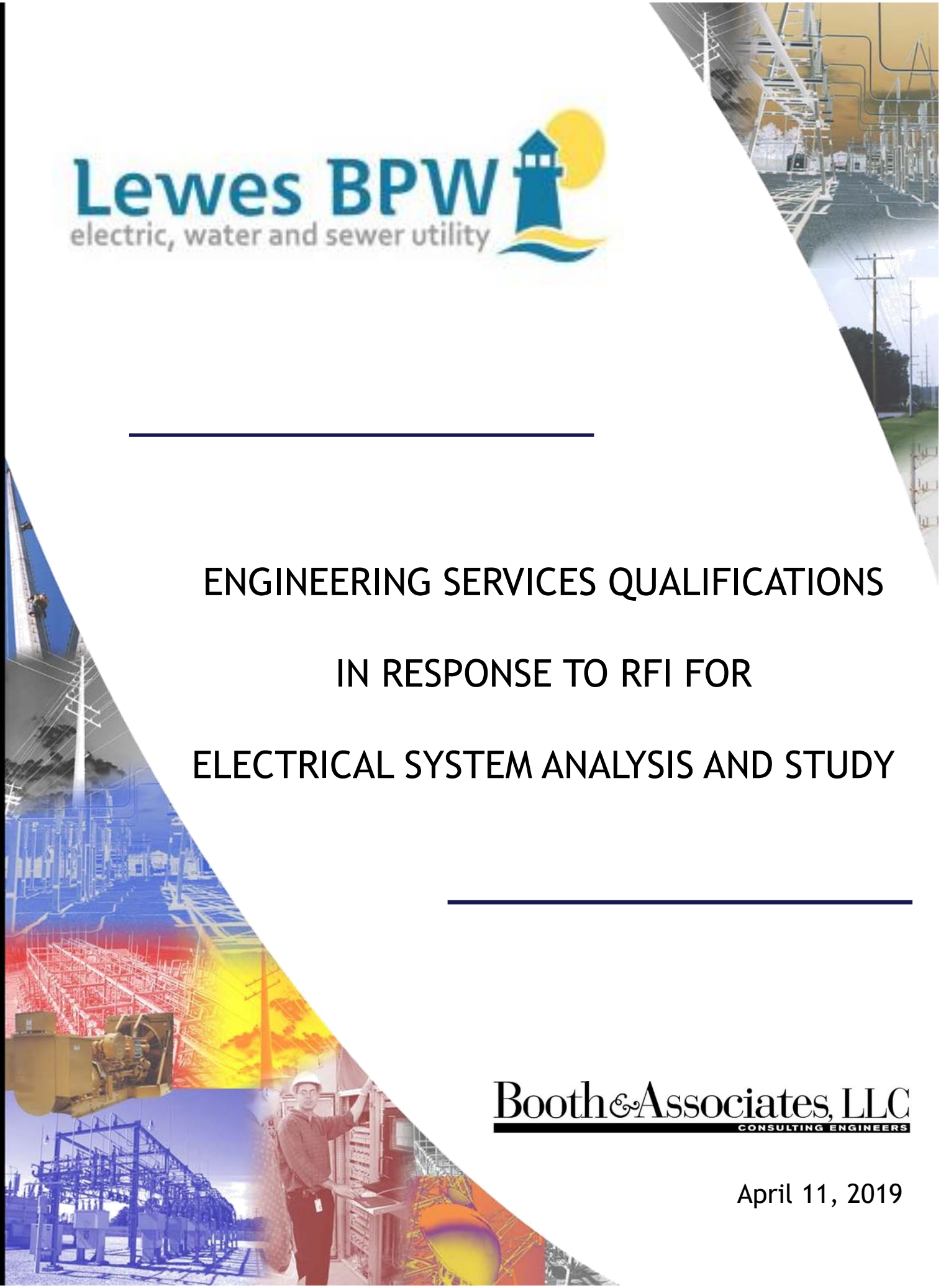
Lewes BPW
electric, water and sewer utility



ENGINEERING SERVICES QUALIFICATIONS

IN RESPONSE TO RFI FOR

ELECTRICAL SYSTEM ANALYSIS AND STUDY

Booth & Associates, LLC
CONSULTING ENGINEERS

April 11, 2019

ENGINEERING SERVICES QUALIFICATIONS

TO

LEWES BOARD OF PUBLIC WORKS

FOR AN

ELECTRICAL SYSTEM ANALYSIS AND STUDY

Booth & Associates, LLC
CONSULTING ENGINEERS

5811 Glenwood Avenue
Raleigh, NC 27612
919.851.8770
www.booth-assoc.com

Contact Persons: **William P. Jordan, PE**
Vice President – Planning, System Studies & Distribution Automation
(919) 851-8770 ext. 143
JordanWP@Booth-Assoc.com

Nathan B. Cooksey, EI
Project Manager
(919) 851-8770 ext. 149
CookseyNB@Booth-Assoc.com

 April 2019

TABLE OF CONTENTS

Transmittal Letter

Booth & Associates
CONSULTING ENGINEERS

Booth & Associates, LLC
CONSULTING ENGINEERS
engineering for the future since 1960

April 10, 2019

Mr. Darrin Gordon
General Manager
Lewes BPW
107 Franklin Avenue
Lewes, Delaware. 19958
dgordon@lewesbpw.com

Subject: Request for Information (RFI) for Lewes Board of Public Works Electric System Analysis and Study

Dear Mr. Gordon:

Booth & Associates, LLC appreciates the opportunity to submit this RFI for the preparation of an Electric System Analysis and Study for the Lewes Board of Public Works.

Our company's goal is to provide the Lewes Board of Public Works with professional engineering services, tailored specifically to your needs. The core project team to be assigned to this Electric System Analysis would be the same planning team that completed your 2003 Long-Range Plan and 2005 Long-Range Plan Update. We feel our experience and familiarity with your system will be beneficial in successful completion of a new Electric System Study. Booth & Associates, LLC employs a staff with 1,797 cumulative years of experience and provides utility engineering services to clients in 37 states, including 59 consecutive years to our first electric cooperative client.

We have almost 60 years of close-working relationships with municipal electric systems that affords a significant benefit to the Lewes Board of Public Works. The preparation of your Electric System Study will be a cooperative effort. Interactions between our project team and your engineering and operations staff will be assured to achieve the ultimate success of this project.

Additionally, Booth & Associates, LLC has supported numerous renewable energy projects over the last several years, approaching 5,000 MW. This includes primarily solar photovoltaic projects and energy storage integration projects. Our experience in investment analysis, system impact studies, and design of renewable applications will be applied to, and prove to be of great benefit for a new Electric System Analysis and Study.

