

Council Bill:     B 268-17    

MOTION TO AMEND:

MADE BY: \_\_\_\_\_

SECONDED BY: \_\_\_\_\_

MOTION: I move that Council Bill     B 268-17     be amended as set forth on this amendment sheet.

=====

Attachment A, the Scope of Services to Exhibit A, attached to this amendment sheet is substituted for the Attachment A, the Scope of Services to Exhibit A, attached to the original bill.



---

# Independent Distribution Reliability Study for the Southwest Region of Columbia, MO

---

**PREPARED FOR:** Columbia, MO Water & Light Department

**DATE:** September 7, 2017

**PREPARED BY:** Bryan Rushing  
brushing@quanta-technology.com  
(636) 288-2946

Carl L. Wilkins  
cwilkins@quanta-technology.com  
(919) 334-3092

**QUANTA TECHNOLOGY, LLC**  
4020 WESTCHASE BOULEVARD, SUITE 300, RALEIGH, NC 27607 USA  
Oakland | Chicago | Boston | Toronto  
**[WWW.QUANTA-TECHNOLOGY.COM](http://WWW.QUANTA-TECHNOLOGY.COM)**

Quanta Technology, LLC is a wholly-owned subsidiary of Quanta Services, Inc. (NYSE: PWR)



**CONFIDENTIAL/PROPRIETARY:** This document contains trade secrets and/or proprietary, commercial or financial information not generally available to the public. It is considered privileged and proprietary to the Offeror, and is submitted by Quanta Technology, LLC in confidence with the understanding that its contents are specifically exempted from disclosure under the Freedom of Information Act [5 USC Section 552 (b) (4)] and shall not be disclosed by the recipient [whether it be Government (local, state, federal, or foreign), private industry, or non-profit organization] and shall not be duplicated, used, or disclosed, in whole or in part, for any purpose except to the extent in which portions of the information contained in this document are required to permit evaluation of this document, without the expressed written consent of the Offeror. If a contract is awarded to this Offeror as a result of, or in connection with, the submission of this data, the right to duplicate, use, or disclose the data is granted to the extent provided in the contract.



## TABLE OF CONTENTS

<b>1</b>	<b>INTRODUCTION .....</b>	<b>1</b>
1.1	About Quanta Technology .....	1
<b>2</b>	<b>PROPOSED PROJECT WORK PLAN.....</b>	<b>3</b>
2.1	Additional Tasks .....	6
<b>3</b>	<b>PROJECT TIMELINE.....</b>	<b>7</b>
<b>4</b>	<b>PROPOSED PROJECT TEAM.....</b>	<b>8</b>
4.1	Organization, Project Management & Key Personnel .....	8
4.2	Proposed Project Team.....	8
<b>5</b>	<b>PRICING AND TERMS .....</b>	<b>13</b>
5.1	Cost Plan/Budget .....	13



## 1 INTRODUCTION

By way of background, the Columbia, MO Water & Light Department (“CWLD”) has been looking at expanding its electric system in the southern part of the city. CWLD has eight (8) substations located throughout its service territory. Over the past few years, CWLD has presented several options for an electric project that would add transmission lines to connect a new Mill Creek substation on Peach Tree Drive with some of the existing lines.

CWLD has indicated an interest in having an independent third party perform a study within the CWLD service territory exploring alternatives to compare with the new Mill Creek substation.

Quanta Technology proposes to perform the following scope of work to assist CWLD by performing a distribution planning analysis of the CWLD electric system. Quanta Technology proposes to perform the scope of work on a time and materials basis estimated at \$97,500.

### 1.1 About Quanta Technology

**Quanta Technology** is an independent consulting company providing business and technical expertise to the energy and utility industries. Our mission is to provide value to our clients in every engagement with the best technical and business expertise, the most holistic and practical advice and the most insightful thought leadership in the industry.

