estimated Cost	**CPWRR	***Residual Value	Net CPWRR
1	18.20	31.19	8.50	22.69
2	21.80	27.41	10.60	16.81
3	105.10	205.40	44.10	161.30
4	155.70	250.09	74.50	175.59
5	87.40	170.81	36.70	134.11

All cost values in millions

Alternatives (Alternatives are Booth Ranking)

1) Narragansett Preferred Alternative
2) No Build- Reconductor G185S/ Install 115KV Capacitors
3) Underground- Solid Dielectric
4) 345 KV Alternative
5) 34.5 KV Alternative

1) **Assumes 2008 Future Value of 2005 dollars from Environmental Report- Volume I Table 4-2**
2) **Assumes 2008 Future Value of 2003 dollars from Environmental Report- Volume I Appendix A**
3) **Assumes 2008 Future Value of 2005 dollars from Environmental Report- Volume I Section 5**
4) **Assumes 2011 Future Value of 2003 dollars from Environmental Report- Volume I Appendix A**
5) **Assumes 2008 Future Value of 2005 dollars from Environmental Report- Volume I Table 5-5**

* **Cost excludes Tower Hill Substation and .75 mile 115 KV tap line**

** **CPWRR based on 30 years**

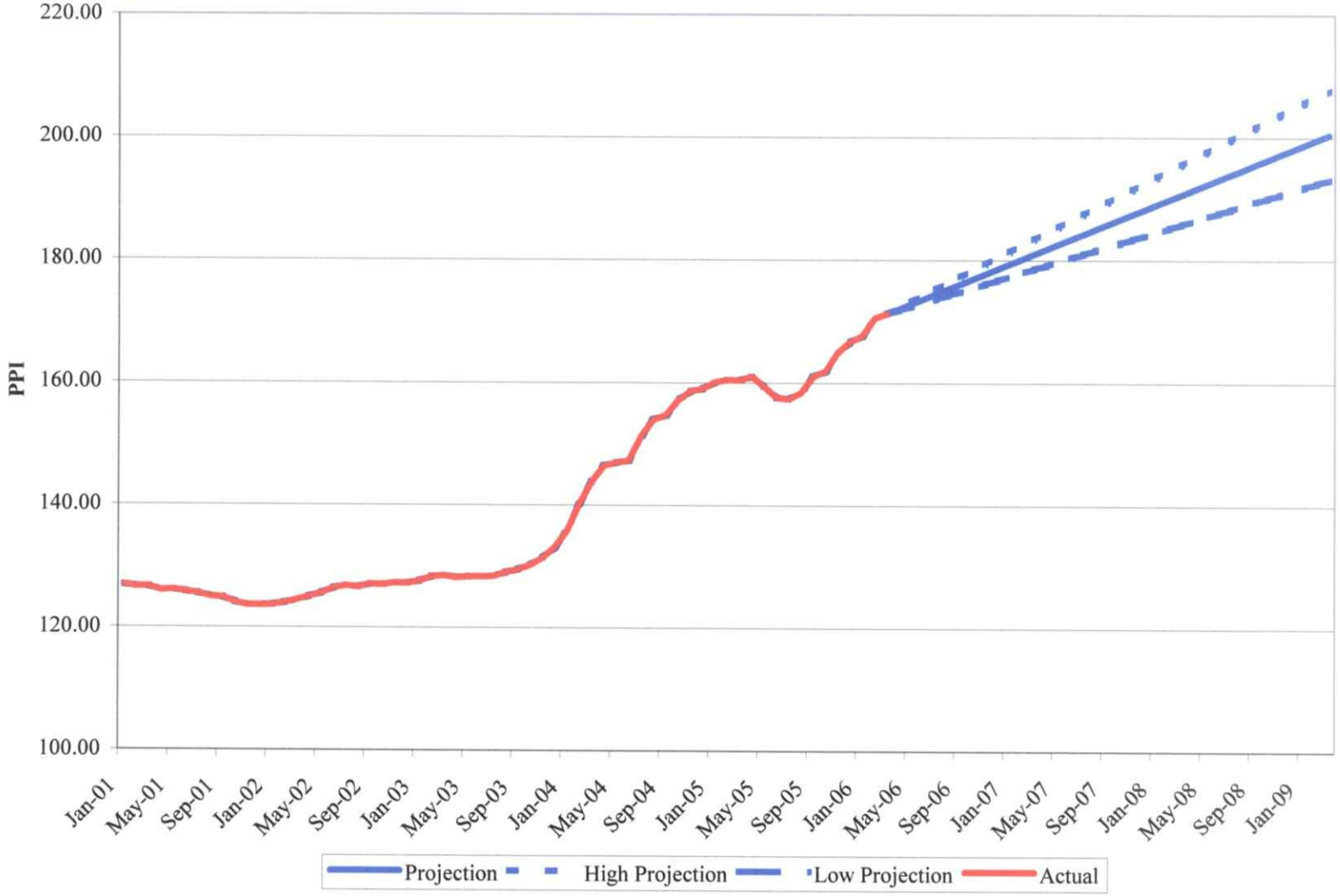
*** **Residual Value based on 50 year amortization after 30 years with the exception of capacitors in Alt. 2 which are fully depreciated after 20-years**