5811 Glenwood Avenue 919.851.8770 office
Raleigh, NC 27612 919.859.5918 facsimile
www.booth-assoc.com

Should you have any questions or desire clarification associated with our submittal, please do not hesitate to call me (ext. 143), Nathan Cooksey (ext. 149), or other project team members, as we will all be actively involved in this planning process. Again, we greatly appreciate the opportunity to submit this RFI to the Lewes Board of Public Works and look forward to speaking with you in regards to our qualifications and thoughts for preparing you for the future. We are confident that we can provide the Lewes Board of Public Works with the guidance and quality you expect for a thorough and forward-thinking Electric System Analysis and Study.

Sincerely,

BOOTH & ASSOCIATES, LLC

William P. Jordan, PE

wpj/kpm

cc: Nathan B. Cooksey, EI

19-0005-0100

I

Company Information

Firm Name & Primary Project Contacts

Firm Experience

Firm Qualifications

Booth & Associates
CONSULTING ENGINEERS

Firm Name:

Booth & Associates, LLC

5811 Glenwood Avenue

Raleigh, North Carolina 27612

919.851.8770 (phone)

919.859.5918 (facsimile)

www.booth-assoc.com

Primary Contacts:

William P. Jordan, PE

Vice President – Planning, System Studies and Distribution Automation

919.851.8770 ext. 143

JordanWP@booth-assoc.com

Nathan B. Cooksey, EI

Project Manager

919.851.8770 ext. 149

CookseyNB@booth-assoc.com

State of Incorporation:

North Carolina

Delaware Licensing:

Business License No. 1989038494 **COA No. 288**

Firm Experience

Booth & Associates, LLC is a nationally-recognized consulting engineering corporation founded February 1, 1960 in North Carolina, providing professional engineering services to rural electric cooperatives and municipal electric systems. Our company began providing electrical consulting engineering services for electric cooperatives and municipal systems in North Carolina, Virginia, Delaware, Maryland and Pennsylvania. Over the years, we have expanded our service territory to an area from Florida to Maine, and as far west as Arizona. We are corporately registered in 40 states.

Booth has a staff of 100 employees, including 28 registered professionals. We believe that personal service is the key to quality consulting engineering and management services. Our clients know that they can rely on this principle, along with the incorporation of advanced technological concepts in the services we offer.

Booth & Associates, LLC has been conducting various planning studies for electric cooperatives and municipal systems for over 59 years. Over this time, we have amassed the personnel, reference material, computer software and expertise to perform long-range plans, construction work plans, sectionalizing studies, loss-evaluation studies, voltage / conductor optimization studies, and economic justification studies for all types of electric systems. We have authored various books, manuals and papers for national groups, such as NRECA, EPRI, and others on electric system planning, operation, economics and design methodologies.

Booth's experience authoring documents such as the "Distribution System Loss Management Manual," the "Underground Distribution System Design and Installation Guide," the "Underground Conduit / Duct Bank Design Guide," and the "Recloser Controls Selection Guide" for NRECA, and teaching courses on these subjects together with the National Electrical Safety Code **(**NESC), enhances our expertise in utility operation. Booth has been continually utilizing the WindMil® system engineering design software since 1988. Many of our staff engineers have backgrounds at municipal, cooperative and investor-owned utilities that round out our experience with a 'hands-on' approach. With this experience, we also offer 24 / 7 emergency services including assistance in storm restoration, substation relay calibration / troubleshooting and accident investigations.

Booth & Associates, LLC …

- was founded in 1960
- has been providing professional engineering and management services for over 50 years
- headquarters is located at
  5811 Glenwood Avenue, Raleigh, North Carolina 27612
- nearest satellite office is located at
  400 Redland Court, Owings Mills, Maryland 21117

Company Officers

James C. Turley, PE
President
Professionally experienced with utilities since 1987.

Michael L. Clements, PE
Executive Vice President
Professionally experienced with utilities since 1985.

David S. Huffstetler
Senior Vice President
Professionally experienced with utilities since 1991.

William P. Jordan, PE
Vice President of Planning, System Studies & Distribution Automation
Professionally experienced with utilities since 2005.

Jutien Hsieh, PE
Vice President - Charlotte Office
Professionally experienced with utilities since 2006.

Joshua W. Timm, PE
Vice President - South Carolina Office
Professionally experienced with utilities since 2005.

John B. Williams, PE
Vice President - Baltimore Office
Professionally experienced with utilities since 1994.

Types of Personnel Employed

- Registered Professional Engineers
- Professional Land Surveyors
- Project Management Professionals
- Masters of Business Administration
- Certified Public Accountants
- Computer Analysts
- Construction Observers
- Right-of-way Personnel
- Field Surveying Personnel
- Designers
- GIS / CAD Technicians

Employing 100 staff members

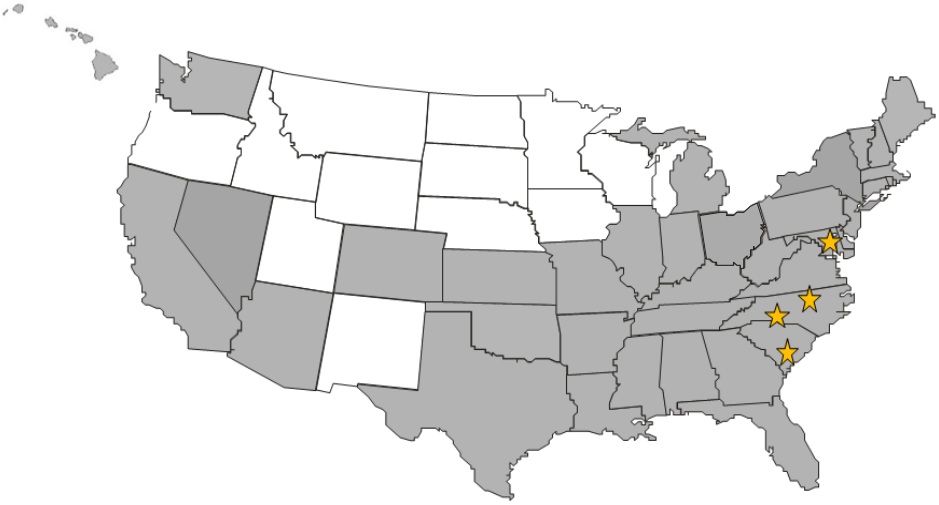
with 1,797 cumulative years of experience

46% of staff has over 20 years of experience

Electric Utility National Experience

37 *States / Districts*

Alabama
Arizona
Arkansas
California
Colorado
Connecticut
Delaware
Florida
Georgia
Hawaii
Illinois
Indiana
Kansas
Kentucky
Louisiana
Maine
Maryland
Massachusetts



Michigan
Mississippi
Missouri
Nevada
New Hampshire
New Jersey
New York
North Carolina
Ohio
Pennsylvania
Rhode Island
South Carolina
Tennessee
Texas
Vermont
Virginia
Washington
Washington, DC
West Virginia