We offer a full spectrum of services in the following areas:

- Transmission & Distribution
- Protection & Control
- Asset Operations
- Asset Management
- Enterprise Integration & Smart Grid Strategies
- Renewables Energy Integration, Storage & Microgrids
- Regulatory Compliance
- Optical Sensors
- Automation & Testing
- Synchrophasors & WAMPAC
- Applied R&D
- Workforce Training & Augmentation

Quanta Technology's client base is well established in North America and in numerous international markets. Our clients include energy delivery utility companies, large industrial companies, energy suppliers, Regional Transmission Operators, Independent System Operators (RTOs/ISOs), and energy industry research and support organizations.

Quanta Technology is a wholly owned subsidiary of **Quanta Services, Inc.** (NYSE: PWR). Quanta Services safely provides engineering, procurement and construction (EPC) services for comprehensive infrastructure needs in the electric power and oil and natural gas industries. With a workforce greater than 24,000 strong and offices throughout North America, Quanta Services is the premier provider in the industries it serves. As part of the Quanta Services family of



companies, Quanta Technology has the manpower, resources, and expertise to complete projects that are local, regional, national, and/or international in scope.

#### About Quanta Services:

- The largest electric transmission and distribution specialty contractor in North America.
- Largest employer of certified electric power linemen in North America.
- The largest pipeline specialty contractor in North America.
- The owner of the largest specialized equipment fleet in the industry.
- Fortune 400 company with a strong balance and the financial resources for capital-intensive projects.
- Full service engineering, procurement and construction (EPC) service provider.
- An innovator of technologies and proprietary methodologies.



## **2 PROPOSED PROJECT WORK PLAN**

Quanta Technology proposes the following work plan to provide CWLD with an independent distribution reliability study for the Southwest region of the CWLD electric system exploring alternatives to compare with the new Mill Creek substation. Quanta Technology has broken the proposed work plan into five major tasks.

### **1. Task 1 – Project Planning and Initiation**

A project initiation meeting is used to ensure there is mutual agreement between parties of the objectives, scope, schedule, deliverables, and budget of the project. This meeting is also used to establish on going contact information and protocols, reporting requirements, and to identify needs for client assistance, data acquisition, and other logistical requirements.

### **2. Task 2 – Data gathering**

The purpose of this task is to obtain all information necessary to perform the work. Quanta Technology will provide a data request at the project outset. The data required for this project will include:

#### **A. Circuit Data**

##### **a. Parameters to be included:**

- i. Cable and/or conductor type;
- ii. Cable and/or conductor size;
- iii. Cable and/or conductor configuration;
- iv. Cable and/or conductor length; and
- v. If available, known loads greater than 1 MVA and their location on the circuit.

#### **B. Load Data**

- a. Circuit amps of each feeder (including date and time the load was recorded).
- b. Substation Power Factor (or MW / Mvar)

#### **C. Capacitors**

- a. Size & Location
- b. Fixed or Switched
- c. If Switched, provide control settings

#### **D. Feeder Load Limits**

- a. Identification of the maximum amps placed on the feeder under normal and contingency conditions.

#### **E. Voltage Drop Permissions**



- a. Provide the maximum voltage drop permitted on the feeders if such a limit has been established.
- F. Transformer Voltage Regulation Settings
- a. Provide the voltage regulation settings on each substation transformer
  - b. Provide location of line regulators (if used) along with settings.
- G. Substation One-line Diagrams
- a. Provide a one-line diagram of each substation.
- H. Location and size of Distribution Transformers
- I. Cost Estimates and other engineering plans for Mill Creek Substation.

The circuit data is assumed to be in a format that Quanta Technology can readily import into a power flow analysis software program. If a circuit model database is needed to be created, or major modifications to the data to build a working model is needed, Quanta Technology proposes to perform this as a separate scope of work within the project.

### **Task 3 – Electric System Review and Assessment**

The purpose of the electric system review and assessment will be to identify system deficiencies, compare with industry best practices and determine if revisions to engineering, operating and maintenance practices should be considered. The circuit and substation capacity analysis and evaluation may include, in part or all, of the following activities.

