TASK ORDER NO. 05

Engineering Design Services – Canal 8-Bay Distribution Substation

THIS TASK ORDER ("Task Order") is made on _____, 2021, between the **City of Lake Worth Beach,** a Florida municipal corporation located at 7 North Dixie Highway, Lake Worth, Florida 33460 ("City") and **Power Engineers, Inc.,** a Florida corporation ("Consultant").

1.0 Project Description:

The City desires the Consultant to provide those services as identified herein and generally described as: **Engineering design and support during construction for a new Canal 8-Bay Distribution Substation** (the "Project"). The Project is described in the consultant's proposal, dated April 8th, 2021, and is attached hereto as **Exhibit "1"** and incorporated herein.

2.0 Scope

Under this Task Order, the Consultant will provide professional services to the City as detailed in the **Consultant's proposal attached hereto and incorporated herein as Exhibit "1".**

3.0 Schedule

The services to be provided under this Task Order shall be completed within **884** calendar days from the City's approval of this Task Order or the issuance of a Notice to Proceed.

4.0 Compensation

This Task Order is issued for a time and expense, not to exceed amount, of **$746,977.00.** The attached proposal identifies all costs and expenses anticipated in the time and expense, not to exceed amount.

5.0 Project Manager

The Project Manager for the Consultant is Ivette Sanchez , phone: 407-341-6907 ; email: ivette.sanchez@powereng.com ; and, the Project Manager on behalf of the City is Carl Turner, P.E.; with the Florida Municipal Power Agency, phone: 321-239-1054 ; email: Carl.Turner@fmpa.com ; and the Project Manager for the City is David Martyniuk, phone: 561-586-1629 ; email: DMartyniuk@lakeworthbeachfl.gov

6.0 Progress Meetings

The Consultant shall schedule periodic progress review meetings with the City Project Manager as necessary but every 30 days as a minimum.

7.0 Limitation of Liability

The City agrees to limit CONSULTANT's liability, to the City and to those under contract with the City to perform the work under the scope of the Project, for insurable events arising from the CONSULTANT's performance under this Task Order to One Million Five Hundred Thousand Dollars ($1,500,000.00). Except for the CONSULTANT's agreement and obligation to indemnify and hold harmless under the Agreement, the CONSULTANT's liability for non-insurable events including breach of contract shall not exceed $746,977

under the proposed Task Order for this project.

8.0 Authorization

This Task Order is issued in compliance with the Consultants' Competition Negotiation Act, section 287.055, Florida Statutes, and pursuant to the Agreement for Professional Services between the City of Lake Worth and the Consultant, dated **May 1st, 2018** ("Agreement" hereafter). If there are any conflicts between the terms and conditions of this Task Order and the Agreement, the terms and conditions of the Agreement shall prevail; however, the specific scope of services set forth in this Task Order shall take precedence over any other more general description of services.

IN WITNESS WHEREOF the parties hereto have made and executed this Task Order on the day and year first above written.

CITY OF LAKE WORTH BEACH, FLORIDA

ATTEST:

By: _____
Deborah M. Andrea, City Clerk

By: _____
Betty Resch, Mayor

APPROVED AS TO FORM AND LEGAL SUFFICIENCY:

By: _____
Glen J. Torcivia, City Attorney

APPROVED FOR FINANCIAL SUFFICIENCY

By: _____
Bruce T. Miller, Financial Services Director

CONTRACTOR: Power Engineers, Inc.

By: _____

[Corporate Seal]

Print Name: _____

Title: _____

STATE OF _____)
COUNTY OF _____)

The foregoing instrument was acknowledged before me this _____ day of _____, 2021, by _____, who was physically present, as _____ (title), of Power Engineers, Inc., which is authorized to do business in the State of Florida, and who is personally known to me or who has produced the following _____ as identification.

Notary Public

_____
Print Name: _____
My commission expires:_____

EXHIBIT "1"
(Consultants Proposal)

POWER ENGINEERS, INC.
1060 MAITLAND CENTER COMMONS
SUITE 110
ORLANDO, FL 32751 USA

PHONE 207-869-1200
FAX 207-869-1299

April 08, 2021

Paul Nicholas
Engineering Manager - Special Projects
City of Lake Worth Beach
1900 2nd Avenue North
Lake Worth Beach, FL 33461

Subject: New Canal 8-Bay 25kV Distribution Substation Proposal

Dear Mr. Nicholas:

Thank you for the opportunity to provide a proposal to City of Lake Worth Beach for your upcoming New Canal eight (8) bay 25kV distribution substation project. We propose to provide the required substation, distribution, civil, permitting and P&C services to complete the necessary Issue for Construction (IFC) plans for this project.

POWER's proposed pricing for this project is outlined in tabular form later in this proposal. Pricing provided is predicated on a time and expense approach with billing rates governed by our existing POWER's Professional Services Agreement with the City of Lake Worth Beach for Energy Management and Engineering Services (RFQ No. 18-303).

We look forward to your review of our proposal. If you have any questions, please contact me at 407-341-6907. Our team is available to meet with you anytime to discuss our approach and proposal in detail. Thank you once again for this opportunity to work with City of Lake Worth Beach.

Sincerely,

Ivette Sanchez, PMP
Project Manager

PROJECT DESCRIPTION

Provide engineering services for the following projects:

Substation Engineering:

- New Canal eight (8) bay 27kV distribution station with 35kV tie breaker, two (2) 138kV/27kV transformers, and 138kV switchyard including (4) 138kV breakers with association 138kV disconnect switches, two dead-end towers, and (1) 138kV tie switch. One 27kV distribution feeder position to connect to capacitor bank via 35kV RMAG breaker and one 27kV distribution feeder position to connect to 27kV express feed via 35kV RMAG breaker.
    - Site preparation design (included in the 138kV Canal Transmission substation project).
    - Environmental permitting (included in the 138kV Canal Transmission substation project).
    - Site permitting (included in the 138kV Canal Transmission substation project).
    - Physical substation design including material and construction specifications and material purchasing support. (138kV equipment and arrangement to match new 138kV Canal Transmission substation and 35kV Distribution equipment and arrangement to use 7th Avenue North design as a go by)
    - Substation protection and control design (138kV equipment and arrangement to match new 138kV Canal Transmission substation and 27kV Distribution equipment and arrangement to use 7th Avenue North design as a go by).
    - Relay settings.
    - SCADA Integration.
    - Engineering support during construction.
    - Record drawings and project closeout.

Distribution Engineering:

- Relocate the existing 27kV Distribution Express Feeder starting at existing structure 3/7 prior to the new Canal 138kV/27kV Distribution station construction.
    - Distribution pole locations affected by new 27kVdistribution substation site location to be relocated.
    - Three (3) existing CLWB poles to be removed.
    - Existing overhead primary and neutral line to be removed.
    - Develop a phased plan with CLWB to coordinate relocation of overhead lines prior to station construction. Plan will entail the design and coordination to temporarily relocate existing facilities prior construction and leverage for final layout design.

  - Permits not included in the 138kV Canal Transmission substation project.
  - Coordinate with Substation and Civil group on work schedule.

- Five (5) new 27kV underground distribution substation exits to feed existing Distribution feeders.
  - Evaluate existing pole line and update facilities to updated CLWB standards.
  - Design five (5) new make ready locations for first switch out of new Canal 138kV/27kV Distribution substation.
  - Design underground layout to feed existing and new substation.
  - Create drawings for local permitting
  - This proposal assumes all existing feeder conductors are up to CLWB standards.
  - Provide completed construction package.
  - Development of hardware material specifications are not a part of the scope of this proposal.
  - Development of pole specifications are not a part of the scope of this proposal.
  - Provide As-Built drawings upon construction completion.
  - Coordinate with Substation and Civil group on work schedule.

PROJECT MILESTONES

The following milestones have been proposed for this project:

MILESTONE	DATE
Begin Detailed Design	4/12/2021
Major Substation Equipment Procurement (Bid)	5/28/2021
Substation Site Development Package (Issued For Permitting) (Substation Physical 30% as part of 138kV Canal Transmission project)	6/4/2021
Major Substation Equipment Procurement (Award date)	6/7/2021
Substation Physical 60% IFR	8/2/2021
Substation P&C Design 60% IFR (Schematics)	8/20/2021
Substation Physical 100% IFC	8/27/2021
Distribution 90% IFB Package	9/6/2021
Distribution & Substation Construction Bids (Bid)	9/6/2021
Substation P&C Design 90% IFR (Wiring & Connection Diagrams)	10/22/2021
Substation P&C Design 100% IFC	11/19/2021
Distribution & Substation Construction Bids (Award)	Dec 2021
Permitting Complete (Assuming 6 Months, Allows for 2 months of float as part of 138kV Canal Transmission project))	12/3/2021
Distribution 100% IFC Package	12/6/2021
Start Substation Construction	2/1/2022
Substation Construction Complete	9/1/2022

POWER'S WORK PLAN FOR THIS PROJECT

This section presents our work plan prepared specifically for your project. Our work plan does the following:

- Defines the scope of work so you know exactly what we intend to do.
- Lists the deliverables that you will receive.
- Identifies your key project concerns and our proposed solutions.
- Serves as a ready-made project control system when the project begins.
- Becomes the foundation for project scheduling and budgeting throughout the project life.

A BASIS FOR PROJECT REPORTING

With this work plan, we can track tasks, subtasks and deliverables throughout the life of the project. Project status reports and project

review checklists assist us in communicating and coordinating internally throughout the project.

CLWB AND POWER REVIEW

We invite you to review and revise this document with us before the project starts. This joint review will provide optimum coordination among all involved parties as the project progresses.

TASK OUTLINE

Task 0 Project Management

Subtask 0.1 Project Supervision and Control

Task 1 Substation Initiation

Subtask 1.1 Data Acquisition
1.2 One-Line Diagram
1.3 General Arrangement Plan
1.4 Design Criteria
1.5 Preliminary Package Design Review
1.6 CLWB Review Preliminary Design
1.7 Geotechnical Report
1.8 Soil Resistivity Report
1.9 Topographic Survey
1.10 Permitting Support
1.11 Drawing Re-creation

Task 2 Major Equipment Specifications

Subtask 2.1 Technical Specifications
2.2 Equipment Purchase Recommendations
2.3 Submittal Review
2.4 Factory Test Report Review

Task 3 Physical Design

Subtask 3.1 Plans and Sections
3.2 Grounding and Fence
3.3 Conduit and Cable Trench
3.4 Conduit and Cable Schedule
3.5 Lightning Protection Design
3.6 Physical Design Review
3.7 Supporting Documentation

Task 4 Civil/Structural Design

Subtask 4.1 Site Preparation
4.2 Foundation Design
4.3 Structure Design
4.4 Oil Containment Requirements
4.5 Civil/Structural Design Review
4.6 Access Road Design
4.7 Landscape Plan
4.8 SWPPP Plan/Civil Permitting
4.9 Aesthetic Design
4.10 Audible Noise Characterization and Mitigation

Task 5 Control and Relaying Schematics

Subtask 5.1 Protective Relaying One-Line Diagram
5.2 Three-Line Diagrams
5.3 Protective Relaying Schematics

5.4 Breaker Schematics
5.5 Alarm Schematic
5.6 SCADA and Automation
5.7 Protective Relaying Design Review

Task 6 Wiring Diagrams

Subtask 6.1 Switchboard Panel Layout
6.2 Switchboard Panel Wiring
6.3 Outdoor Equipment Wiring
6.4 RTU Wiring
6.5 Communications Interface
6.6 Wiring Diagram Design Review
6.7 Supporting Documentation