Locations

- Headquartered in Raleigh, NC
- Baltimore, MD
- Charlotte, NC
- Summerville, SC

LICENSE NO. 1989038494 DORBL

POST CONSPICUOUSLY

STATE OF DELAWARE
DIVISION OF REVENUE

VALID
01/01/19 - 12/31/19
NOT TRANSFERABLE

DLN: 18 98888 29

BUSINESS CODE 540
GROUP CODE 007

LICENSED ACTIVITY: PROFESSIONAL SERVICES- ENGINEER
PROFESSIONAL AND/OR PERSONAL SERVICES

DATE ISSUED: 12/13/18

LICENSE FEE: $ 75.00

VALIDATED

2019

BUSINESS LICENSE

MAILING ADDRESS

BOOTH & ASSOCIATES LLC
5811 GLENWOOD AVE STE 109
RALEIGH NC 27612-6260

BUSINESS LOCATION

BOOTH & ASSOCIATES LLC
5811 GLENWOOD AVE STE 109
RALEIGH NC 27612-6260

IS HEREBY LICENSED TO PRACTICE, CONDUCT OR ENGAGE IN THE OCCUPATION OR BUSINESS ACTIVITY INDICATED ABOVE IN ACCORDANCE WITH THE LICENSE APPLICATION DULY FILED PURSUANT TO TITLE 30, DEL CODE

JENNIFER R. HUDSON
DIRECTOR OF REVENUE

IMPORTANT - TEAR AT ABOVE PERFORATION AND DISPLAY IN A PUBLIC LOCATION

Federal E.I. No. or Social Security Number B18817952429 002

Business Code 540
Group Code 007

Licensed Activity: PROFESSIONAL SERVICES- ENGINEER
PROFESSIONAL AND/OR PERSONAL SERVICES

The State of Delaware Business License printed above must be posted in a public area at the location address listed. If you have any questions regarding this license, please call (302) 577-8778.

REPLACEMENT LICENSES

Keep this portion of your license separate, in case you need a replacement for any lost, stolen or destroyed license. A $15 fee will be charged for the replacement of a license. Send the $15 along with a copy of this form or provide your Federal Employer Identification Number, or Social Security Number, suffix, Business Code, Business Name and address to Delaware Division of Revenue, Attn.: Business Master File, PO Box 8750, Wilmington, DE 19899-8750. You will receive your replacement license within three to four weeks.

OTHER IMPORTANT INFORMATION

Most licensees are also required to pay either gross receipts or excise taxes in addition to the license fee. You can file these taxes online or obtain a paper form from our website at www.revenue.delaware.gov. You must **submit all business tax returns** filed with the Division of Revenue **under the same identification number.** If you are a sole-proprietor, and have a federal employer identification number, use the employer identification number, not your social security number. Only sole proprietors with no employees are allowed to file under their social security number. Inquiries regarding your coupon booklets to pay withholding, corporate tentative, and Sub Chapter "S" estimated taxes, or to make changes to your name, address, or identification number, should be directed to the Business Master File Unit at **(302) 577-8778.**

INTERNET SITE

The Division of Revenue web address is: www.revenue.delaware.gov. Visit our web site for tax tips, links to telephone numbers, forms that you can download, links to other State agencies, the Delaware Code, the publication "Delaware Guide for Small Business" and lots more. Internet filing of personal income tax returns via the Division of Revenue's website is available. Internet filing for Withholding, Gross Receipts and Corporate Tentative payments is also available.

STATE OF DELAWARE

DELAWARE ASSOCIATION OF PROFESSIONAL ENGINEERS
92 Read's Way, Suite 208, New Castle, DE 19720

PHONE: 302-323-4588
E-mail: office@dape.org

CERTIFICATE OF AUTHORIZATION

ISSUED BY THE AUTHORITY OF
THE COUNCIL OF THE DELAWARE ASSOCIATION OF PROFESSIONAL ENGINEERS
TO

BOOTH & ASSOCIATES, LLC
5811 GLENWOOD AVENUE, SUITE 109
RALEIGH, NC 27612

THIS CERTIFICATE AUTHORIZES THE AFORESAID CORPORATION OR PARTNERSHIP TO PRACTICE OR OFFER TO PRACTICE PROFESSIONAL ENGINEERING IN THE STATE OF DELAWARE AS PROVIDED IN THE DELAWARE LAW, TITLE 24, CHAPTER 28, SECTION 2821.

FOR THE PERIOD: 7/01/2018 to 06/30/2019

CERTIFICATE NUMBER: 288

ANNUAL RENEWAL FEE: $150.00

DATE OF ISSUE: JUNE 15, 2018

APPROVED

BY: Soheil Gharebaghi

Soheil Gharebaghi, P.E., President

II

Typical Project Scope and Implementation

Booth & Associates
CONSULTING ENGINEERS

TASK 1 **Data Acquisition** ***(Provided by Lewes BPW)***

TASK 2 **Project Start-up**

Project kick-off meeting at BPW

TASK 3 **Substation/Circuit Projections** ***(Five-Year and Ten-Year Planning Horizons)***

TASK 4 **Long-Range Plan Without Improvements** ***(Present System Analysis)***

A. System Load and Voltage Profile Model

B. Circuit Diagram Showing Loads and Voltage Drops without Improvements

C. Identify Problem Areas

TASK 5 **Develop Design Criteria**

Establish standards and operational limits for design, reliability and power quality.

A. Point-of-Delivery *(reliability, capacity, etc.)*

B. Transmission *(reliability, capacity, etc.)*

C. Substations *(reliability, reserve capacity, backup capacity, etc.)*

D. Distribution Lines *(reliability reserve capacity, single- phase and three-phase conductor, multi-phasing, and conductor replacement)*

E. Power Factor *(capacitor applications)*

F. Miscellaneous Equipment *(including thermal loading and other criteria)*

G. Maximum Voltage Drop

H. Load Balance

I. System Demand and Energy Losses

J. Construction Unit Cost

K. Environmental Criteria *(including storm hardening criteria)*

L. Other Criteria
- Reliability Criteria
- Power Quality Criteria

TASK 6 Initial Planning Meeting

Booth & Associates, LLC and Lewes BPW

A. Identify Problem Areas

B. Identify Feasible Solutions

C. Review Design Criteria

D. Review Projections

TASK 7 System Engineering Analysis Based on Initial Planning Meeting

A. Power Delivery

1. Reliability
2. Capacity
3. Equipment sizing

B. Transmission

1. Reliability
2. Capacity
3. Equipment sizing

C. Substations

1. Reliability
2. Capacity
3. Equipment sizing

D. Distribution

1. Reliability
2. Capacity
3. Voltage drop
4. Load balance
5. Equipment sizing and placement *(i.e. capacitors)*

E. Alternatives

F. kW and kWh Losses

G. Planning for N-1 Contingency

1. Loss of transmission feed
2. Loss of substation transformer

H. Smart Grid Technologies

1. Feasibility
2. Implementation

I. Recommended Plan

TASK 8 Cost Estimate with Recommended Year of Completion

A. By Substation Area

1. New tie lines
2. Line changes
3. New substations
4. Increased substation capacity
5. Sectionalizing
6. Capacitors
7. Conductor replacement *(lump sum)*
8. Other *(load management, SCADA, etc.)*

B. System Summary

TASK 9 Final Report

Three (3) copies for Lewes BPW, plus electronic copy (CD format) of entire report and database including maps and model (in AutoCAD and WindMil® format, respectively):

A. Executive Summary

B. Summary of Report, Conclusions, and Recommendations

C. System Analysis

Review of present system operating characteristics to determine the quality of service and feasible methods to improve overall system operations.