1. Visual overview of the system components.
2. Review of Distribution Standards and Planning Guidelines
3. Review of operating practices.
4. Review of outage records and reliability reports.
5. Review of substation and equipment loading practices.
6. Discussions with engineering and operations personnel.
  - o Reliability goals;
  - o Operating issues; and
  - o Financial targets;
7. Review load growth projections and determine, at a system level, the ability of the infrastructure to support current and future load.
  - o Perform equipment loading analysis as required for transformers, conductors, cables, etc.
8. Identify areas of the city that the electric utility will not be able to support with the current infrastructure.





#### **Task 4 – Review of Potential Mitigations and Comparison to Proposed Mill Creek Substation**

Quanta Technology will develop and propose additional alternatives to construction of the Mill Creek Substation. Quanta Technology will also evaluate if the Mill Creek Substation is the best solution for the CWLD’s electric system expansion.

1. Propose alternative solutions to Mill Creek that may include
  - Expansion of surrounding substations
  - Re-distribution of available capacity from other substations in the territory.
  - Novel solutions such as distribution battery banks
  - Rooftop Solar
  - Any combination
2. Compare
  - Reliability goals;
  - Operating issues; and
  - Financial targets;
3. Review CWLD southern service territory load growth projections and the ability of the surrounding electrical infrastructure to support current and future load with each proposed alternative and Mill Creek Substation.

#### **Task 5 – Deliverable Items**

1. Secure File Sharing

Prior to the model setup and validation, a secure file sharing site (Box.com) will be provided for CWLD to upload data required for Quanta Technology to conduct the study.
2. Kick-off Meeting

Quanta Technology proposes a ½ day kick-off meeting for the project. The meeting will be to review the data provided, gain a better understanding of CWLD electric system and kick-off the project. The information gathered from the workshop will be the basis for the study and the written report that will conclude the project. The success of the meeting will be dependent upon having subject matter experts from CWLD in attendance. Additionally, it might be helpful for CWLD to provide Quanta Technology with a high level tour of the more important physical electrical system facilities in Columbia, MO.
3. Bi-weekly Updates

After the project kick-off, a bi-weekly call will be organized by Quanta Technology with CWLD to review the project status, deliverables, and ensure that the project is on-



schedule. A summary of the bi-weekly calls will be sent out following the conclusion of each call.

#### 4. Written Study Report

A detailed written study report will present Quanta Technology's findings of the power flow computations, substation load evaluations, concerns, and mitigation options. In order to obtain an interim consensus on layout and content of the report, it is proposed that a draft of the report be presented two weeks prior to the final report, with CWLD providing feedback in a timely fashion.

Through this proposal, Quanta Technology offers its technical capabilities and expertise to assist CWLD in performing an independent distribution reliability study for the Southwest region of the CWLD electric system exploring alternatives to compare with the new Mill creek substation.

### 2.1 Additional Tasks

In addition to the tasks detailed above, Quanta Technology will support CWLD with any additional support it might require on a time and material basis. The costs of these tasks will be determined upon understanding of the requirement, and are not included in the current pricing package.



### 3 PROJECT TIMELINE

Quanta Technology proposes to complete the scope of work outlined in this proposal in approximately ten (10) weeks from the date of being awarded this project, subject to availability of working models. If it is determined that one of the tasks of the project is needed prior to the others, Quanta Technology will work in concert with CWLD to try to best achieve CWLD’s needs and objectives. Assuming the project is awarded the week of October 1<sup>st</sup>, 2017, the anticipated completion date would be December 6<sup>th</sup>, 2017. Quanta Technology will make every effort to complete the study sooner if possible.

Table 3-1 contains a draft project schedule of the tasks for this proposal. Quanta Technology will make every effort to meet or exceed the timing outlined in this schedule. Quanta Technology will work with CWLD to adjust this proposed schedule as necessary to meet their needs.