Task 7 Protective Relay Settings & Studies

Subtask 7.1 Data Acquisition
7.2 Short Circuit Study
7.3 Project Studies
7.4 SCADA Integration
7.5 Protective Relaying Criteria
7.6 Protective Relay Settings
7.7 Relay Test Procedures
7.8 Commissioning Support

Task 8 Control Building

Subtask 8.1 Control Equipment Enclosure Plan and Sections
8.2 AC Station Service
8.3 DC Station Service
8.4 Control Building Lighting & HVAC
8.5 Supporting Documentation

Task 9 Pre-Construction Activities

Subtask 9.1 Construction Specification
9.2 Bid Unit Schedule
9.3 Construction Bid Package
9.4 Contractor Selection Activities

Task 10 Construction Activities

Subtask 10.1 “Issued for Construction” Documents
10.2 Pre-Construction Meeting
10.3 Engineering Support during Construction

Task 11 Post-Construction Activities

Subtask 11.1 Record Drawings
11.2 Project Close-Out Documentation
11.3 Lessons-Learned Review

Task 12 Commissioning

Subtask 12.1 Substation Commissioning Procedures
12.2 Substation Commissioning
12.3 Substation Energization

12.4 Final Commissioning Report

Task 13 Distribution Pre-Design Activities

Subtask 13.1 Design Criteria
13.2 Site Visit

Task 14 Distribution Line Design

Subtask 14.1 Pre-design
14.2 Poleforeman
14.3 Design

Task 15 Distribution Underground Design

Subtask 15.1 Pre-design
15.2 Design
15.3 Pull Calculations

Task 16 Permitting Activities

Subtask 16.1 Permits

Task 17 Material Procurement

Subtask 17.1 Material List

Task 18 Construction Drawings

Subtask 18.1 Plan Drawings
18.2 Plan & Profile Drawings

Task 19 Quality Assurance

Subtask 19.1 Quality Assurance

Task 20 Post-Construction Activities

Subtask 20.1 Construction Specifications

Task 21 Construction Activities

Subtask 21.1 “Issued For Construction” Drawings
21.2 Pre-Construction Meeting
21.3 Engineering Support During Construction

Task 22 Post-Construction Activities

Subtask 22.1 As-Built Drawings

Task 22 Post-Construction Activities

Subtask 22.1 As-Built Drawings

TASK 0
PROJECT MANAGEMENT

Objective(s):
- To manage POWER's scope of services per City of Lake Worth Beach (CLWB)'s expectations and POWER's procedures.
- To coordinate with CLWB and to direct the smooth flow of project communications.
- To manage the work plan, schedule, and budgets for on-time completion of the project within approved parameters.

Prerequisite(s):
- Purchase Order (P.O.)
- Notice to Proceed

SUBTASK 0.1 PROJECT SUPERVISION AND CONTROL

Responsibility: POWER

Deliverable(s):
- Supervision Management

Communicate, supervise and coordinate project participants (within POWER's purview) to complete all tasks and activities as outlined in the approved scope of work. Establish and maintain with CLWB the project schedule for engineering related tasks. Track deliverables progress and completion relative to schedule. Monitor the work and budget and document work scope variances, if there are any, for CLWB's review. Prepare a Monthly Status Report to be attached to the Monthly Invoice which will summarize the status of deliverables, schedule and cost. Summarize the work performed in the reported billing period as well as work expected to be performed in the next billing period. Address problems, risks, trends and/or delays and the actions being taken to bring those areas back on schedule or budget.

Direct and coordinate POWER's project team with emphasis on:

- Compliance with CLWB's stated procedures and standards
- Adherence to budget, scope, and schedule
- Compliance with the Project Procedures and Design Criteria
- Adherence to POWER's Quality Control and Quality Assurance procedures.

Assumption(s):
- The 138kV Canal Transmission project is awarded to PEI.
- This project will be in parallel with the 138kV Canal Transmission project. Meetings costs were captured in the 138kV Canal Transmission project.

TASK 1
SUBSTATION INITIATION

Objective(s):
- To prepare the Preliminary Design Package and develop the Design Criteria that will serve as the basis for detailed design.

Prerequisite(s):
- Purchase Order (P.O.)
- Notice To Proceed

SUBTASK 1.1 DATA ACQUISITION

Responsibility: POWER/CLWB

Deliverable(s):
- Data Requests
- Meeting Minutes

Schedule and attend a project initiation meeting in CLWB's office to gather and review available project data. Interview key CLWB engineering, operations, and maintenance personnel to determine key concerns to be addressed during the design. Conduct a project site visit to identify existing features and conditions that will be considered in the design. Forward data requests and a proposed meeting agenda sufficiently in advance to allow CLWB to gather requested data and prepare for the meeting. Summarize the meeting minutes and route copies to all concerned parties for review.

Review existing studies and reports and conduct additional research as required to identify and confirm the design requirements. Coordinate with CLWB to ensure compatibility with the existing system

Gather information required for preliminary engineering. Include the following:

- Meteorological information
- Existing reports or studies concerning the project
- CLWB's preferred materials and designs
- CLWB operating constraints and practices that may affect the project design
- Any additional information that will aid in design
- CLWB and agency specifications and requirements
- Project maps
- Environmental data

Review, organize and file the information for use by POWER's project team.

Assumption(s):
- CLWB will provide a survey of the property associated with Canal distribution substation including siting of all the transmission and distribution line poles and top and bottom wire elevations of these lines.
- CLWB will provide a topographic map of the Canal distribution property.
- CLWB will provide soil resistivity data association with the Canal distribution property.
- CLWB will provide geotechnical information associated with the Canal distribution property.
- Preliminary engineering including one lines, substation layouts, and initial transmission line routing was provided under another project.

SUBTASK 1.2 ONE-LINE DIAGRAM

Responsibility: POWER

Deliverable(s):
- One-Line Diagram

Prepare the One-Line Diagram for the substation. Illustrate the general bus arrangement, interconnection of relaying, metering, relaying communications, transformers, circuit breakers, and other devices. Determine metering and relaying locations and requirements and indicate such on the drawing by the location of the instrument transformers. Identify major equipment ratings on the drawing.

Assumption(s):
- The details of the protective relaying schemes will be fully developed under the Protective Relaying One-Line Diagram subtask.
- Preliminary engineering of the one lines was completed under another project.

SUBTASK 1.3 GENERAL ARRANGEMENT PLAN

Responsibility: POWER

Deliverable(s):
- General Arrangement Plan

Prepare the General Arrangement Plan. Depict the physical bus arrangement and configuration, line entries and exits, transformer, circuit breaker and switch locations, cable trench location, access roads, substation baselines and control building location. Identify and note bus connections and phasing on the drawing.

Assumption(s):
- Preliminary engineering of the general layout was completed under another project.

SUBTASK 1.4 DESIGN CRITERIA

Responsibility: POWER

Deliverable(s):
- Design Criteria Document

Review available data, and compile and issue the Design Criteria for CLWB's review, revision and approval. Summarize proposed analysis and design procedures and criteria. Include the following:

- General Description
- Site Criteria
- Controlling Codes
- Access Requirements
- Electrical Loading
- Mechanical Loading
- Major Equipment
- Electrical Clearances
- Drainage
- Control House
- Communications
- Metering
- AC Station Service
- Number of Terminals
- Structures
- Grounding
- Conductor
- Bus
- Insulation
- Shielding
- Material Types
- Foundations
- Surfacing
- Operating Voltages
- SCADA
- Substation Lighting
- DC Station Service
- Substation Layout
- Relaying
- Reclosing

The scope and content of this document, as approved by CLWB, will serve as the basis for the detailed design engineering.

Assumption(s):
- POWER's standard design criteria document will be completed and submitted to CLWB for review.

SUBTASK 1.5 PRELIMINARY PACKAGE DESIGN REVIEW

Responsibility: POWER

Deliverable(s):
- Preliminary Design Package

Assemble a complete set of all preliminary design drawings and documents and all supporting data. Perform a detailed independent review of all documents to be included in the Preliminary Design Package. Address each of the reviewer's comments and incorporate changes into the drawings and documents as appropriate.

Assumption(s):
- Preliminary engineering of the design review was completed under another project.

SUBTASK 1.6 CLWB REVIEW PRELIMINARY DESIGN

Responsibility: POWER

Deliverable(s):
- CLWB-Approved Preliminary Design Package

Schedule and attend a meeting at CLWB's office to review the Preliminary Design materials. Provide the One-Line Diagram, General Arrangement Plan, and Design Criteria one week in advance of the meeting to allow for CLWB review. Incorporate changes requested by CLWB that are in conformance with the scope of work contained in this Work Plan.

Secure CLWB approval of the Preliminary Design package. Final design will be based on the agreement reached during this review process. Summarize the meeting minutes and route copies to all concerned parties for review.

Assumption(s):
- Ongoing phone conferences have been provided to discuss the preliminary design. Final acceptance by CLWB of the preliminary one lines, general arrangement, and transmission line routing to be provided prior to start of detailed engineering.

SUBTASK 1.7 GEOTECHNICAL REPORT

Responsibility: CLWB

Deliverable(s):
- Geotechnical Specification
- Geotechnical Report

Specifications for the geotechnical field evaluation and soil analysis shall contain detailed soil data for the design of the structure footings/foundations for the substation. The geotechnical report shall include consideration of axial capacity, lateral load resistance, settlement, and corrosion due to soil conditions and shall develop recommendations for the foundation design parameters. A boring plan detailing the location of the required borings shall be provided. Quantities and depths of borings including field and laboratory sampling and testing procedures in general accordance with ASTM procedures.

Local drilling and laboratory firms shall be identified. Obtain quotations, and select, subcontract, and schedule a local drilling subcontractor and soils laboratory subcontractor.

CLWB to review the geotechnical report submitted by the hired subcontractor for adherence to the geotechnical specification. File geotechnical report for use by POWER's project team.

Assumption(s):
- CLWB will provide access to the site for the soil testing contractor.
- CLWB will issue Purchase Order (P.O.) to the soil testing contractor.

SUBTASK 1.8 SOIL RESISTIVITY REPORT

Responsibility: CLWB

Deliverable(s):
- Soil Resistivity Specification
- Soil Resistivity Report

Perform field resistivity tests at the substation site. Determine ground resistance parameters representative of the major soil type encountered. Note the weather and soil conditions that could affect the ground resistivity at the time the readings were taken. Evaluate the field resistivity data and develop resistivity profile for each test location. Incorporate the analysis of the field data into the design of the grounding for the station.

Assumption(s):
- CLWB will provide all data for the soil resistivity testing.

SUBTASK 1.9 TOPOGRAPHIC SURVEY

Responsibility: CLWB

Deliverable(s):
- Topographic Survey Data

Perform a topographical survey of the substation site. Define the existing contours using a grid system based on the precision required for final grade. Represent the results of the survey on a map with 1-foot contour intervals.

Establish the baseline monuments and gather all planimetric data within the impact zone of the substation. Locate section and/or quarter corners and property corners that lie within or adjacent to the site and can be located after a reasonable search. Monument property corners for use by construction contractor in establishing locations for construction.

Field inspect and inventory existing facilities and equipment to gather reliable data for inclusion in the final design. Tabulate the data on existing facilities that may be included in the final design and include pertinent information such as manufacturer, model and rating.

Plot and identify the substation baselines and baseline monuments. Show all planimetric features within the substation impact zone. Include the location of roads, fences, trees, drainage features, railroads, canals, buildings, foundation remains, existing power and/or communication

lines (all structures), rock outcrops, rock slides, swamps, rivers, and other permanent features.

Assumption(s):
- CLWB will provide files of the topographic survey in AutoCAD format.

SUBTASK 1.10 PERMITTING SUPPORT

Responsibility: POWER

Deliverable(s):
- Permit Applications
- Permit Authorizations from applicable Agencies

Provide CLWB the required support to acquire the necessary permits to complete the project.