1. System, substation, and circuit capacity and loading
2. Voltage conditions
3. System energy losses
4. Service reliability
5. Smart grid technologies *(i.e. distribution automation, AMI, DSM)*
6. Energy storage alternatives, PV+Storage, Microgrid, and / or other non-wires alternatives
7. Renewables
8. Electric vehicle charging effects
9. Protective relay coordination
10. Other factors that substantially influence the quality of service and the cost of providing quality service

D. Construction Program

1. Long-Range Plan tabulation

   Summary of cost estimate including a detailed description and cost of each proposed improvement by substation area, as well as cost / benefit analysis and discussion for new technology implementation.

2. Discussion of recommended Long-Range Plan system improvements

   a. Cost estimate, cost / benefit analysis
   b. New line extension
   c. Increased capacity of existing services
   d. Ordinary replacement
   e. Substations, line changes, sectionalizing, voltage regulators, capacitors, and conductor replacement
   f. Transmission
   g. Technology and non-wires alternatives
   h. Conductor/pole replacement program
   i. System-wide right-of-way widening
   j. Security lights
   k. Miscellaneous

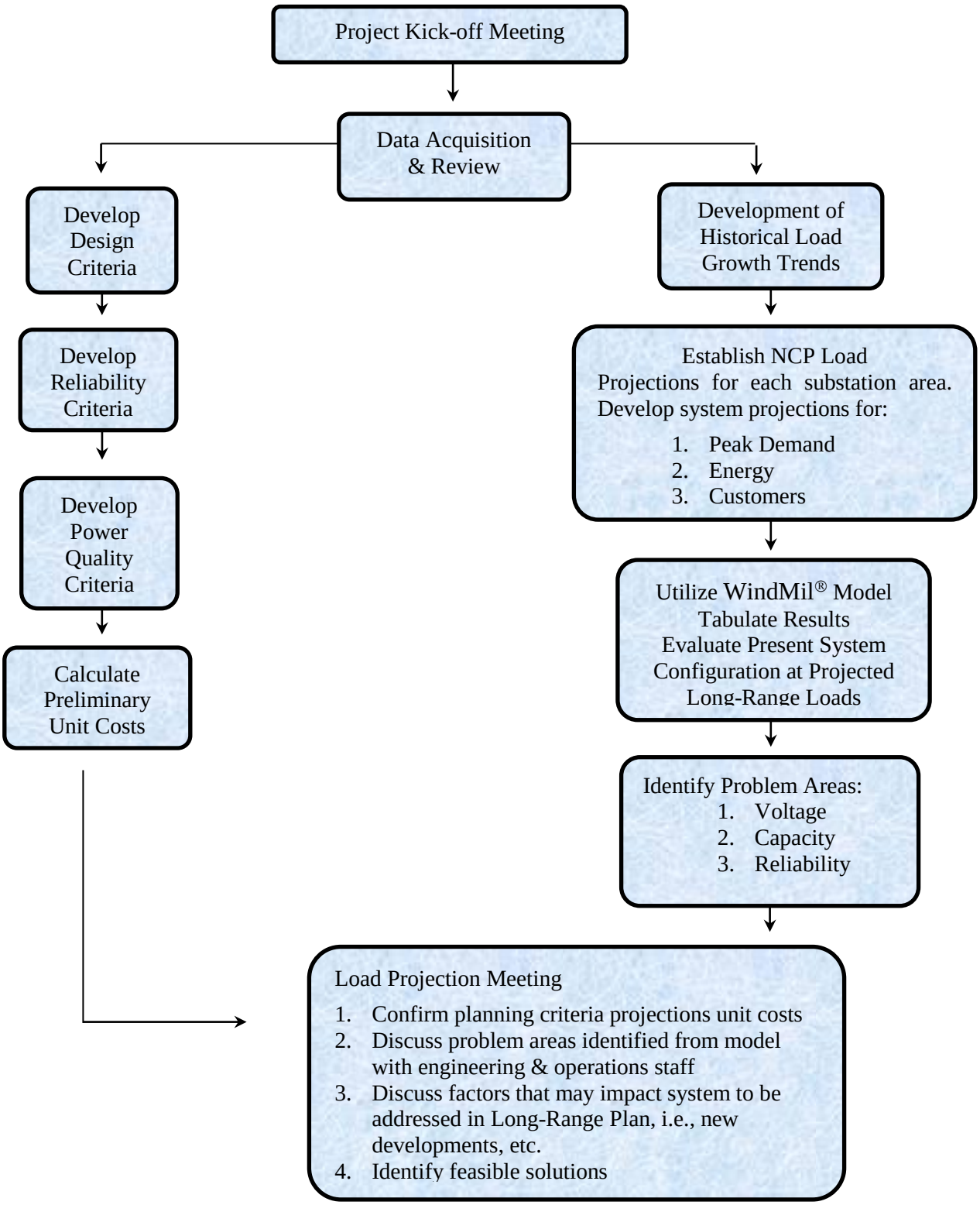
E. Graphs and tables included in the Exhibits show historical and analysis data utilized in the development of the Long-Range Plan. Typically, this includes system projection graphs, historical system statistical data, substation equipment and loading, service interruptions, unit construction cost, and sample calculations.