EXHIBIT
GLB - 5

PPI FOR METALS AND METAL PRODUCTS INDICES AND DISTILLATE FUEL OIL

Exhibit GLB-5
Sheet 1 of 2

Metals and Metal Products PPI



Distillate Fuel Oil PPI

Exhibit GLB-5
Sheet 2 of 2

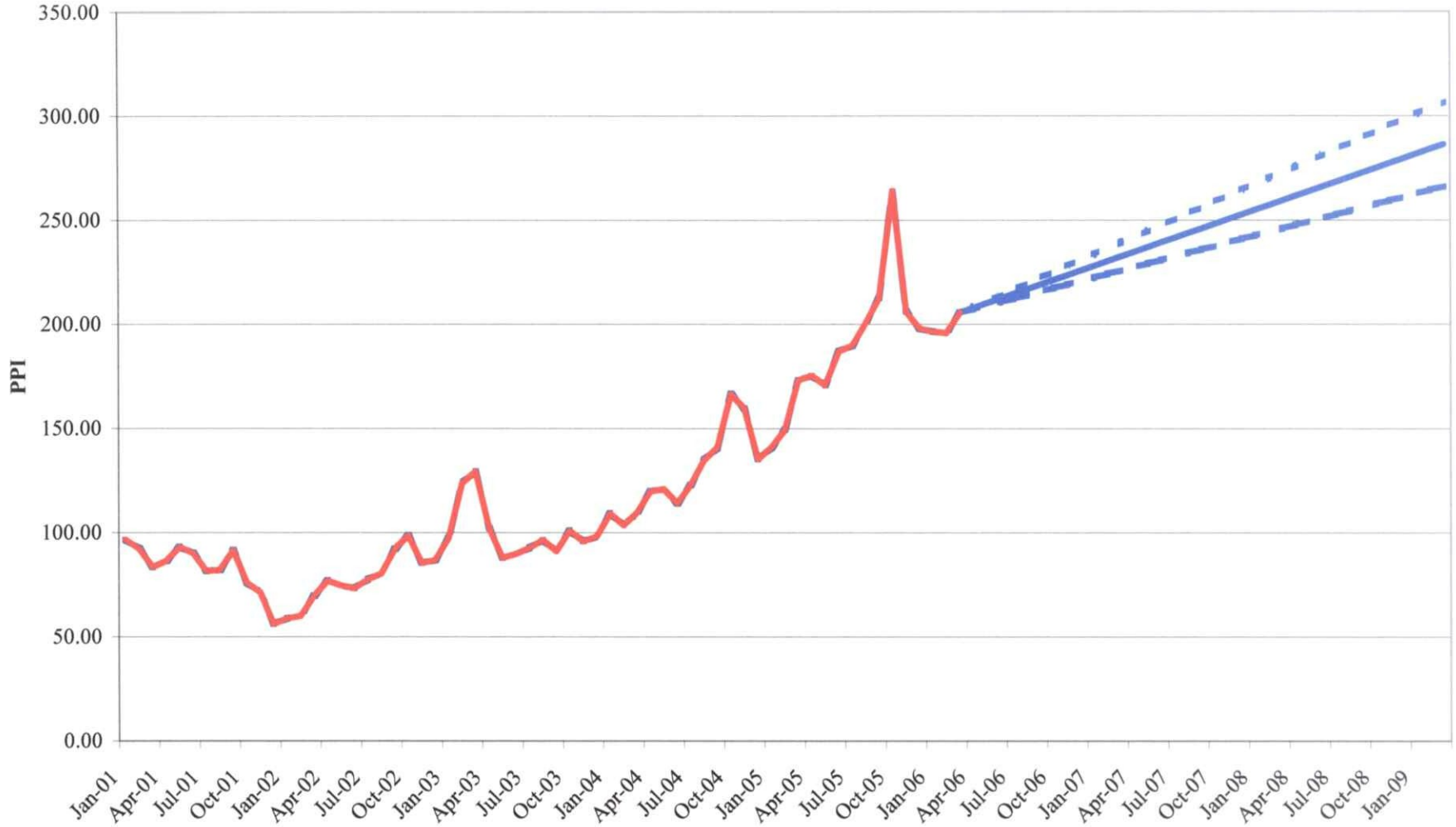


EXHIBIT
GLB - 6

PRESENT WORTH ANALYSIS

30 year Present Worth Analysis
Of Transmission Alternatives

Exhibit GLB-6
Sheet 1 of 2

	Narragansett Estimates		Booth Estimates			
Alternative	**Cost**	**CPWRR**	***Cost**	****CPWRR**	*****Residual Value**	**Net CPWRR**
1	16.25	27.85	18.20	31.19	8.50	22.69
2	16.30	20.50	21.80	27.41	10.60	16.81
3	83.45	163.09	105.10	205.40	44.10	161.30
4	108.10	173.63	155.70	250.09	74.50	175.59
5	78.00	152.44	87.40	170.81	36.70	134.11

All cost values in millions

Alternatives (Alternatives are Booth Ranking)

1) Narragansett Preferred Alternative
2) No Build- Reconductor G185S/ Install 115KV Capacitors
3) Underground- Solid Dielectric
4) 345 KV Alternative
5) 34.5 KV Alternative

1) **Assumes 2008 Future Value of 2005 dollars from Environmental Report- Volume I Table 4-2**
2) **Assumes 2008 Future Value of 2003 dollars from Environmental Report- Volume I Appendix A**
3) **Assumes 2008 Future Value of 2005 dollars from Environmental Report- Volume I Section 5**
4) **Assumes 2011 Future Value of 2003 dollars from Environmental Report- Volume I Appendix A**
5) **Assumes 2008 Future Value of 2005 dollars from Environmental Report- Volume I Table 5-5**

* **Cost excludes Tower Hill Substation and .75 mile 115 KV tap line**