Contact the applicable county/city/government agency to determine the required permits for the project. Identify the necessary support information required to submit the permit application. Collect or develop the necessary support information, complete the permit application, and submit to the appropriate agency.

Follow up with the city/county/government agency to confirm that the permit application has been received and is being processed.

Anticipated permits that will be required include:

- South Florida Water Management District – Environment Resource Management Permit;
- Palm Beach County – Building Permit;
- CLWB Drainage District – Notification and Concurrence of Development

Assumption(s):
- The 138kV Canal Transmission project is awarded to PEI.
- Permitting of site is included in the 138kV Canal Transmission project.

SUBTASK 1.11 DRAWING RE-CREATION

Responsibility: POWER

Deliverable(s):
- Vector Drawings

Identify which existing drawings are not in vector format. Determine which drawings would provide sufficient benefit to support the cost of redrawing and submit this list to CLWB for review. Through discussions

with CLWB, determine which drawings will be redrawn and submit a change request notification to complete this additional work.

Create combination vector/raster drawings from the original paper or mylar drawings. Create the drawings in AutoCAD® format. Scan the original drawings into a tif/cit format and insert into the correct project border. Update the drawing title blocks with the pertinent information and make minor modification to the raster file to give the drawing a clean appearance.

- **Note:** This task does not address the technical verification of the design details represented on the drawings.

Assumption(s):

- If during the course of the project, it is determined that drawings need to be redrawn; POWER will submit a change order notification to document the additional cost.

TASK 2
MAJOR EQUIPMENT SPECIFICATIONS

Objective(s):
- To support CLWB in purchasing major long-lead-time equipment and materials.

Prerequisite(s):
- CLWB approved Preliminary Design Package

SUBTASK 2.1 TECHNICAL SPECIFICATIONS

Responsibility: POWER

Deliverable(s):
- Material and Equipment Specifications

Develop Technical Specifications for each piece of major equipment identified based on the CLWB approved Design Criteria. Specify design, performance requirements, fabrication and manufacturing requirements, operational and maintenance features, field service engineer requirements, warranty, assembly drawings, compliance submittals, protective coating, and shipping and delivery by the manufacturer. Develop an equipment-specific list of qualified vendors.

Assumption(s):
- CLWB will provide a list of equipment currently under blanket contracts.
- 138kV/27kV transformers were ordered prior to award of the project and technical specifications for this equipment are not included.
- 138kV equipment will use the same equipment specifications as the 138kV Canal Transmission substation
- Technical specifications will be developed for the following:

> Circuit Breakers
> Disconnect Switches
> CVTs
> Control Building
> Control Panels
> Station Service Transformers
> Steel Structures Design and Fabrication
> Battery Charger & Batteries
> SCADA RTU
> Reclosers
> Capacitor Bank

SUBTASK 2.2 EQUIPMENT PURCHASE RECOMMENDATIONS

Responsibility: POWER

Deliverable(s):
- Material and Equipment Purchase Recommendations

Review and evaluate manufacturer/vendor, material and equipment proposals. Evaluate proposals according to requirements as outlined in the Technical Specifications. Request bid clarifications from vendors as required to thoroughly evaluate proposals. Prepare purchase recommendations based on compliance to the specifications and other factors that could contribute to the quality and delivery of the material or equipment. Compile evaluation criteria in spreadsheet form. Include analysis and data generated as part of the review.

Assumption(s):
- Purchase recommendations will be provided for material and equipment specified in the Technical Specifications subtask.

SUBTASK 2.3 SUBMITTAL REVIEW

Responsibility: POWER

Deliverable(s):
- Review of Approval Drawings
- Review of Data Submittals

Review the Manufacturer's Approval Drawings and Data Submittals. Verify manufacturer compliance with the technical specifications, outline drawings, and technical submittals. To expedite delivery, return Approval Drawings directly to the manufacturer and copies of the Approval Drawings to CLWB.

Provide additional information for the vendor as needed to clarify specifications. Provide technical support to CLWB during manufacture. Compare the technical specifications with vendor information and identify known problems that may arise during installation. Coordinate the resolution of any problems associated with the equipment during installation.

Assumption(s):
- Review of submittals will be provided for materials and equipment specified in the Technical Specifications subtask.

SUBTASK 2.4 FACTORY TEST REPORT REVIEW

Responsibility: POWER

Deliverable(s):
- Review of Factory Test Reports

Review Equipment Test Reports prior to installation. Verify that the equipment is performing as specified in the Technical Specifications, based on manufacturer's test results, and that all required tests have been performed.

Provide for design personnel to witness factory testing of equipment at CLWB's request. Prepare a trip report on the results of the testing and resolution of any problems found.

Assumption(s):

- Review of test reports will be provided for materials and equipment specified in the Technical Specifications subtask.
- Witnessing factory testing will be provided on a time-and-expense basis and not included in this proposal.

TASK 3
PHYSICAL DESIGN

Objective(s):
- To develop a functional, reliable, and cost-effective design for the physical portion of the substation.

Prerequisite(s):
- CLWB approved Preliminary Design Package
- Information from the Data Acquisition subtask

SUBTASK 3.1 PLANS AND SECTIONS

Responsibility: POWER

Deliverable(s):
- Station Plan Drawing
- Section and Elevation Drawings
- Miscellaneous Detail Drawings
- Rigid Bus Calculations
- Flex Bus Calculations

Layout and design the Substation Plan. Prepare a detailed overhead view of the bus arrangement. Show all buses, insulator locations, equipment (transformers, switches, circuit breakers, etc.), structures, control building, and auxiliary equipment.

Prepare the Elevation and Section Drawings. Show the equipment, structures, rigid bus, flexible buswork, and connections to scale for the station. Locate and uniquely identify material and hardware. Expand significant details for clarity. Dimension critical clearances and other special concerns. Show adequate detail to accomplish construction and to support maintenance. Incorporate a drawing-specific legend and notes.

Perform necessary bus calculations to determine maximum bus spans based on the environmental conditions, bus size and insulator type outlined in the design criteria.

Assumption(s):
- The 138kV Canal Transmission project is awarded to PEI.
- 138kV portion of the substation yard will reflect same design as 138kV Canal Transmission substation project.
- 27kV portion of the substation yard will reflect same design as existing 7th Avenue North Substation

SUBTASK 3.2 GROUNDING AND FENCE

Responsibility: POWER

Deliverable(s):
- Grounding and Fence Plan Drawing
- Grounding and Fence Details Drawings
- Grounding Analysis Report based on IEEE Std 80

Perform grounding system analysis within the area enclosed by the grounding system out to four (4) feet beyond the substation fence and any outward opening gates, based on the provided layout, fault and soil resistivity data. Grounding calculations will be performed using a computer model and design software package and based on IEEE Std 80 requirements. Produce a grounding analysis report in PDF with a single recommended design for the new grounding system area for use.

Prepare the Grounding and Fence Plan Drawing. Show the approximate locations of the underground conductor. Represent conductor sizes, connections, ground rod locations, equipment and structure grounding leads, operating platforms, and fence and gate grounding locations. Expand significant details for clarity and for ease of interpretation. Extend the grid four (4) feet outside of the fence as well as four (4) feet past the swing of the gate(s).

Lay out the substation fence. Include dimensions for corner posts and gates. Show locations of fence mounted equipment such as “Danger High Voltage” and “Hard Hat Area” signs and hot stick storage canister. Incorporate drawing-specific legend and notes.

Assumption(s):
- No unusual site conditions that require atypical grounding will be encountered. Typical grounding system design will consist of grounding conductor in 20’-40’ grid patterns and driven 10’-20’ long ground rods.
- Proximity to the existing Canal Distribution station will not be analyzed. It is assumed that the existing Canal Distribution station will be demolished once the new Canal Distribution station is energized.

SUBTASK 3.3 CONDUIT AND CABLE TRENCH

Responsibility: POWER

Deliverable(s):
- Conduit and Cable Trench Plan Drawing
- Conduit and Cable Trench Details Drawing

Determine the preliminary control and substation service cabling requirements based upon the Design Criteria, Major Equipment Specifications, SCADA requirements, and the preliminary one-line diagram. Identify the devices to be interconnected, the number of conductors per cable, cable type and conductor size with sufficient accuracy to size the conduit and cable trench.

Prepare the Conduit and Cable Trench Drawing, based on the Foundation Plan. Locate and identify each conduit route and riser with a unique station-specific descriptor. Provide dimensional data for the contractor to purchase the pre-cast cable trench. Determine the cable trench size, layout, and location as dictated by the unique requirements of the station. Include drive sections as required. Incorporate the routing of the cable trench on the drawing.

Assumption(s):
- Schedule 40 PVC pipe will be used for all underground and above-grade conduit applications.
- Cable trench will be "drive" rated in particular locations only.

SUBTASK 3.4 CONDUIT AND CABLE SCHEDULE

Responsibility: POWER

Deliverable(s):
- Conduit and Cable Schedule
- Voltage Drop Calculations

Prepare the Cable Schedule. Specify cable number, cable type, insulation level, conductor quantity and size, cable destinations, brief description of cable usage, and cable routing. Size the conductor wires to accommodate NEC designated amperages. Review long cable runs and/or high current circuits for voltage drop concerns. Complete voltage drop calculations for circuits with potential unacceptable voltage drop levels.

Evaluate available cable types and select control and power cables based on application, voltage, insulation, operating and ambient temperatures, and CLWB's requirements.

Prepare a Conduit Schedule. Include conduit designation, conduit material, associated cables, and destination. Size each conduit in accordance with allowable fill percentages defined by NEC.

Assumption(s):
- Standard cables specified will be #10 and #12 of various number of conductors and unshielded.
- Standard conduits specified will be 1", 2", 3" and 4" depending on application.

SUBTASK 3.5 LIGHTNING PROTECTION DESIGN

Responsibility: POWER

Deliverable(s):
- Lightning Protection Design
- Lightning Protection Calculations

Lay out the lightning protection. Incorporate lightning protection into structures designated for other use as much as practical. Locate additional lightning protection structures and shield wires where needed to achieve adequate protection.

Assumption(s):
- The Rolling Sphere method of lightning protection design will be used. (ref IEEE 998-2012)
- Static wires attached to static masts will be utilized to provide adequate lightning protection.
- Adequacy of the lightning protection will be verified for new equipment only.

SUBTASK 3.6 PHYSICAL DESIGN REVIEW

Responsibility: POWER

Deliverable(s):
- Physical Design Package

Assemble a complete set of all physical design drawings and documents and all supporting data. Perform a detailed independent review of all documents to be included in the Physical Design Package. Utilize standardized drawing checklists and the design criteria document to ensure the design parameters and interfaces have been confirmed and meet the project requirements. Address each of the reviewer's comments and incorporate changes into the drawings and documents as appropriate.

SUBTASK 3.7 SUPPORTING DOCUMENTATION

Responsibility: POWER

Deliverable(s):
- Physical Equipment Catalog Cuts
- Physical Equipment Material List
- Physical Equipment Nameplate List

Compile and present the following supporting documentation:

Catalog Cuts are photocopies from vendor catalogs showing materials and equipment that will be used for the project. They are compiled for reference during design and construction and cross-referenced to the Material List. In addition, the catalog cuts will be used to ensure that the correct material has been procured and expedite receiving.

The Material List includes quantity, brief description, manufacturer, and part number, if applicable, for each item. It is cross-referenced to the design drawings.

The Nameplate List contains quantity, text specifications, and required wording for the nameplates to be used on each item. The list is cross-referenced to the design drawings.

TASK 4
CIVIL / STRUCTURAL DESIGN

Objective(s):
To develop a functional, reliable, and cost effective civil/structural design for the substation.