F. Distribution Circuit Diagram

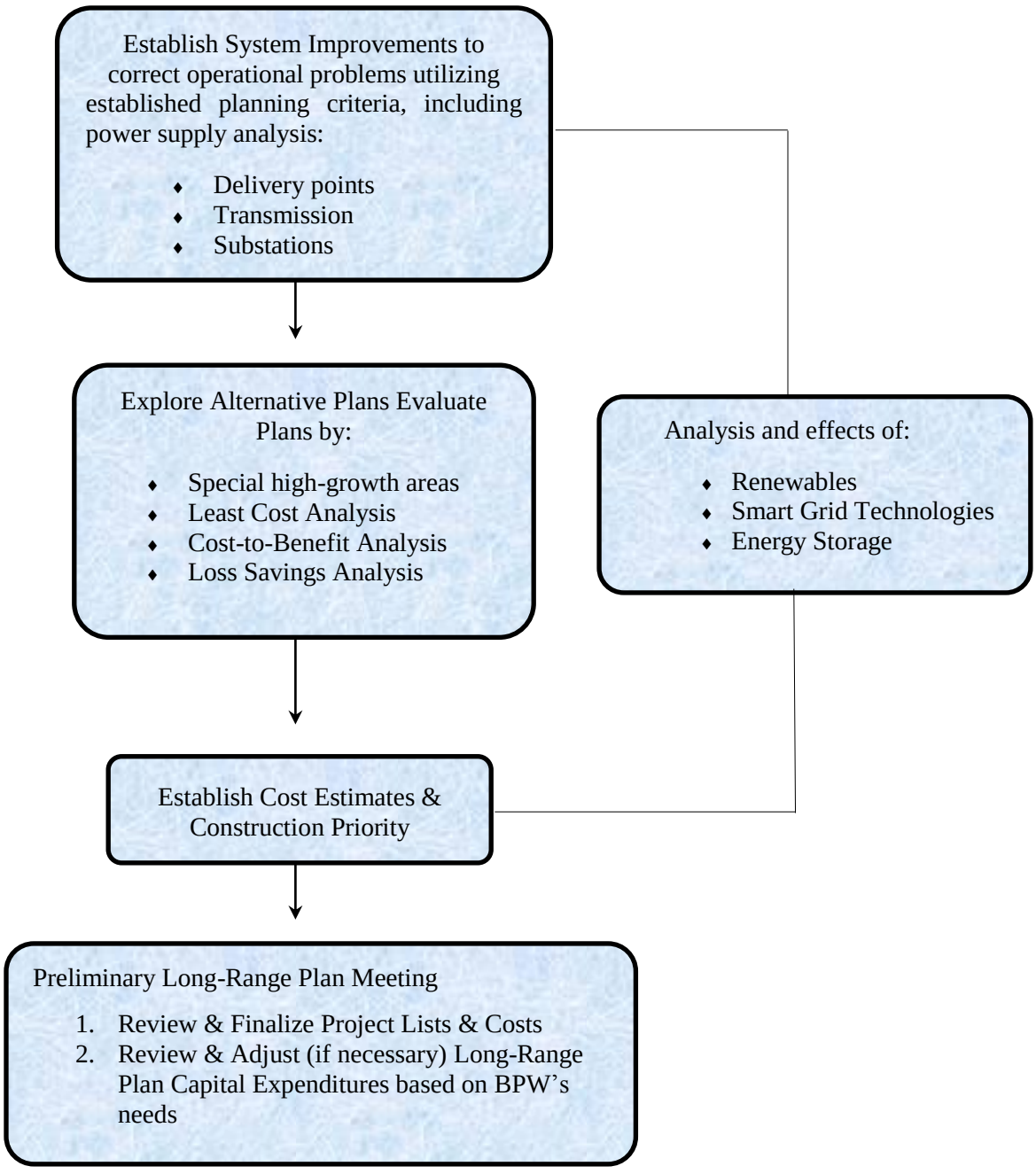
Three (3) sets of circuit diagrams illustrating improvements proposed in the Five-Year and Ten-Year Planning Horizons. Three (3) sets of circuit diagrams illustrating voltage and loads at projected Long-Range Plan loads without proposed improvements (Existing System).

G. Digital copy of Long-Range Plan With Improvements WindMil® Model

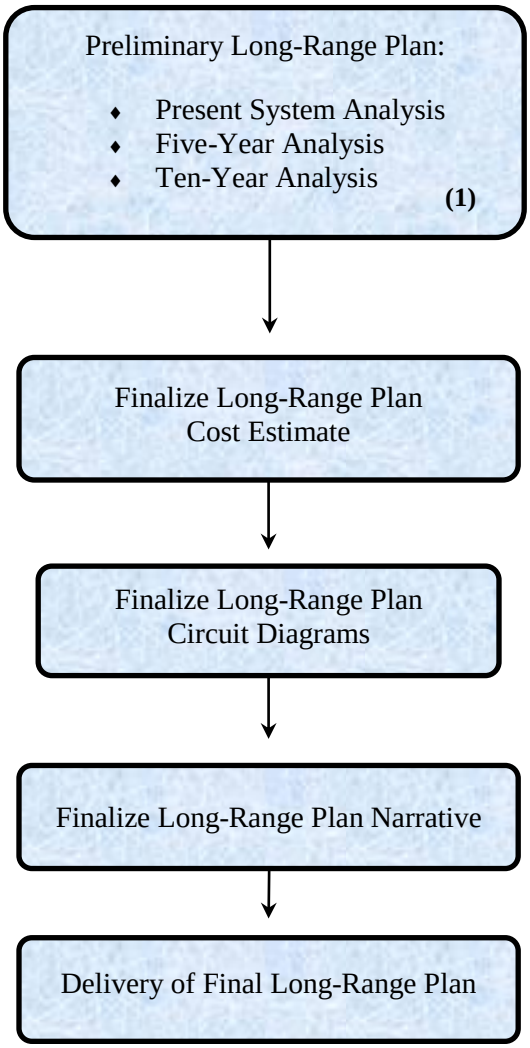
PHASE I


Project Kick-off Meeting
Data Acquisition & Review
Develop Design Criteria
Develop Reliability Criteria
Develop Power Quality Criteria
Calculate Preliminary Unit Costs
Development of Historical Load Growth Trends
Establish NCP Load Projections for each substation area. Develop system projections for:
1. Peak Demand
2. Energy
3. Customers
Utilize WindMil® Model
Tabulate Results
Evaluate Present System Configuration at Projected Long-Range Loads
Identify Problem Areas:
1. Voltage
2. Capacity
3. Reliability
Load Projection Meeting
1. Confirm planning criteria projections unit costs
2. Discuss problem areas identified from model with engineering & operations staff
3. Discuss factors that may impact system to be addressed in Long-Range Plan, i.e., new developments, etc.
4. Identify feasible solutions

PHASE II


Establish System Improvements to correct operational problems utilizing established planning criteria, including power supply analysis:
Delivery points
Transmission
Substations
Explore Alternative Plans Evaluate Plans by:
Special high-growth areas
Least Cost Analysis
Cost-to-Benefit Analysis
Loss Savings Analysis
Analysis and effects of:
Renewables
Smart Grid Technologies
Energy Storage
Establish Cost Estimates & Construction Priority
Preliminary Long-Range Plan Meeting
1. Review & Finalize Project Lists & Costs
2. Review & Adjust (if necessary) Long-Range Plan Capital Expenditures based on BPW's needs

PHASE III



(1) Time frame can vary to meet Lewes BPW's specific needs

Software Used:

- Microsoft Office Suite *(Word, Excel, PowerPoint)*
- Milsoft's WindMil® v 8.7.23 *(typical for Distribution model)*
- EasyPower v 10.2 *(typical for Transmission model)*
- AutoCAD 2018

* Booth & Associates has several other software options at our disposal should they be required to effectively support a complete Lewes BPW System Study.