**Table 3-1 Proposed Project Schedule**

<b>Proposed Project Phases/Tasks</b>	<b>Timing</b>
Task 1: Project Planning and Initiation	T <sub>0</sub> (October 1, 2017)
Task 2: Data gathering	T <sub>0</sub> + 2 Weeks
Task 3: Electric System Review and Assessment	T <sub>0</sub> + 5 Weeks
Task 4: Review of Potential Mitigations and Comparison to Proposed Mill Creek Substation	T <sub>0</sub> + 8 Weeks
Task 5: Deliverable Items	T <sub>0</sub> + 10 Weeks
Project Wrap-up	

Quanta Technology proposes to host either weekly or bi-weekly meetings with CWLD to review the project findings, costs, and schedule.



## 4 PROPOSED PROJECT TEAM

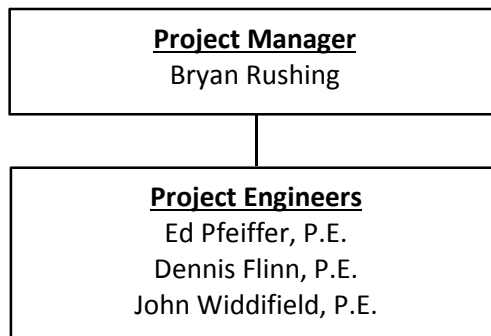
Quanta Technology’s project team is composed of experts who have worked together previously on similar projects. This section provides details on their qualifications, how they will be organized and who will work on what aspects of this project.

### 4.1 **Organization, Project Management & Key Personnel**

The proposed project team is composed of the following engineers. The following resources are considered to act as primary support for CWLD in this effort.

- Bryan Rushing – Project Manager
- Ed Pfeiffer – Technical Project Lead
- Dennis Flinn – Distribution Studies Support
- John Widdifield – Cost Estimation Support

The proposed team members and their respective roles in this project are presented below. On a task-by-task basis, additional members, such as junior staff, from the Quanta Technology team will be utilized. It should be noted that the ultimate team will be selected per project needs and specification to meet specific project scope.

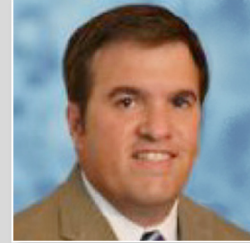


### 4.2 **Proposed Project Team**

Quanta Technology is proud of our team and the depth of real-world experience we can bring to CWLD. For this particular engagement, we propose the following key personnel to support the Project. A brief synopsis of each team member is provided below.

## Bryan Rushing

**Bryan Rushing**, *Executive Advisor, Vice President, Electric Transmission Infrastructure Development*, Business development and management professional with more than seventeen years of technical, operational, problem solving, and commercial experience in business-to-business sales, technical support, and marketing. Skilled in identifying business development opportunities, technical and economic valuation, strategy formulation, and plan implementation. A self-starter and top performer in business-to-business transactions.



**Vice President**  
*Electric Transmission  
Infrastructure Development*

### Areas of Expertise

- Origination & Business Development
- Power Supply Planning
- Transmission Service Procurement and Analysis
- Energy and Ancillary Service Markets
- Regulatory and Policy

### Experience & Background

- Years of experience in the electric power industry .....1999–Present
- Vice President, Electric Transmission Infrastructure Development, Quanta Technology, LLC...2016-Present
- Sr. Director, Transmission & Regulatory, Quanta Technology, LLC.....2014–2016
- Manager, Business Development, Quanta Technology, LLC ..... 2012–2014
- Director of Origination, LS Power Development, LLC..... 2006–2012
- Transmission & Operations Executive, Ameren Energy Marketing..... 2004–2006
- Transmission Service Engineer, Ameren Services..... 1999–2004

### Accomplishments & Industry Recognition

- IEEE Member
- Missouri Division of Professional Registration (Engineering Intern - FE)
- NERC - Certified Reliability Coordinator Operator (December 23, 2005)