Prerequisite(s):
- CLWB Approved Preliminary Design Package
- Information from the Data Acquisition subtask

SUBTASK 4.1 SITE PREPARATION

Responsibility: POWER

Deliverables(s):
- Site Preparation Plan Drawing
- Site Preparation Detail Drawing
- Erosion Control Plan and Details
- Stormwater Details

Prepare the Site Preparation Plan Drawing based on the Design Criteria, Geotechnical Report, and Topographic Survey Report. Show the original contours as dashed lines and the final grade contours as solid lines. Consider cut-and-fill quantities and balance, if possible. Show details for the drainage facilities such as oil containment, drainage ditches, water diversions, culverts, and other significant drainage control features. Show finish surfacing and landscaping requirements, berms, retaining walls, and other significant design features. Expand significant details for clarity and ease of interpretation. Incorporate a drawing-specific legend and notes. Show erosion control details on plans.

Assumption(s):
- The 138kV Canal Transmission project is awarded to PEI.
- All site preparation, environmental studies, roadway design and permitting is included in the 138kV Canal Transmission project.

SUBTASK 4.2 FOUNDATION DESIGN

Responsibility: POWER

Deliverables(s):
- Foundation Plan Drawing
- Foundation Detail Drawings
- Foundation Calculations

Prepare the Foundation Plan Drawing based on the substation Plan Drawing. Locate, with centerline dimensions and spacing, each foundation that is required for the supporting steel structures, equipment, and control building. Dimension the Foundation Plan from the

substation baselines. Identify each foundation with a unique station-specific alphanumeric descriptor. Indicate the orientation and elevation for the foundations.

Evaluate the structure and equipment loading requirements and design the foundations using data contained in the Geotechnical Report and Design Criteria. Determine the type of foundation to be used for each type of structure or equipment. Document all analysis and calculations.

Prepare the Foundation Detail Drawing. Show the foundations required to support the substation structures, equipment, and control building. Identify each foundation with an alphanumeric descriptor. Show the dimensions, the approximate neat line volume of concrete, the anchor bolt requirements, and the type of rebar.

Show a typical cross section and a plan view for each type of foundation. Show the projection and position of the anchor bolts and the arrangement of the rebar. Indicate sizes for all rebar.

Assumption(s):
- The 138kV Canal Transmission project is awarded to PEI.
- All 138kV foundation designs will be used from the 138kV Canal Transmission project.
- All 27kV equipment foundation designs will be used from the 7th Avenue North substation design. POWER will analyze the 7th Avenue North substation foundations to confirm that they are adequate for the soil conditions at the Canal substation site and modify the designs, if required.
- Two (2) transformer foundations and oil containment design are included in this proposal.
- One capacitor bank foundation is included in this proposal.
- One 35kV RMAG breaker foundation is included in this proposal.

SUBTASK 4.3 STRUCTURE DESIGN

Responsibility: POWER/Steel Supplier

Deliverable(s):
- Structure Outline Drawings

Prepare structure outline drawings for steel design and fabrication based on the Design Criteria and the Plan and Section Drawings. Show equipment and conductor loads and where they are applied. Show dimensional configurations, and mounting locations for switches, insulators, or other devices that are to be mounted on the structures.

Perform all calculations and provide final detailed steel fabrication and assembly drawings for manufacture. Document all analyses and calculations.

Assumption(s):
- The 138kV Canal Transmission project is awarded to PEI.

- All 138kV structure designs will be used from the 138kV Canal Transmission project.
- All 27kV structure designs will be used from the 7th Avenue North substation design. POWER will not perform any structural analyses/designs for the 27kV structures.

SUBTASK 4.4 OIL CONTAINMENT REQUIREMENTS

Responsibility: PEI

Deliverable(s):
- Oil Containment Plan
- Oil Containment Detail Drawing
- Oil Containment Calculations

Perform preliminary site evaluation considering the following parameters:

- Site drainage
- Proximity to waterways
- Soil permeability
- Depth to ground water
- Volume of oil

Select the oil containment design method for the transformer that best suits the site, considering the above listed project site conditions. Oil containment types that will be considered are: concrete basin, general site berming, basin with spray-on liner and fabric liner. Prepare an Oil Containment Plan and Details Drawing showing critical dimensions and details. Incorporate catch basins, collection system, piping, separator valves and other details as required.

Assumption(s):
- Oil containment for two (2) transformers are included.
- No SCADA monitoring of the oil containment will be required.
- A complete SPCC plan will be developed for this project.

SUBTASK 4.5 CIVIL/STRUCTURAL DESIGN REVIEW

Responsibility: POWER

Deliverable(s):
- Civil/Structural Design Package

Assemble a complete set of all civil/structural design drawings and documents and all supporting data. Perform a detailed independent review of all documents to be included in the Civil/Structural Design Package. Utilize the site survey, geotechnical evaluation, design criteria, boring logs and any other applicable data to confirm that the civil design meets the site conditions and the project requirements. Address each of

the reviewer's comments and incorporate changes into the drawings and documents as appropriate.

SUBTASK 4.6 ACCESS ROAD DESIGN

Responsibility: POWER

Deliverables(s):
- Access Road Plan Drawing
- Access Road Detail Drawing

Prepare the Access Road Plan and Profile Drawing. Show existing features, items to be installed or constructed (culverts and drainage ditches, etc.) and final elevations.

Prepare Access Road Detail Drawing. Specify the roadway width, show road cross-sections, surfacing sections, culvert specifications, drainage ditches, water bar details, and typical cut and fill sections. Identify materials to be used for construction.

Assumption(s):
- The 138kV Canal Transmission project is awarded to PEI.
- All access road design is included in the 138kV Canal Transmission project.

SUBTASK 4.7 LANDSCAPE PLAN

Responsibility: POWER

Deliverable(s):
- Landscape Plan

If required prepare a Landscape Plan for the substation to provide visual shielding from potential development in the vicinity of the substation. Utilize natural contours and vegetation to the extent possible. New landscaping required will consist of berms and native vegetation. Show location and dimensions of berms, location and type of trees, shrubs and other vegetation required. Incorporate a drawing-specific legend and notes.

Assumption(s):
- The 138kV Canal Transmission project is awarded to PEI.
- All landscape design is included in the 138kV Canal Transmission project.

SUBTASK 4.8 SWPPP PLAN/CIVIL PERMITTING

Responsibility: POWER

Deliverable(s):

- Stormwater Pollution Prevention Plan
- Stormwater Management Report

POWER will develop a Stormwater Pollution Prevention Plan (SWPPP) in accordance with Florida Department of Environmental Protection (FDEP) NPDES Generic Permit requirements for land disturbances over 1 Acre. Post-construction stormwater management is anticipated as the station installation will increase the stormwater runoff from the project site. POWER will design all post-construction stormwater management features in accordance with FDEP, Palm Beach County and Lake Worth Drainage District requirements. POWER will attend any meetings via teleconference to support the SWPPP approval process.

Assumption(s):

- The 138kV Canal Transmission project is awarded to PEI.
- All SWPPP design is included in the 138kV Canal Transmission project.

SUBTASK 4.9 AESTHETIC DESIGN

Responsibility: N/A

SUBTASK 4.10 AUDIBLE NOISE CHARACTERIZATION AND MITIGATION

Responsibility: N/A

TASK 5
CONTROL AND RELAYING SCHEMATICS

Objective(s):
To develop a functional, reliable and cost-effective control and relay design for the station.

Prerequisite(s):
- CLWB Approved Preliminary Design Package
- Information from the Data Acquisition subtask

SUBTASK 5.1 PROTECTIVE RELAYING ONE-LINE DIAGRAM

Responsibility: POWER

Deliverable(s):
- Protective Relaying One-Line Diagram

Review the protection, control, and metering schemes outlined in the Design Criteria and the Preliminary One-Line Diagram. Check that the schemes will coordinate with the system, the proposed equipment and the known CLWB operating procedures. Select protective and auxiliary relay types.

Review the proposed substation equipment ratings to determine that equipment will support the protection and metering schemes. Check the current rating (continuous and interrupting), instrument transformer accuracy class and burden, overload capabilities, and auxiliary features.

Show instrument transformer locations and ratings. Show equipment (relays, control switches, etc.) identified by standard ANSI device function numbers. Show metering, indicating instruments, and control devices. Show the instrument transformer secondary circuit connections to devices. Use dashed lines to show the protection, control and metering functions. Incorporate a drawing-specific legend and notes.

Assumption(s):
- No corrections to the existing equipment locations and ratings will be required.
- No corrections to the interface points will be required to these drawings.

SUBTASK 5.2 THREE-LINE DIAGRAMS

Responsibility: POWER

Deliverable(s):
- Three-Line Diagrams

Prepare the Three-Line Diagrams. Show the interconnection of the instrument transformer metering, relaying, and control circuits. Include the relays, meters, transducers, indicating instruments, test switches, cable and fiber connections and AC panel interconnections. Show the transducer input connections to the SCADA RTU. Incorporate a drawing-specific legend and notes.

Assumption(s):
- No corrections will be required to the existing three-line representations.
- Only new equipment and interface points will be added to these drawings.

SUBTASK 5.3 PROTECTIVE RELAYING SCHEMATICS

Responsibility: POWER

Deliverable(s):
- Protective Relaying Schematic Diagrams

Prepare the Protective Relaying Schematic Diagrams. Show the interconnections of the relaying and control circuits. Include relays, control switches, control contacts, SCADA RTU control and status connections, and DC panel interconnections. Show contact developments of the control switches and relays indicating the terminal connections and state of the contacts for each position. Prepare drawings for each line position or relay function. Incorporate a drawing-specific legend and notes.

Assumption(s):
- The existing protective relaying schematics will only be modified if equipment is being replaced or added.
- Feeder protection will utilize a SEL-651R relay and use a 487B relay for 27kV differential protection.
- Ground bus fault detection on the 25kV reclosers will utilize a SEL-551
- 27kV Tie breaker will utilize a SEL-351S.
- Transformer protection will utilize a SEL-487E and SEL-451 relay.
- Capacitor Bank protection will include a SEL-487V relay.

SUBTASK 5.4 BREAKER SCHEMATICS

Responsibility: POWER

Deliverable(s):
- Circuit Breaker Control Schematic Diagrams
- Motor Operated Disconnect Control Schematic Diagrams
- Recloser Control Schematic Diagrams

Prepare the Interrupting Device Control Schematic Diagrams. Show the interconnections of the relaying and control circuits. Include relays, control switches, control contacts, SCADA RTU control and status connections, and DC panel interconnections. Show contact developments of the control switches and relays indicating the terminal connections and state of the contacts for each position. Prepare drawings for each interrupting device. Incorporate a drawing-specific legend and notes.

Assumption(s):
- The only modifications to the existing interrupting device control schematics will be to reflect the addition or replacement of new control switches and/or relays associated directly with this project.
- The 138kV Canal Transmission project is awarded to PEI.
- 27kV equipment will utilize 7th Avenue North as go by drawings.
- 138kV equipment will utilize Canal Transmission as go by drawings.

SUBTASK 5.5 ALARM SCHEMATIC

Responsibility: POWER

Deliverable(s):
- Alarm Schematic Diagram
- RTU Schematic Diagram

Prepare the Alarm and RTU Schematic Diagram(s). Show the interconnection of the alarm contacts with the alarm indicating device (annunciator, light, buzzer, etc.) and/or SCADA input, reset devices, conditional status contacts, and the alarm circuit power supply. Show interposing relays where required. Incorporate a drawing-specific legend and notes.

Assumption(s):
- One (1) RTU will be required for CLWB. Size to be determined at later date.
- SCADA will implement RTAC and poll all relays with communication over Serial/fiber.