III

Historical Project List

Booth & Associates
CONSULTING ENGINEERS

The Booth & Associates, LLC Project History lists similar projects completed in the past 10 years. However, we did want to highlight the fact that our company completed a Comprehensive Long-Range Plan in 2003 that led to the construction of the Schley Road Substation and ultimate conversion of the system distribution voltage. Booth & Associates also completed an update to the System Long-Range Plan in 2005.

The Electrical System Studies listed in the following pages cover the scope of work outlined on page 3 of the RFI. Line Items 1 and 2 are typical of any planning study with focus on voltage and capacity of infrastructure at normal peak loads, as well as under N-1 Contingency.

The effects of Smart Grid Technologies, the effects of Renewables and other distributed generation, the effect of EV loads and the potentials of battery storage options are all included in the typical scope of services.

Booth & Associates, LLC has completed 41 similar studies for cooperatives and municipal electric systems in the mid-Atlantic region; 14 Construction Work Plans over the past 5 years and 20 Long-Range Plans over the past 10 years, which are listed on the following pages. Below is a listing of projects the System Planning Department has completed for the Board of Public Works.

Project	**Year of Completion**
Long-Range Plan	2003
Long-Range Plan Update	2005
Circuit Coordination (Schley / Wellfield)	2005
Showfield Subdivision Load Study	2007

Construction Work Plans typically cover a 3 to 4 year planning period. These are considered a short-term planning document that is based on the Utility's most current Long-Range Plan. Planning processes are identical to that of a Long-Range Plan, consisting of system load projections, distribution model analysis, project recommendations and project cost estimates.

CONSTRUCTION WORK PLANS
(3 - 4 Year Planning Period)

Utility	No. of Consumers	Year of Completion
Rappahannock EC (VA)	166,114	2008, 2012, 2016, 2018 *(in progress)*
Four County EMC (NC)	33,160	2009, 2015
Halifax EMC (NC)	11,842	2009, 2015
Pee Dee EMC (NC)	21,277	2009, 2012, 2015
Tri-County EC (PA)	19,359	2009, 2015
Valley REC (PA)	22,218	2009, 2014
Roanoke EC (NC)	18,572	2011, 2018 *(in progress)*
Central EC (PA)	26,090	2011, 2015, 2018 *(in progress)*
Albemarle EMC (NC)	13,313	2011, 2015, 2018
Cape Hatteras EMC (NC)	7,936	2012, 2017
Claverack EC (PA)	18,679	2014
SMECO (MD)	137,000	2014
Central EMC (NC)	24,531	2015
Randolph EMC (NC)	32,935	2017
Carteret Craven (NC)	40,986	2018
Marlboro EC (SC)	6,588	2018 *(in progress)*

Long-Range Plans typically cover a 6 to 20 year planning period. These plans are typically broken into 2 to 4 year planning analysis segments. The planning processes include system load projections, distribution model analysis, project recommendations and project cost estimates. See Section IV for a more detailed description of a typical overall Long-Range Plan process task list and flow chart.

LONG-RANGE PLANS
(6 - 20 Year Planning Period)

Utility	No. of Consumers	Year of Completion
Halifax EMC (NC)	12,414	2008
City of Wilson (NC)	34,115	2008, 2013
City of Kinston (NC)	11,634	2010
Tri-County EC (PA)	19,359	2009, 2016
Albemarle EMC (NC)	14,096	2010
Delaware EC (DE)	97,018	2010, 2015, 2018
Roanoke EC (NC)	17,856	2010
Rappahannock EC (VA)	162,638	2012
City of Washington (NC)	13,628	2012
Claverack EC (PA)	18,679	2014
Shenandoah Valley EC (VA)	91,409	2014
Town of Smithfield (NC)	4,511	2015
Central EMC (NC)	24,531	2015
Pee Dee EMC (NC)	21,277	2015
SMECO (MD)	137,000	2016
Town of Berlin (MD)	2,575	2017
Randolph EMC (NC)	32,935	2017
Reading Municipal Light Department (MA)	30,000	2017
Carteret Craven (NC)	40,986	2018
Berkeley EC (SC)	99,941	2018
Central EC (PA)	26,090	2018 *(in progress)*