### Education

- MBA, Maryville University at St. Louis, 2008
- BS, Engineering Management, Missouri University of Science & Technology, 1998
- BA, Business Administration, Drury University, Springfield, Missouri, 1996

## Ed Pfeiffer, PE

**Ed Pfeiffer, PE, Principal Advisor, Transmission & Regulatory**, has almost 40 years of progressive experience in hands-on power system analysis in both transmission and generation expansion planning. Ed has worked with wind farm developers seeking to interconnect in the RTO environment and assisted with interconnection details for transmission owners. He has performed ISO/RTO interconnection studies, acted as a transmission subject matter expert for NGO stakeholders in the Eastern Interconnection Planning Collaborative, provided transmission planning expertise to assist utilities in developing transmission and distribution processes and procedures, provided oversight for regional production cost studies evaluating congestion issues and their mitigation, and performed transfer capability studies related to FERC market power assessment. He also has regional and national industry committee experience through NERC.



**Principal Advisor**  
*Transmission & Regulatory*

### Areas of Expertise

- Transmission and distribution planning assisting utilities develop processes and procedures.
- Regional production cost studies evaluating congestion issues and their mitigation
- Interconnection in the RTO environment and assist with wind power interconnection details with transmission owners.
- Transmission consultant for NGO stakeholders in the Eastern Interconnection Planning Collaborative
- Compliance with related NERC standards, participation in near and long term SERC study efforts

### Experience & Background

- Years of experience in the electric power industry.....1978–Present
- Executive Advisor, Transmission & Regulatory, Quanta Technology.....2011–Present
- Associate, AMEC Earth and Environmental..... 2009–2010
- Manager Electric Planning, Ameren ..... 2000–2009
- Transmission & Operations Planning, Ameren ..... 1978–2000

### Accomplishments & Industry Recognition

- Member IEEE
- Member of NERC Planning Committee 2007-2009
- Member of NERC PAS, G&TRPMTF, TADSTF, RICCITF, OLDTF
- Registration as professional engineer in Missouri

### Education

- MSEE, Southern Illinois University, Carbondale, 1975
- BSEE, Southern Illinois University, Carbondale, 1975

## Dennis Flinn

**Dennis Flinn**, *Principal Advisor*, has over 38 years of experience in distribution systems modeling, operations, and analysis, with a significant emphasis on distribution automation, Volt/VAR, CVR, renewable, and storage. He has taught numerous training seminars worldwide related to distribution engineering and circuit protection



*Principal Advisor*

### Areas of Expertise

- Renewables & Energy Storage System integration and the impact within Distribution Systems.
- Distribution Smart Grid Strategy, Design & Implementation.
- Distribution Conservation Voltage Reduction Impact.
- Distribution Planning: Load Flow, Short Circuit, and Reactive Power Flow Studies, Contingency Analysis, and Load Forecasting.
- Application Integration: Interface design between business processes.
- Power System Protection: Overcurrent protection and coordination.
- Reliability: Conducted individual Reliability Studies.
- Power Quality: Data collection and analytics of disturbances & Indices.

### Accomplishments & Industry Recognition

- Professional Engineer – Pennsylvania
- Senior Member IEEE – Power & Energy Society (PES)
- Senior Member IEEE – Industry Applications Society (IAS)
- Published over 20 papers

### Education

- MS, Electric Power Engineering – Ohio State University, 1978
- BS, Electric Power Engineering – Ohio University, 1977
- AAS, Electric Engineering – Ohio State University, 1975

## John H Widdifield

**John H. Widdifield, Principal Advisor,** Mr. Widdifield has extensive experience in high voltage substations, equipment and apparatus. He has substantial knowledge of relaying, protection, coordination, fault current calculations, and relay settings for transmission lines and high-voltage substations. Additional areas of expertise include investigating and reporting root causes of substation, transmission line, and distribution feeder operations and outages.