SUBTASK 5.6 SCADA AND AUTOMATION

Responsibility: POWER

Deliverable(s):
- SCADA Points List

Prepare the SCADA Points List, including the control, status, analog, and pulse accumulator points required for the substation. Identify addresses of networked equipment and location of data, protocol used and scaling as required. Specify the integration of the SCADA system with the total substation control. Determine if interposing relays are required.

Assumption(s):
- The substation SCADA system will be implemented using DNP 3.0 communication between the equipment and the RTU.

SUBTASK 5.7 PROTECTIVE RELAYING DESIGN REVIEW

Responsibility: POWER

Deliverable(s):
- Control and Relay Schematics

Assemble a complete set of all control and relay schematic drawings and all supporting data. Perform a detailed independent review of all documents to be included in the Control and Relay Schematic Package. Confirm the design against the design criteria and client comments to the preliminary design package. Utilize standardized drawing checklists to ensure that the design parameters and interfaces have been reviewed and confirmed. Address each of the reviewer's comments and incorporate changes into the drawings and documents as appropriate.

TASK 6
WIRING DIAGRAMS

Objective(s):
- To design an efficient substation wiring system.

Prerequisite(s):
- Control and Relay Schematics
- Information from the Data Acquisition subtask

SUBTASK 6.1 SWITCHBOARD PANEL LAYOUT

Responsibility: POWER

Deliverable(s):
- Switchboard Panel Layout Drawings

Review the Design Criteria and determine the control panel arrangement. Lay out the control switchboard panels. Determine the placement (logically, operationally, and electrically) of all control, protection, and metering devices on the panels.

Prepare Switchboard Panel Layout Drawings. Show plan and elevation details, control devices, metering, relays, and indicating lights. Locate and uniquely identify material and hardware. Incorporate a drawing-specific legend and notes.

Assumption(s):
- The only modifications to the existing switchboard panel layout drawings will be to reflect the removal/addition of equipment associated directly with this project.
- The 138kV Canal Transmission project is awarded to PEI.
- The switchboard manufacturer will provide the detail design for the switchboard panel steel.
- 27kV equipment will utilize 7th Avenue North as go by drawings.
- 138kV equipment will utilize 138kV Canal Transmission as go by drawings.

SUBTASK 6.2 SWITCHBOARD PANEL WIRING

Responsibility: POWER

Deliverable(s):
- Switchboard Panel Wiring Diagrams

Prepare Switchboard Panel Wiring Diagrams. Organize the required terminal blocks by panels and function (CT shorting type, voltage input, breaker contacts, trip circuits, close circuits, auxiliary circuits, RTU circuits, etc.) Show wiring terminations required for each panel. Clearly designate the destination of the wire at each terminal. Place wiring from yard equipment or from other panels on one side of the terminal block

and all wiring to the panel devices on the other side as much as is practical. Show a maximum of two (2) terminations per terminal. Designate the panel name or number at the top of each page.

Assumption(s):
- The only modifications to the existing switchboard panel wiring diagrams will be to reflect the removal/addition of new equipment or terminations as required to interface with substation modifications associated directly with this project.
- The 138kV Canal Transmission project is awarded to PEI.
- 27kV equipment will utilize 7th Avenue North as go by drawings.
- 138kV equipment will utilize Canal Transmission as go by drawings.

SUBTASK 6.3 OUTDOOR EQUIPMENT WIRING

Responsibility: POWER

Deliverable(s):
- Circuit Breaker Wiring Diagrams
- Motor Operated Disconnect Wiring Diagrams
- Recloser Wiring Diagrams
- Instrument Transformer Wiring Diagrams
- External Junction Box Wiring Diagrams

Prepare Wiring Diagrams for the outdoor equipment. Show external terminal block connections, jumpers, and internal wiring changes to the manufacturer's wiring. Show grouping of individual conductors into cables, reference cable designations and indicate remote end destination. The manufacturer's internal wiring will not be reproduced except where wiring changes are necessary.

Assumption(s):
- Vendor drawings will be redrawn to the extent necessary to show the exterior connections for the new cabling.

SUBTASK 6.4 RTU WIRING

Responsibility: POWER

Deliverable(s):
- RTU Wiring Diagrams

Prepare RTU Wiring Diagrams for the substation equipment. Show external terminal block connections, jumpers, and internal wiring changes to the manufacturer's wiring. Show grouping of individual conductors into cables, reference cable designations and indicate remote end destination. Show communication interfaces to IEDs including protocols. The manufacturer's internal wiring will not be reproduced except where wiring changes are necessary.

Assumption(s):
- The primary function of the RTU wiring diagrams will be to clarify the external connections to the RTU control, status, analog and accumulator cards from the substation equipment. Component to component wiring is expected to have been done by the RTU vendor.

SUBTASK 6.5 COMMUNICATIONS INTERFACE

Responsibility: POWER

Deliverable(s):
- Communications Interface Drawing

Define the interface requirements for relaying and SCADA communications to the remote substations or remote facilities. Define relaying and SCADA hardware and software requirements and communication equipment located in the substation. Show the communications requirements as a one-line block representation on a Communications Interface Drawing. Indicate specific interfaces between equipment and provide notes for clarity.

Develop performance specifications for the communications equipment located in the substation to be compatible with the defined communication system.

Assumption(s):
- The communication interfaces are defined for the substation only. Remote sites are not included.

SUBTASK 6.6 WIRING DIAGRAM DESIGN REVIEW

Responsibility: POWER

Deliverable(s):
- Switchboard Panel and Wiring Design Package

Assemble a complete set of all switchboard panel and wiring drawings and all supporting data. Perform a detailed independent review of all drawings to be included in the Switchboard Panel and Wiring Design Package. Confirm the design against the design criteria, NEC conductor ampacities and standard accepted design practices. Utilize standardized drawing checklists to ensure that the design parameters and interfaces have been reviewed and confirmed. Address each of the reviewer's comments and incorporate changes into the drawings and documents as appropriate

SUBTASK 6.7 SUPPORTING DOCUMENTATION

Responsibility: POWER

Deliverable(s):

- Switchboard Panel Catalog Cuts
- Switchboard Panel Material List
- Switchboard Panel Nameplate List

Compile and present the following supporting documentation:

- Catalog Cuts: are photocopies from vendor catalogs showing items that will be used for the project. They are compiled for reference during design and construction and cross-referenced to the Material List. In addition, the catalog cuts will be used to ensure that the correct material has been procured and expedite receiving.
- Material List: includes quantity, brief description and part number for each item. It is cross-referenced to the design drawings.
- Nameplate List: contains quantity, text specifications, and required wording for the nameplates to be used on each item. The list is cross-referenced to the design drawings.

TASK 7
PROTECTIVE RELAY SETTINGS & STUDIES

Objective(s):

To develop, document, and support protective relay settings, studies, and SCADA Integration in accordance with CLWB's protection and operations practices. Includes meeting the basic objectives of protective relaying (i.e. dependability, security, selectivity, speed, and simplicity).

Prerequisite(s):

- Issued-for-Construction Electrical Drawings
- Data requested from CLWB
- Up-to-date and usable ASPEN short circuit data base of the interconnected FPL system.

SUBTASK 7.1 DATA ACQUISITION

Responsibility: POWER

Deliverable(s):

- Information necessary to prepare settings

Prepare a written data request and submit to CLWB. Request CLWB's protective relaying standards or guidelines, example settings, CT data, database for short circuit studies in ASPEN, settings for relays that must be coordinated with, settings for remote end relays, system single line drawings, loading for tapped substations, all transmission line rating data, and other pertinent information.

Gather applicable "Issued for Construction" drawings, including meter and relay single line drawings, DC schematic drawings, AC three-line drawings, and panel drawing from POWER's design team.

Review data received and communicate with CLWB and POWER's design team to clarify information and/or request additional information.

Organize data in electronic and paper files.

Assumption(s):

- CLWB's protection engineer will be available to assist in interpreting the data provided.
- CLWB's provided information will be assumed as up-to-date.
- "Issued for Construction" drawings will be available.
- Documentation of final configurations at remote terminals will be available.
- The 138kV Canal Transmission project is awarded to PEI.
- 7th Avenue North Substation relay setting templates will be provided for 27kV relaying.

SUBTASK 7.2 SHORT CIRCUIT STUDY

Responsibility: POWER/CLWB

Deliverable(s):
- Revise and use the ASPEN model developed under the scope of the New 138kV Canal Switchyard project to perform short circuit study for Canal distribution switchyard protection. (Draft and "Issued for Implementation")

Perform short circuit studies using the database provided by CLWB. Run the following cases:

- Maximum and low (using an agreed upon contingency case) 138kV and 27kV bus fault currents.
- Close-in and end-of-line fault currents for maximum and low fault current cases on distribution feeders
- Interim faults, as needed, in order to identify/remedy any terminals where coordination cannot be achieved with upstream/downstream devices.

Results from study will be recorded and utilized in the calculation workbooks for clarity and reference.

SUBTASK 7.3 PROJECT STUDIES

Responsibility: N/A

SUBTASK 7.4 SCADA INTEGRATION

Responsibility: POWER/CLWB

Deliverable(s):
- SEL-RTAC configuration files, SCADA points list, and Integration One-Line Drawing (Draft and "Issued for Implementation").
- Support for SCADA related settings inside of protective relays.

Develop SCADA point assignment list, Integration One-Line drawing and configuration files for SEL-RTAC per CLWB's standard SCADA application. This includes confirming SCADA related settings inside of protective relays.

Assumption(s):
- CLWB will provide up-to-date SCADA application standards for reference.
- CLWB SCADA subject matter experts will be available for support.
- One (1) review cycle per each SCADA deliverable has been provided in estimate.
- HMI development, including alarm annunciation screen(s), is not included with POWER's scope of work. Local station HMI can be included upon CLWB request with change request.

- SCADA estimate includes integration of up to 30 Intelligent Electronic Devices (IED) connecting via industry standard interfaces and protocols.
- SCADA Point Lists and RTAC configuration will be limited to up to two (2) SCADA off-taker data maps with a maximum of 250 total point count each.

SUBTASK 7.5 PROTECTIVE RELAYING CRITERIA

Responsibility: POWER/CLWB

Deliverable:
- Protective Relaying Criteria Document (Draft and "Issued for Implementation")

Review information received from CLWB and from POWER's design team to determine relay functionality required and setting guidelines that will need to be followed. Review single line, DC schematic, and AC three line drawings to verify relay inputs and output assignments, trip and control circuits, and instrument transformer inputs to the relays.

Review protection scheme and provide any comments or suggestions for CLWB consideration. In particular, consider system operation in case failure of any single device or piece of equipment.

Prepare a draft Protective Relaying Criteria Document consisting of:

- Introduction including discussion of project, description of work, and document organization.
- Discussion of protection scheme review and any comments/ suggestions for CLWB's consideration.
- Meter and relay single line diagram.
- System Level Protection Description that provides an overview of the protection system by identifying the protective relaying elements that provide primary and backup protection for each protection zone and/or piece of major equipment. Include discussion of protection during abnormal switching.
- Protective Relaying and Setting Specification that includes relay part number, instruction manual references, CT and VT data, DC inputs, contact outputs, communications port settings, description of relay logic, elements to be set, and guidelines for setting elements.
- Short circuit study results.
- Selected CLWB-provided information.

Submit a PDF copy of the draft Protective Relaying Criteria to CLWB for review. Discuss the draft document with CLWB in a tele-conference. Make agreed upon changes to the document and re-submit a PDF copy "Issued for Implementation."

Assumption(s):
- The 138kV Canal Transmission project is awarded to PEI.