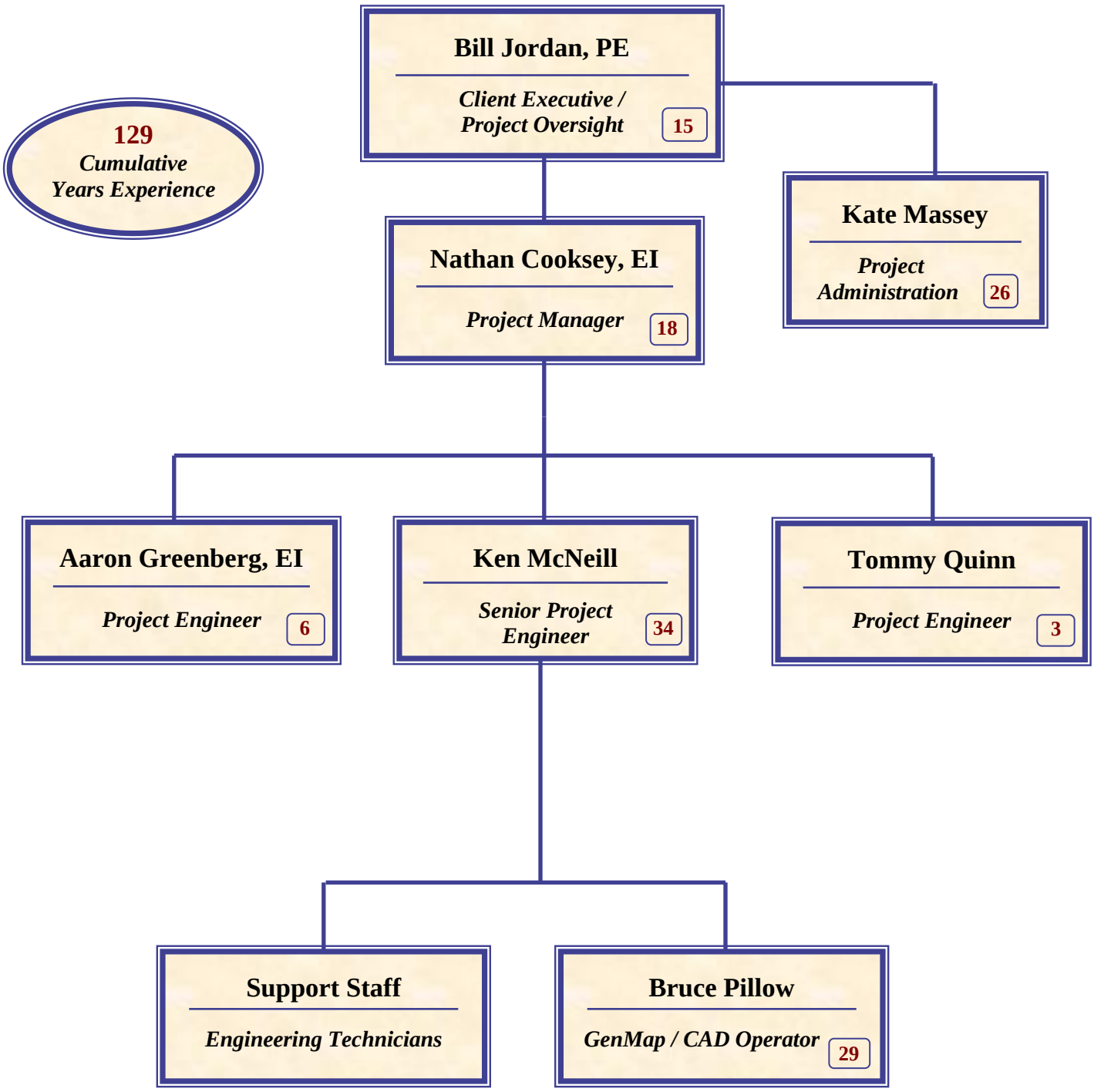
IV

Project Management

Project Team Chart

Project Team Resumes

Booth & Associates
CONSULTING ENGINEERS



xx *denotes years of experience*

WILLIAM P. JORDAN, PE

Vice President of Planning, System Studies, Distribution Automation

Experience includes National Electric Safety Code (NESC) and National Electrical Code (NEC) interpretation and application, on-site field evaluations for utility reconstruction or re-route, fiber optic layout and specifications, structure location staking, and preparation of construction documentation and specifications for overhead and underground utility ranging from 4 kV through 230 kV. Calculations include conductor sag and tension analysis, structural loading and classification, maximum span analysis, electrical clearances, and cable pull and installation limitations. Additional calculations/experiences include area lighting evaluations/design, Arc Flash Hazard Analysis & Mitigation, System Reliability & Resiliency Assessments, and System Planning, Impact and Technology Integration studies. Experienced with reviewing and generating technical specifications, bid and contract documentation, construction release packages, and project closeout documentation associated with municipal, electric cooperative, IOU and other private utility labor and material contracts, overhead and underground line layout and design for new installation as well as retrofitting to existing transmission and distribution lines. Experienced in material specification and analysis; design and implementation of transmission and distribution hardware framing drawings; structural loading requirements and limitations; installation specification and limitation analysis; preparation of engineering and construction cost estimates and scheduling.

Employment Status

Vice President – Raleigh Office

Education & Training

North Carolina State University
BS-Electrical Engineering
BS-Computer Engineering

Professional Registrations

Registered as a Professional Engineer in North Carolina, South Carolina, Virginia, Maryland, Arkansas, Georgia, Pennsylvania, Oregon, Texas and Massachusetts

Experience – 15 Years

RELEVANT EXPERIENCE

Bonner Bridge – Transmission Cable Relocation, Cape Hatteras EC

Project Manager and Engineer of Record for the design and installation of over three (3) miles of 115kV power cables as part of the Herbert C. Bonner Bridge Replace Project (NCDOT Tip B-2500) which carries N.C. 12 over Oregon Inlet between Hatteras and Bodie islands in Dare County, North Carolina. The multi-year project consisted of heavy coordination and engineering support with the N.C.D.O.T. and their contractors. The design included four (4) new 115kV cables (3 plus 1 spare) in a fiberglass hanger system, four (4) under-bridge splice cabinets, multi-single point grounding scheme, new 115kV riser structures and assemblies, wetland and regulatory permitting and impact mitigation, and construction observation.

Blowing Rock HWY 321 – Utility Relocation, Blue Ridge Energy

Project Manager and Engineer of Record for the design of the relocation of electric facilities from overhead to underground associated with a twelve (12) mile roadway widening project. Existing facilities to be relocated included electric distribution, electric transmission, fiber optic, telephone, CATV, and street lighting. Electric facilities were inventoried and the proposed facilities were laid out on roadway drawings provided by NCDOT. Removal and installation assembly units were inserted into Partner Software. The multi-year and multi-phased project included heavy coordination and engineering support with the N.C.D.O.T. and their engineering staff. The design included approximately one-half (1/2) mile of four (4) new 115kV cables (3 plus 1 spare) in a PVC ductbank system, two new transmission vaults, a new 115kV riser structure and assemblies, and approximately three (3) miles of 12.47kV distribution relocation.

Wilson 8 Solar, Vaughn Industries

Project Task Manager and Engineer of Record for the design of eight (8) separate solar farm AC utility point of interconnection facilities (POIs). Project consisted of conforming to an aggressive schedule to design and issue for construction AC collector ring projects of varying distribution voltages. The design included electrical and loading calculations, NESC compliance certifications, and bill of material development.

Battery Energy Storage, City of Wilson, NC

Project development and management, vendor selection, and balance of plant integration for a 1 MW / 4 MWh utility scale Lithium-Ion battery storage system within Substation No. 4.

NATHAN B. COOKSEY, EI

Project Manager

Responsibilities include managing the preparation and planning process of Construction Work Plan with corresponding Environmental Reports, Distribution Protective Coordination Studies and Special Projects including Load Shift Analysis, Capacitor Placement, Motor Start Analysis and PV Impact Analysis. Software experience includes WindMil®, CYMDist & Synergee Distribution Analysis Software, CYMETCC and LightTable Protective Coordination Software and EasyPower® Transmission Analysis Software. Oversees the creation and maintenance of WindMil® Engineering Models; Provides on-site training with WindMil® Distribution software including importing models from GIS and clean-up, billing load application, load allocation, basic and advanced uses and techniques; Compiles training manuals customized to client's needs. Familiar with RUS Guidelines and Procedures for System Planning.

Employment Status

Project Manager II – Raleigh Office

Education & Training

North Carolina State University
BS-Industrial Engineering

Professional Registrations

Registered as an Engineering Intern in North Carolina

Experience – 18 Years

RELEVANT EXPERIENCE

Construction Work Plans & Long-Range Plans

These plans identify the need for proposed system improvements based on a set of established design criteria, including basic loading levels for initiating multiphasing projects, capacity limitations of inter-substation tie lines, and substation transformers, etc. These criteria are based, in part, on industry standards, standard operating policies of the Client and sound engineering practices, combined with economic analysis for each component. The planning processes include system load projections, distribution model analysis, project recommendations and project cost estimates. Construction Work Plans typically cover a 3-4 year planning period and are considered a short-term planning document that is based on the most current Long-Range Plan (6-20 year planning period).

Environmental Reports

Construction of distribution lines, substations, transmission lines and associated equipment require the preparation of an Environmental Report in accordance with the Rural Utilities Service, RUS 7 CFR, Part 1794, Environmental Policies and Procedures. This policy requires that all proposed system improvements that are non-exempt be reviewed for their effect upon the environment. Federal, state and local agencies are contacted regarding projects that impact the earth or are located near water resources. A detailed report based on agency responses is prepared for the Client.