During his career Mr. Widdifield has held positions of Manager of Substation Engineering, Manager of Transmission Standards, and Manager of Transmission Line Engineering at a large IOU utility.



*Principal Advisor*

### Areas of Expertise

- Substation Design
- Medium/High Voltage Equipment & Apparatus
- Application of Substation Equipment/Relaying

### Experience and Background

- |  |              |
|--|--------------|
| • Number of years of experience in the electric power industry | 38 years     |
| • Supervising Engineer - Dashiell                              | 2008 – 2010  |
| • Senior Project Engineer - Utility Engineering                | 2007 – 2008  |
| • General Manager -,Southeastern Transformer                   | 2005 – 2007  |
| • Senior Project Engineer – Booth & Associates                 | 1995 – 2005  |
| • Manager of Engineering Units – Progress Energy (was CP&L)    | 1980 – 1995  |
| • Senior Project Engineer – Monterey Coal                      | 1976 – 1980  |
| • Associate Engineer – Virginia Power                          | 1971 -- 1976 |

### Accomplishments & Industry Recognition

- Registered Professional Engineer, NC, VA, MS, CO, CA, AZ, WY, NJ,TX

### Education

- BSEE- Virginia Tech
- MS Business – Virginia Commonwealth University





## 5 PRICING AND TERMS

### 5.1 Cost Plan/Budget

Quanta Technology offers the project team, capabilities and experience described in this proposal on a time and material basis estimated at \$97,500.

In recognition of CWLD being a valued customer of Quanta Technology, the time will be charged at the Quanta Technology standard hourly rate less a 15% discount (see table below “Standard Hourly Rate (15% Discount)”). Periodic reviews of the cost, estimates and schedules will be conducted during the project execution.

Below please find an estimate of the costs associated with each phase for Quanta Technology to support CWLD by performing an independent distribution reliability study for the Southwest region of the CWLD electric system exploring alternatives to compare with the new Mill creek substation.

**Table 5-1 : Cost Estimate and Man-Hours By Task**

Task #	Task Name/Description	Cost Estimate	Man-Hours
1	Project Planning and Initiation	\$2,500	9
2	Data gathering	\$15,000	62
3	Electric System Review and Assessment	\$35,000	130
4	Review of Potential Mitigations and Comparison to Proposed Mill Creek Substation	\$35,000	130
5	Deliverable Items	\$10,000	36
TOTAL		\$97,500	367

**Table 5-2 : Standard Hourly Rate (15% Discount)**

Title	Standard Hourly Rate	Standard Hourly Rate (15% Discount)
Industry Advisor	\$400	\$340
Executive Advisor	\$350	\$298
Principal Advisor	\$295	\$251
Senior Advisor	\$250	\$213
Advisor	\$210	\$179
Principal Engineer	\$185	\$157
Senior Engineer	\$167	\$142
Engineer III	\$150	\$128



<b>Title</b>	<b>Standard Hourly Rate</b>	<b>Standard Hourly Rate (15% Discount)</b>
<b>Engineer II</b>	\$135	\$115
<b>Engineer I</b>	\$120	\$102
<b>Senior Project Manager</b>	\$200	\$170
<b>Project Manager</b>	\$175	\$149
<b>Analyst</b>	\$100	\$85
<b>Administrative</b>	\$50	\$43

**Notes**

1. Rates subject to change

Travel, lodging, and materials costs will be billed separately on a cost plus 10% basis. For every one hour of project-related travel time, the customer should be billed one half hour of consulting time up to eight hours of travel per day (four hours billed). If the consultant is performing project work during travel, this time should be treated as normal project work and will not be billed separately as travel time.

**5.2 Proposal Expiration Date**

This offer is valid through September 30, 2017. For information on extensions of the offer, please contact Bryan Rushing, [brushing@quanta-technology.com](mailto:brushing@quanta-technology.com), (636) 288-2946.