- A PDF copy of the draft Protective Relaying Criteria document will be submitted.
- A PDF copy of the "Issued for Implementation" Protective Relaying Criteria document will be submitted.
- Relays, elements, logic, and features included are:

  > (6) SEL-651R (phase and ground overcurrent, and automatic reclosing)
  > (8) SEL-551 (ground bus overcurrent protection)
  > (2) SEL-487B (bus differential, phase and ground overcurrent, as needed).
  > (2) SEL-487E (transformer differential, phase and ground overcurrent, as needed)
  > (2) SEL-451 (phase and ground overcurrent, breaker failure protection)
  > (1) SEL-351S (bus tie protection, automatic sectionalizing)
  > (1) SEL-487V (capacitor bank protection)
  > (1) SEL-351S (Express feeder protection)

- Custom relay logic is limited to that necessary to implement the relay elements, logic, and features listed above. Relay programming to perform non-protection functions (e.g. replace control switch and lockout relay functions, substation automation, custom displays, and so on) is not provided unless specifically included in the scope of work.

SUBTASK 7.6 PROTECTIVE RELAY SETTINGS

Responsibility: POWER/CLWB/FPL

Deliverable:
- Protective Relay Settings and Supporting Documentation (Draft and "Issued for Implementation")
- Drafted Logic Diagrams (Draft and "Issued for Implementation")

Perform calculations using CLWB-provided templates, POWER calculations templates (typically on Excel spreadsheets), or hand calculations. Calculate overcurrent pickup values, the reach of distance elements, over/under frequency settings, time delays, time current curves and time dials, differential element sensitivity and slopes, and other relay parameters using the guidelines and short circuit study from the "Issued for Implementation" Protective Relaying Criteria.

Prepare time current curves (TCCs) if time overcurrent coordination is required. Prepare curves using SKM Power Tools for Windows (PTW) or similar agreed-upon software (e.g. ASPEN).

Use ASPEN as a design aid and to confirm distance and ground relay coordination for transmission line relays. Consider intact system cases and the contingency cases defined in the Protective Relaying Criteria.

Prepare logic to implement the relay functionality defined in the "Issued for Implementation" Protective Relaying Criteria document. This may include functions such reclosing, breaker close control, breaker failure scheme, pushbutton functionality, and logic to interface with the substation monitoring and control system.

Prepare relay settings files in applicable electronic format (e.g. SEL AcSELerator software).

Prepare a draft basis document that includes settings calculations, TCCs, printouts of settings, and logic diagrams.

Submit an electronic copy of the draft basis document to CLWB for review. Discuss the draft document with CLWB in a telephone conference. Make agreed-upon changes to the document and re-submit a PDF and native settings files, as "Issued for Implementation."

Provide a formal document detailing the correspondence and agreed-upon philosophies for setting protection elements guarding tie-lines between neighboring utilities, per PRC-001 requirements. This document will be reviewed and approved by project personnel from, both, CLWB and FPL.

Assumption(s):
- A PDF copy of the draft basis document will be prepared and submitted.
- A PDF copy of the "Issued for Implementation" copy of the basis document will be prepared and submitted.
- New and existing devices included in this scope:

  > 27kV bus-tie relay
  > Transformer protection at new Canal distribution substation on both transformers (primary and backup)
  > 27kV differential protection at new Canal Distribution substation
  > 27kV recloser relaying for each feeder
  > 27kV feeder fault bus relaying
  > 27kV bus-tie relay
  > 27kV capacitor bank protection

SUBTASK 7.7 RELAY TEST PROCEDURES

Responsibility: N/A

SUBTASK 7.8 COMMISSIONING SUPPORT

Responsibility: POWER/CLWB

Deliverable(s):
- Technical support during commissioning

- Protective Relaying Criteria and Protective Relay Settings and Supporting Documentation (record copy)

Answer questions about the relay settings and logic during the testing and commissioning of the relays.

Review the “as left” settings provided after testing and commissioning. Identify differences (if any) between the “Issued for Implementation” settings and the “as left” settings and document them. Discuss any identified differences with CLWB and document the agreed-upon follow-up.

Prepare a record copy of the Protective Relaying Criteria, relay settings and all supporting documentation, and Relay Test Procedure documents that includes any changes resulting from information provided to POWER after testing and commissioning.

Assumption(s):

- The relays will be wired and applied as shown in the “Issued for Construction” drawings and “Issued for Implementation” copies of the Protective Relaying Criteria and relay settings.
- A PDF record copy of the Protective Relaying Criteria and relay basis documentation, including logic diagrams, will be prepared and submitted.
- Any changes to the relay settings from “Issued for Implementation” version will be discussed, documented, and approved by POWER SAS engineer and/or CLWB prior to implementation.

TASK 8
CONTROL BUILDING

Objective(s):
- To design and specify a functional substation control building.

Prerequisite(s):
- Switchboard Panel Design
- CLWB-approved Preliminary Design Package

SUBTASK 8.1 CONTROL EQUIPMENT ENCLOSURE PLAN AND SECTIONS

Responsibility: POWER and Control Equipment Enclosure (CEE) Vendor

Deliverable(s):
- CEE Plan Drawing
- CEE Section and Detail Drawing

Prepare the Control Equipment Enclosure Plan and Section Drawings. Show the dimensioned location of the equipment within the Control Equipment Enclosure. Integrate the access and operational requirements with equipment considerations to establish the Equipment Enclosure layout and size. Assess the environmental loading, weather conditions, and aesthetic considerations to determine the type of structure to be specified. Determine the requirements of the cable routing system and entrance (floor trench or overhead cable tray). Show the Control Equipment Enclosure grounding requirements. Expand significant details for clarity and ease of interpretation. Incorporate a drawing-specific legend and notes. Prepare Control Equipment Enclosure Foundation Plan and Detail Drawings.

Assumption(s):
- Enclosure will be a self-framing or modular-type pre-engineered steel building.
- CEE supplier will perform detailed engineering for the building.
- CEE permitting will be handled by POWER.
- Time is budgeted for one new CEE at new Canal Distribution Substation.

SUBTASK 8.2 AC STATION SERVICE

Responsibility: POWER

Deliverable(s):
- AC Station Service Drawing
- AC Station Load Calculations

Determine the substation AC load, including substation lighting, building heating and cooling, equipment auxiliary loads (heaters, fans, pumps, convenience outlets, etc.), special load requirements (oil processing, welders, etc.), and construction loads. Size the AC equipment and provide for AC automatic transfer switch (ATS) when required.

Prepare the AC Supply Drawing. Show the AC substation service transformer fusing, substation service transformer, and AC panel layout. Identify the loads served from the AC panel. Include spare breakers on each panel. Size the breakers and conductors to the loads served by each circuit per NEC requirements. Show the connection to the battery charger.

Assumption(s):
- AC station service transformer will be connected from one of the local distribution feeders.
- Backup AC station service source will be connected from a separate local distribution feeder.
- Pad mount transformer and overhead distribution transformers are both valid options. Determination of type to be determined during design.
- Automatic Transfer Switch will be located in the CEE.

SUBTASK 8.3 DC STATION SERVICE

Responsibility: POWER

Deliverable(s):
- DC Station Service Drawing
- DC Station Service Calculations

Analyze the substation DC requirements. Determine the substation DC load, including the operation of protective equipment (power circuit breakers, circuit switchers, reclosers, etc.) and motor-operated disconnects, control circuits, emergency lighting, equipment power supplies, and indicating and alarm equipment. Based on all identified loads and the Design Criteria requirements, calculate the required battery system and battery charger from the preliminary design; determine if battery system will be designed for future expansion.

Prepare the DC Supply Drawing. Show the battery charger, battery bank, and DC panel layout. Identify the loads served from the DC panel. Size breakers to the loads served by each circuit in accordance with NEC requirements. Include spare breakers in each panel. Incorporate a drawing-specific legend and notes.

Assumption(s):
- Battery system will be sized for the load requirements of the substation equipment only.

- Two 138kV lines, two 138/25kV transformers and 8 bay distribution substation for Canal Distribution substation is the ultimate design and any expansion will not be included in these calculations.

SUBTASK 8.4 CONTROL BUILDING LIGHTING AND HVAC

Responsibility: CEE Vendor; Reviewed by POWER

Deliverable(s):
- Control Building Power, Lighting and HVAC Drawing

Review the design of the building HVAC system is not included.

Review the design of the building power and lighting system. Review that the design considers the location and use of all equipment and designs for lighting levels as determined in the design specification. The design should provide for switched AC lighting and a light over the door operated by a photo cell. The design should include emergency DC lights if required per the specification. Confirm that the drawings locate AC and DC light switches, photo cell controls and AC convenience power outlets for the building. Confirm that the drawing shows a legend and notes to clarify the design.

Assumption(s):
- Design provided by CEE Vendor.

SUBTASK 8.5 SUPPORTING DOCUMENTATION

Responsibility: POWER

Deliverable(s):
- Control Building Catalog Cuts
- Control Building Material List

Compile and present the following supporting documentation:

- Catalog Cuts: are photocopies from vendor catalogs showing items that will be used for the project. They are compiled for reference during design and construction and cross-referenced to the Material List. In addition, the catalog cuts will be used to ensure that the correct material has been procured and expedite receiving.
- Material List: includes quantity, brief description and part number for each item. It is cross-referenced to the design drawings.

TASK 9
PRE-CONSTRUCTION ACTIVITIES

Objective(s):
- To develop the documents that will be required during the construction bidding phase of the project.

Prerequisite(s):
- Construction Drawings

SUBTASK 9.1 CONSTRUCTION SPECIFICATION

Responsibility: POWER

Deliverable(s):
- Construction Specification

Prepare a Construction Specification for the substation. Include general requirements as well as specific sections on site work, concrete, structure erection, insulation, painting, equipment installation, control building erection, switches and fuses, conduit and fittings, wire and cable, buswork connections, instrumentation, grounding, and testing.

Incorporate readily available site-specific environmental conditions and CLWB's requirements that will affect the method or sequence of construction.

Include a copy of CLWB's Work Rules or Safety Standards.

Compile and assemble one (1) reproducible copy of the Construction Specifications and Drawings Document. This document will include the Construction Specifications, Construction Drawings, and Reference Drawings.

Assumption(s):
- Any modifications to the construction specifications between bid and construction will be handled with addenda in lieu of re-issuing entire specification.
- The 138kV Canal Transmission project is awarded to PEI.
- New Canal Distribution substation construction will be included in the 138kV Canal Transmission substation construction specification. Separate line items for cost between two substations will be included.

SUBTASK 9.2 BID UNIT SCHEDULE

Responsibility: POWER

Deliverable(s):
- Bid Unit Descriptions
- Bid Unit Tabulations

Develop the Construction Bid Unit Descriptions required for the Construction Contract. Briefly categorize and describe the particular work element and payment basis.

Prepare the Construction Bid Unit Schedule. Tabulate and identify the bid units by alphanumeric descriptor and title. Identify the quantity (per unit or per lot) of each unit and allow for the inclusion of construction unit labor costs, material costs, and labor and material cost extensions.

Assumption(s):
- Standard RUS bid units will be used.

SUBTASK 9.3 CONSTRUCTION BID PACKAGE

Responsibility: POWER

Deliverable(s):
- Construction Bid Package
- Physical Construction Bid Package
- Protection & Control Bid Package

Prepare a general description of the overall project scope and schedule. Assemble a construction bid package to include the following:

- General Project Description
- Bid Unit Schedule
- Material List
- Plan and Section Drawings
- Foundation Drawings
- Miscellaneous Drawings
- Construction Schedule
- Construction Specification
- Geotechnical Report
- Control & Protection Drawings
- Switchboard Drawings
- Wiring Diagrams

Incorporate site-specific environmental constraints and clarify outage limitations and equipment delivery that could affect the method or sequence of construction.