Protective Distribution / Transmission Coordination Studies

These studies provide a comprehensive analysis of existing protective equipment throughout the distribution/transmission systems. They identify deficiencies in equipment or operations within the system, and other aspects of the system which would benefit from additional analysis due to changes in system loading, available fault currents from the Power Supplier and changes in the system itself due to construction and maintenance.

Capacitor Placement Studies

These studies entail a review of the placement, sizing and switching methodologies of each capacitor bank on the electric distribution system, utilizing the WindMil® Distribution model. We provide recommended settings for VAR control with voltage override and evaluate existing capacitor settings. The goal is to satisfy the Power Factor requirements of the Client's power supplier to avoid unnecessary expenditures due to imposed power factor penalties.

Power Flow Studies

These studies are a numerical analysis of the flow of electric power in an interconnected system. They analyzes the power system in normal steady-state operation using simplified notations, such as one-line diagrams, and focus on various aspects of AC power parameters, such as voltages, voltage angles, real power and reactive power.

KENNETH R. McNEILL

Senior Project Engineer

Responsibilities include System planning (distribution and transmission) for municipal and rural electric cooperatives, including Long-Range and Construction Work Plans; least-cost and cost-to-benefit planning; Computer modeling of electric systems for voltage drop and fault current analyses; motor start and voltage flicker analyses; Capacitor Optimization Studies; Feasibility Studies; load forecasts; Power Requirements Studies; system loss evaluations; soil resistivity testing; Sectionalizing Studies; distribution substation design; industrial power audits, peak demand evaluation and energy reduction methods; distribution system design, staking and condition assessment; Military Base Electrical System Privatization.

Employment Status

Senior Project Engineer – Raleigh Office

Education & Training

North Carolina State University
BS-Electrical Engineering

Professional Registrations

Registered as an Engineering Intern in North Carolina

Experience – 34 Years

RELEVANT EXPERIENCE

Construction Work Plans & Long-Range Plans

These plans identify the need for proposed system improvements based on a set of established design criteria, including basic loading levels for initiating multiphasing projects, capacity limitations of inter-substation tie lines, and substation transformers, etc. These criteria are based, in part, on industry standards, standard operating policies of the Client and sound engineering practices, combined with economic analysis for each component. The planning processes include system load projections, distribution model analysis, project recommendations and project cost estimates. Construction Work Plans typically cover a 3-4 year planning period and are considered a short-term planning document that is based on the most current Long-Range Plan (6-20 year planning period).

THOMAS T. QUINN

Project Engineer

Responsibilities include conducting various solar farm design verification studies including Load Flow Studies, Reactive Power Studies, Short Circuit Studies, Arc Flash Hazard Assessments, Harmonic Studies, Voltage Flicker Studies, and Statistical Capacity Testing. Other projects include System Planning work for Construction Work Plans and Long Range Plans, Underground Cable Design, Cable Ampacity Studies and Electromagnetic Transient Studies including Transient Overvoltage and Transient Recovery Voltage.

Employment Status

Project Engineer I – Raleigh Office

Education & Training

N.C. State University
BS - Electrical Engineering

N.C. State University
MS - Electric Power Systems Engineering

Experience – 3 Years

RELEVANT EXPERIENCE

Load Flow/Reactive Power Study
Modeling of Solar Farm to ensure plant operation requirements are within capabilities of equipment and satisfy reactive power requirement stipulated by the interconnected utility.

Short Circuit Study
Modeling of Solar Farm under fault conditions. Evaluate the short circuit contributions from the utility and from the solar inverters. Analyze capability of plant equipment and protective devices.

Arc Flash Hazard Assessment
Modeling of Solar Farm short circuit conditions at equipment and evaluating the incident energy and proper PPE necessary for energized work at locations throughout the plant.

Harmonic Study
Modeling of Solar Farm including inverter harmonic current contributions. Analysis against IEEE 519 Standard requirements to ensure plant operates within allowable harmonic current limits.

Voltage Flicker Study
Simulation of Solar Farm flicker events and evaluating change in voltage at Point of Interconnection to ensure plant meets interconnection agreement requirements.

Solar Farm Capacity Testing
Verification that operational solar plant is producing expected amount of power according to design requirements and ASTM Standards.

Transient Overvoltage Study
Analysis of lightning surges, switching overvoltages, and fault clearing scenarios using Electromagnetic Transient Programs to ensure proper equipment withstand ratings.

Transient Recovery Voltage Study
Analysis of circuit breaker recover voltages using Electromagnetic Transient Programs to ensure proper equipment ratings.

Underground Cable Design and Ampacity
Design of grounding systems for underground transmission cable and modeling of system operating conditions to ensure required ampacity is met.

AARON J. GREENBERG, EI

Project Engineer

Responsibilities include Arc Flash Hazard Analysis using standards listed in IEEE 1584, NFPA70E, and NESC for substations and solar farms; DC Arc Flash Analysis; Assists in the fabrication of Arc Flash Labels; Protection Coordination & Recommended Settings; Short Circuit Analysis; Load Flow Analysis; Voltage Drop Analysis; Flicker Analysis; Harmonics Studies; Motor Starting Analysis; Reverse Power Flow Analysis; Interconnection Studies; Assists in development of Construction Work Plans and Long-Range Plans; Scope of Work and Cost Estimates; Distribution Surveying; Route Planning & Route Planning Cost Estimates; and Underground Subdivision Layout.

Employment Status

Project Engineer – Raleigh Office

Education & Training

Penn State Behrend, BS-Electrical Engineering Minor-Computer Engineering

Professional Registrations

Registered as an Engineering Intern in Pennsylvania

Experience – 6 Years

RELEVANT EXPERIENCE

Arc Flash Hazard Analysis

Analysis to determine the incident energy of a potential arc flash, establish the arc flash boundary and determine the required clothing and PPE.

Protection and Coordination Studies

Studies performed to determine the optimum characteristics, ratings and settings of protective devices.

Interconnection Studies

An evaluation of a proposed interconnection of either a load or source of generation and the impact the interconnection will have on a utility's system.

Construction Work Plans & Long-Range Plans

Plans designed to help utilities determine construction projects required to maintain and improve system reliability. The plans also help utilities determine the future costs of projects for budgetary purposes.

Route Planning & Route Planning Cost Estimates

A determination of the most feasible route for transmission or distribution lines and an estimate of the cost.

Distribution Surveying

An evaluation of the physical characteristics and attachments of distribution class poles.

V

Deliverables

Booth & Associates
CONSULTING ENGINEERS

Long-Range Plan deliverables are as follows:

- Three (3) copies of final Long-Range Plan, including narrative, cost estimate, project justifications, exhibits and appendices
- Three (3) sets of circuit diagrams, including base circuitry, Long-Range Plan recommendations
- One (1) electronic .pdf copy of Final Long-Range Plan
- One (1) electronic copy of Circuit Diagrams in AutoCAD
- One (1) electronic copy of WindMil® Model, With and Without Improvements