** **CPWRR based on 30 years**
*** **Residual Value based on 50 year amortization after 30 years with the exception of capacitors in Alt. 2 which are fully depreciated after 20-years**

30 year Present Worth Analysis
Of Transmission Alternatives

Exhibit GLB-6

List of Assumptions

1. Escalation rates are applied to cost on the basis of 60% materials and 40% labor
2. For Alternatives 1,2, 4 and 5, material costs are escalated by a trended projection of US Bureau of Economic Analysis Metals and Metal Products PPI
3. For Alternative 3, material costs are escalated by a trended projection of US Bureau of Economic Analysis Distillate Fuel PPI
4. Due to the extreme volatility of fuel prices over the historical period, the Distillate Fuel PPI escalator for materials is based on a 12-month moving average of the US Bureau of Economic Analysis Distillate Fuel PPI.
5. A fixed charge rate of 17% is applied to cost to determine the return component of the revenue requirement with a separate calcalution for depreciation
6. Capital is depreciated over a 50-year life with the exception of capacitors in Alternative 2 which is depreciated over a 20-year life
7. A discount rate of 6% is used to determine present value
8. For Alternatives 1, 2, 3 and 5, a two-year construction window is used beginning in September 2006 for the major components of each alternative
9. For Alternative 4 a five-year construction window is used beginning in September 2006.
10. All prices are those used in the Narragansett Environmental Report escalated to account for the different construction windows.