Assumption(s):
- The 138kV Canal Transmission project is awarded to PEI.
- New Canal Distribution substation construction will be included in the 138kV Canal Transmission substation construction specification. Separate line items for cost between two substations will be included.
- One (1) hard copy and one (1) electronic copy of the Construction Bid Package will be prepared and submitted to CLWB as part of the 138kV Canal Transmission substation.
- CLWB will provide their standard terms and conditions to use in the bid contract.
- Only one construction bid package will be assembled and issued for all work that will be contracted.

SUBTASK 9.4 CONTRACTOR SELECTION ACTIVITIES

Responsibility: POWER/CLWB

Deliverable(s):
- Contractor Bid List
- Construction Pre-Bid Meeting Minutes
- Construction Cost Estimate
- Bid Evaluation

Prepare a list of Contractors who will be invited to bid on the subject project.

Schedule, attend, and document Construction Pre-Bid Meeting. Issue Pre-Bid Meeting Minutes. Issue any applicable Addendums to the Construction Bid Package.

Provide technical support during the addendum/clarification phase (bid window) of the bidding phase.

Prepare Engineer's Construction Cost Estimate from the construction bid unit schedule.

Include unit prices for labor and material individually, both CLWB-furnished and/or contractor-furnished. Develop an extension based on the quantity required for each unit.

Analyze and evaluate the contractor proposals received and make recommendation to CLWB for the award of Contract. Include back-up data, calculations, assumptions, and any necessary explanations. Review contractor submitted substitution requests and make recommendation to CLWB relative to acceptance.

Assumption(s):
- The 138kV Canal Transmission project is awarded to PEI.
- New Canal Distribution substation construction will be included in the 138kV Canal Transmission substation construction specification. Separate line items for cost between two substations will be included.
- Three (3) POWER representatives will attend construction pre-bid meeting. (Included in the 138kV Canal Transmission project proposal)
- CLWB will prepare Contract document and execute with Contractor.

TASK 10
CONSTRUCTION ACTIVITIES

Objective(s):
- To develop the documents that will be required during the construction phase of the project.
- To provide engineering support during the construction phase.

Prerequisite(s):
- Pre-Construction Activities
- Outage and Energization Plan

SUBTASK 10.1 "ISSUED FOR CONSTRUCTION" DOCUMENTS

Responsibility: POWER

Deliverable(s):
- "Issued For Construction" Drawings

Update the Construction Bid Package drawings. Modify the bid issue drawings to include any changes that have occurred in the design during the bidding process.

Assumption(s):
- One (1) hard copy and one (1) electronic copy of the "Issued For Construction" Drawings will be prepared and submitted to CLWB.
- The construction specification will not be re-issued.

SUBTASK 10.2 PRE-CONSTRUCTION MEETING

Responsibility: POWER

Deliverable(s):
- Pre-Construction Meeting Minutes

Schedule, attend, and document a Pre-Construction Meeting between CLWB, Contractor and POWER. Review the construction documents, project schedule, project contacts for involved parties and the detailed scope of the project. Issue Pre-Construction Meeting Minutes. Issue any applicable changes to the Contract documents.

Assumption(s):
- The 138kV Canal Transmission project is awarded to PEI.
- Two (2) POWER representative will attend construction pre-construction meeting. (Included in the 138kV Canal Transmission project)

SUBTASK 10.3 ENGINEERING SUPPORT DURING CONSTRUCTION

Responsibility: POWER

Deliverable(s):
- Engineering Support During Construction

Provide technical support to the Contract Administrator and Construction Inspectors during construction.

Review material test reports for required material and coordinate the resolution of any problems associated with the material tests.

Assumption(s):
- Up to forty (40) hours of engineer time to provide office support for construction activities will be budgeted.
- Up to two (2) full day field trips will be budgeted in the event that is needed during construction progress.
- Field trips and/or hours required in excess of the limit specified above will be performed on a time-and-expense basis.

TASK 11
POST-CONSTRUCTION ACTIVITIES

Objective(s):
- To update the construction drawings with any changes that occurred during construction.
- To assist CLWB with project close-out documentation.

Prerequisite(s):
- Construction Completion

SUBTASK 11.1 RECORD DRAWINGS

Responsibility: CLWB/POWER

Deliverable(s):
- Construction Drawings “Issued For Record”

Incorporate the changes received during construction and furnish a complete set of drawings to reflect the "record drawing" condition when the project is completed.

Assumption(s):
- A set of red-lined drawings, depicting construction changes, will be submitted to POWER by CLWB or their representative.
- One (1) hard copy and one (1) electronic copy of the Record Issue Construction Drawings will be prepared and submitted to CLWB.
- A field trip to walk through the completed project, if required, will be performed on a time-and-expense basis.

SUBTASK 11.2 PROJECT CLOSE-OUT DOCUMENTATION

Responsibility: CLWB/POWER

Deliverable(s):
- Project Close-Out Documentation

Review the completed project with CLWB. Summarize and reconcile project payments and the final scope of work. Prepare a final payment recommendation for CLWB’s consideration.

Prepare and submit any required CLWB or agency documents closing out the construction activities. Summarize the information to allow CLWB to incorporate total facility and component costs in CLWB’s accounting system. Prepare a final report summarizing unresolved issues.

Assumption(s):
- Project close-out documentation, if required, will be performed on a time-and-expense basis.

TASK 12
COMMISSIONING

Objective(s):
- To provide verification of construction per design, acceptance testing of apparatus, protection systems and controls, and assist in energization of the substation.

Prerequisite(s):
- Protective Relaying One-Line Diagram
- Completed Wiring Schematics
- Preliminary outage and energization schedule
- Relay Settings
- Substation equipment installed and wiring in progress

SUBTASK 12.1 SUBSTATION COMMISSIONING PROCEDURES

Responsibility: CLWB

SUBTASK 12.2 SUBSTATION COMMISSIONING

Responsibility: CLWB

SUBTASK 12.3 SUBSTATION ENERGIZATION

Responsibility: CLWB

SUBTASK 12.4 FINAL COMMISSIONING REPORT

Responsibility: CLWB

TASK 13
DISTRIBUTION PRE-DESIGN ACTIVITIES

Objective(s):
- To identify, define, and secure City of Lake Worth Beach approval of the parameters necessary to proceed with the line design for the project.

Prerequisite(s):
- Notice to Proceed

SUBTASK 13.1 DESIGN CRITERIA

Responsibility: POWER

Deliverable(s):
- Design Criteria

Review the information from the project initiation meeting and data acquisition. Compile and issue the project conceptual for City of Lake Worth Beach review, revision, and approval. Summarize the proposed final design procedures and criteria including the proposed applicable design standards.

Ensure that the scope and content of the Design Criteria, as approved by City of Lake Worth Beach, serves as the basis for the detailed design engineering. Maintain and update the Design Criteria, during the life of the project.

Assumption(s):
- POWER will incorporate City of Lake Worth Beach's standards wherever possible.

SUBTASK 13.2 SITE VISIT

Responsibility: City of Lake Worth Beach/POWER

Deliverable(s):
- Meeting Notes

Review the maps or drawings for overhead electric provided by City of Lake Worth Beach. POWER will note existing telephone and other communications, water, sewer, gas and storm drains during the site visit to determine any possible conflicts.
Use data obtained from the facilities maps during design to select and review routes/locations for line design to minimize possible interference between new, existing and future utilities.

ASSUMPTION(S):
- Preliminary Scope has been approved
- Right-of-Entry has been granted

TASK 14
DISTRIBUTION LINE DESIGN

Objective(s):

- To determine the height, location and type of structures and prepare plan drawings.
- To compile the constraining factors that determine the final line design, and use this information to establish the final structure, conductor and foundation configurations to suit the specific requirements for the line.
- To prepare and document the design for the structures and conductors.

Prerequisite(s):

- Design Criteria
- Site Visit
- Overhead Construction Standards

SUBTASK 14.1 PRE-DESIGN

Responsibility: City of Lake Worth Beach/POWER

Deliverable(s):

- Schedule of deliverables

Following the site visit of Canal Substation Expansion and meeting with the City of Lake Worth Beach to discuss standards, a schedule will be created. The schedule will include both the Transmission Underbuild design and the delivery of design standards and will be broken out by month.

Assumption(s):

- Construction estimate will be created based on POWER's standard estimating spreadsheet, unless City of Lake Worth Beach has an internal tool.

SUBTASK 14.2 POLEFOREMAN

Responsibility: POWER

Deliverable(s):

- Pole Foreman Results for all distribution poles (pdf and pole foreman .pft files)

Input material specifications into PoleForeman for all relevant material, including:

- Insulators
- Concrete Poles
- Wood Poles
- Conductor
- Guys
- Anchors
- Reclosers
- Transformers

Design structures to the loading conditions identified in the Design Criteria. Reference standards and use PoleForeman client file for design and loading

Assumption(s):
- Pole Foreman will be run on all distribution poles.
- Budget is based on 6 poles. Additional work will be billed on a time-and-expense basis.
- Distribution will coordinate with transmission on all underbuild poles. Transmission is responsibility for structural loading on their poles. PoleForeman will not be run on the transmission poles
- City of Lake Worth Beach to provide all known material specifications and preferred vendor information (conductor, transformers, reclosers, disconnects and pole information).
- City of Lake Worth Beach to provide specifications and vendor preferences for all other material.

SUBTASK 14.3 DESIGN

Responsibility: POWER

Deliverable(s):
- Pole Class, Pole Height, Equipment Size, Design, and Specification

Design structures to the loading conditions identified in the Design Criteria. Reference City of Lake Worth Beach standards and use PoleForeman results to assist in design.

Determine and select the location and sizing for each required component (guys, anchors, insulators, line hardware, risers, cap banks, etc.) or member in conformance with applicable codes and design constraints.

Design will involve hardening the circuit and consist of:

- Transferring existing distribution line to new FPL Transmission Poles
- Structural analysis on all midspan poles. Any failing pole will be replaced.
- Replacing any damaged poles, insulators, braces, etc. discovered during the site visit.
- Replacing out of standard insulators with 35kV polymer insulators.

- Updating lightning protection and grounding to meet updated standards.
- Replacing transformers with 26kV transformers
- Replace Underground riser facilities
- Replace Overhead equipment per City of Lake Worth Beach's standards.

Assumption(s):

- City of Lake Worth Beach will provide any as built information of existing underground facilities.
- Conductor size will be provided by City of Lake Worth Beach.
- Budget is based on 6 poles. Additional work will be billed on a time-and-expense basis.

TASK 15
DISTRIBUTION UNDERGROUND DESIGN

Objective(s):

- To determine the location of duct, splice boxes, type of cable and prepare plan & profile drawings.
- To compile the constraining factors that determine the final underground design, and use this information to establish the final structure, cable and foundation configurations to suit the specific requirements for the circuit.
- To prepare and document the design for the cable, splice boxes and terminations.
- Develop a phased plan with CLWB to coordinate relocation of overhead lines prior to station construction. Plan will entail the design and coordination to temporarily relocate existing facilities prior construction and leverage for final layout design.

Prerequisite(s):

- Design Criteria
- Site Visit
- Underground Construction Standards
- Topographical Survey

SUBTASK 15.1 PRE-DESIGN

Responsibility: City of Lake Worth Beach/POWER

DELIVERABLE(S):

- Schedule of deliverables

Following the site visit of Canal Substation Expansion and meeting with the City of Lake Worth Beach to discuss standards, a schedule will be created. The schedule will include both the Transmission Underground design and the delivery of design standards and will be broken out by month.

ASSUMPTION(S):

- Construction estimate will be created based on POWER's standard estimating spreadsheet, unless City of Lake Worth Beach has an internal tool.

SUBTASK 15.2 DESIGN

Responsibility: POWER

Deliverable(s):

- Splice Box Locations, Equipment Size, Design, and Specification

Design underground circuit per conditions identified in the Design Criteria. Reference City of Lake Worth Beach standards and use survey results to assist in design.

Determine and select the location and sizing for each required component member in conformance with applicable codes and design constraints.

Design will involve creating underground circuit and consist of:

- Creating new Underground circuit to replace the existing express feeder substation exit.
- Installing junction box for substation exit to serve existing and new distribution substation.
- Replacing out of standard insulators with 35kV polymer insulators.
- Install new Underground riser facilities.
- Install Underground equipment per City of Lake Worth Beach's standards.

Assumption(s):

- City of Lake Worth Beach will provide any as built information of existing underground facilities.
- Cable size will be provided by City of Lake Worth Beach.
- Budget is based 5 new underground substation exists and 2 splice boxes. Additional work will be billed on a time-and-expense basis.

SUBTASK 15.3 PULL CALCULATIONS

Responsibility: City of Lake Worth Beach/POWER

Deliverable(s):

- Pull Calculations

Review the design criteria and gather details to design the conduit/cable route for the new underground design..

Identify terminations locations and configurations. Consider the type of conduits, size of conduit, cable size, cable type and location of primary feed.

Provide engineering calculations related to conduit and cable sizing and prepare preliminary drawings to document design.

Assumption(s):

- City of Lake Worth Beach approved conduit, cable size and standard design will be used for sizing and locating.

- City of Lake Worth Beach to provide specifications on cable limitations.

TASK 16
PERMITTING ACTIVITIES

Objective(s):

- To identify other agencies or utilities that may be affected by the proposed project.
- To secure permits required for the proposed project.

Prerequisite(s):
- Site Visit
- Notice to Proceed

SUBTASK 16.1 PERMITS

Responsibility: City of Lake Worth Beach/POWER

Review project and determine what road permits and environmental permits are required.

Assumption(s):
- Distribution will coordinate with substation on all permits.
- If needed, construction print will be used for permitting. If additional permit drawings are needed, they will be performed on a time-and-expense basis.
- If environmental permit drawings are needed, they will be performed on a time-and-expense basis.
- We will provide permit drawings for application package. If application submittal is needed, they will be performed on a time-and-expense basis.
- City of Lake Worth Beach will perform or subcontract all environmental services required to secure permits.
- POWER will submit all permit applications, pay permit fees and track the procurement of the permits.
- Application and/or Permit Fees (local, state, or federal), or Public Notice Publication Fees allowance of $2,750, including a carrying and handling charge of 10%, has been included as part of this scope of work. Any applicable Application and/or Permit Fees beyond that amount will be remitted by CLWB.
- Construction permits required by state and local agencies for access off highways, driveway permits, traffic control, de-watering, burning, etc., will be prepared, submitted and acquired by City of Lake Worth Beach's construction contractor.

TASK 17
MATERIAL PROCUREMENT

Objective(s):

- To develop items required for the procurement phase of the project.

Prerequisite(s):
- Overhead Construction Standards
- Line Design

SUBTASK 17.1 MATERIAL LIST

Responsibility: City of Lake Worth Beach/POWER

Deliverable(s):
- Overall Material List
- Material List by Location

Using City of Lake Worth Beach master material list from previous projects, a material list will be created for all locations. A total material list will include an appropriate multiplier to cover loss and breakage.

Assumption(s):
- City of Lake Worth Beach is responsible for selecting vendor and ordering all material.
- City of Lake Worth Beach will provide their most up to date master material list.
- Technical specifications will not be required for purchase of miscellaneous material.
- Technical material specifications, if required, will be performed on a time-and-expense basis.
- For any needed material not on the City of Lake Worth Beach's master list, Lake Worth Beach will be responsible to select a vendor and part number.
- City of Lake Worth Beach will provide commercial conditions, solicit bids, and award contract for materials.

TASK 18
CONSTRUCTION DRAWINGS

Objective(s):
- To generate the drawings required during the construction phase of the project.

Prerequisite(s):
- Line Design

SUBTASK 18.1 PLAN DRAWINGS

Responsibility: POWER

Deliverable(s):
- Plan Drawings (PDF and CAD files)

Prepare final Plan Drawings at one inch equal to forty feet (1”=40’) unless otherwise specified by City of Lake Worth Beach. Profile drawings will only be created in critical areas. Depict information required for bidding, construction, and recording of the line including the following as applicable:

- Crossings
- Cable Phasing
- Transmission Locations
- Right of Way Boundaries
- Environmental Areas
- Termination Structures

Assumption(s):
- Planimetric and land line data shown in the plan view of the drawings will be limited to the detail delivered in the Line Survey or otherwise provided by City of Lake Worth Beach in electronic format.
- City of Lake Worth Beach to provide electronic version of the completed substation general arrangement drawing.
- Profile and supplemental drawings will be created only in critical areas on a time-and-expense basis.
- Modifications and/or creation of the overhead line plan drawings are not included in the budget, and if required, will be performed on a time-and-expense basis.
- Drawing format to be created by POWER and approved by City of Lake Worth Beach.
- Facility backgrounds will be easily exportable from the GIS system. If a background will need to be created from scratch, it will be created on a time-and-expense basis.

SUBTASK 18.2 PLAN & PROFILE DRAWINGS

Responsibility: POWER

Deliverable(s):
- Plan & Profile Drawings

Prepare final Plan & Profile Drawings at one inch equal to forty feet (1”=40’) unless otherwise specified by City of Lake Worth Beach. Depict information required for bidding, construction, and recording of the line including the following as applicable:

- Crossings
- Cable Phasing
- Transmission Locations
- Right of Way Boundaries
- Environmental Areas
- Termination Structures

Assumption(s):
- Planimetric and land line data shown in the plan view of the drawings will be limited to the detail delivered in the Topographical Survey or otherwise provided by City of Lake Worth Beach in electronic format.
- City of Lake Worth Beach to provide electronic version of the completed substation general arrangement drawing.
- Modifications and/or creation of the underground line plan drawings are not included in the budget, and if required, will be performed on a time-and-expense basis.
- Drawing format to be created by POWER and approved by City of Lake Worth Beach.
- Facility backgrounds will be easily exportable from the GIS system or from survey. If a background will need to be created from scratch, it will be created on a time-and-expense basis

TASK 19
QUALITY ASSURANCE

Objective(s):
- To meet the quality objectives established for the project.

Prerequisite(s):
- Line Design
- Material Procurement
- Construction Drawings

SUBTASK 19.1 Quality Assurance

Responsibility: POWER

Deliverable(s):
- Green Book Design Summary
- Independent Review of Material List
- Independent Review of PoleForeman Structure Calculations
- Independent Review of Pull Calculations
- Independent Review of Construction Drawings
- Independent Review of Construction Package

Assemble project-related design data, during the course of the project, into a three-ring binder, referred to within POWER as the Green Book. Prepare cover sheets for each major set of calculations or design data included in the document as well as a table of contents summarizing the Green Book content. Include the following: Design Criteria, Supporting Calculations, Structure Design, Equipment Sizing. Assemble a complete set of the documents making up the construction package. Perform a detailed independent review of the construction drawings looking for check print history of changes, records of picking up client requested changes, overall content quality and drafting standards. Perform a detailed independent review of the complete construction package focusing on the minimum amount of information needed to bid and construct project, as well as overall constructability issues. Address each of the reviewer's comments and incorporate changes into the documents as appropriate.

Assumption(s):
- POWER will submit digital copies to City of Lake Worth Beach at the completion of the project upon request.
- All design documents will be stored in a shared location accessible to both City of Lake Worth Beach and POWER throughout the life of the project.
- POWER'S QA/QC procedures will be followed unless City of Lake Worth Beach has additional requirements.

- Budget includes 2 revisions with City of Lake Worth Beach reviewers. Any additional revisions will be performed on a time-and-expense basis.

TASK 20
PRE-CONSTRUCTION ACTIVITIES

Objective(s):
- To develop the documents that will be required during the construction bidding phase of the project.

Prerequisite(s):
- Construction Drawings

SUBTASK 20.1 CONSTRUCTION SPECIFICATION

Responsibility: Not Applicable

Deliverable(s):
- No deliverables are required by POWER (This task is included to show the below assumptions).

Assumption(s):
- CLWB's Standard Construction Specifications will be utilized.
- Only one construction bid package will be assembled and issued for all work that will be contracted.

SUBTASK 21.3 PROJECT COORDINATION

Responsibility: POWER

Deliverable(s):
- Engineering Coordination with City of Lake Worth Beach and POWER's Substation and Civil groups.

Provide communication to the City of Lake Worth Beach, POWER Substation and POWER Civil team in planning and scheduling of work.

Assumption(s):
- Up to one hundred and forty-five (145) hours of engineering time to provide office support for coordination will be budgeted.
- Field trips and/or hours required in excess of the limit specified above will be performed on a time-and-expense basis.

TASK 21
CONSTRUCTION ACTIVITIES

Objective(s):
- To develop the documents that will be required during the construction phase of the project.
- To provide engineering support during the construction phase.

Prerequisite(s):
- Pre-Construction Activities

SUBTASK 21.1 "ISSUED FOR CONSTRUCTION" DOCUMENTS

Responsibility: POWER

Deliverable(s):
- "Issued For Construction" Drawings

Update the Construction Bid Package drawings. Modify the bid issue drawings to include any changes that have occurred in the design during the bidding process.

Assumption(s):
- One (1) electronic copy of the "Issued For Construction" Drawings will be prepared and submitted to CLWB.
- The construction specification will not be re-issued.

SUBTASK 21.2 PRE-CONSTRUCTION MEETING

Responsibility: POWER

Deliverable(s):
- Pre-Construction Meeting Minutes

Schedule, attend, and document a Pre-Construction Meeting between CLWB, Contractor and POWER. Review the construction documents, project schedule, project contacts for involved parties and the detailed scope of the project. Issue Pre-Construction Meeting Minutes. Issue any applicable changes to the Contract documents.

Assumption(s):
- Two (2) POWER representative will attend construction pre-construction meeting.

SUBTASK 21.3 ENGINEERING SUPPORT DURING CONSTRUCTION

Responsibility: POWER

Deliverable(s):

- Engineering Support During Construction

Provide technical support to the City of Lake Worth Beach and Construction Crew during construction.

Assumption(s):

- Up to forty (40) hours of engineer time to provide office support for construction activities will be budgeted.
- Up to two (2) full day field trips will be budgeted in the event that is needed during construction progress.
- Field trips and/or hours required in excess of the limit specified above will be performed on a time-and-expense basis.

TASK 22
POST-CONSTRUCTION ACTIVITIES

Objective(s):
- To update the construction drawings with any changes that occurred during construction.
- To assist City of Lake Worth Beach with project close-out documentation.

Prerequisite(s):
- Construction Completion
- Construction As-Built Mark-Ups

SUBTASK 22.1 AS-BUILT DRAWINGS

Responsibility: City of Lake Worth Beach/POWER

Deliverable(s):
- Construction Drawings “Issued for Record”

Incorporate the changes received during construction and furnish a complete set of drawings to reflect the "record drawing" condition when the project is completed.

Assumption(s):
- A set of red-lined drawings, depicting construction changes, will be submitted to POWER by City of Lake Worth Beach or their representative within 30- days of construction completion.
- It will not be necessary for POWER to field review the construction changes.
- One (1) electronic copy of the Record Issue Construction Drawings will be prepared and submitted.
- A field trip to walk through the completed project, if required, will be performed on a time-and-expense basis.

ENGINEERING BUDGET

POWER proposes to perform these engineering and design services on a time and expense basis, in accordance with POWER's Professional Services Agreement with the City of Lake Worth Beach for Energy Management and Engineering Services (RFQ No. 18-303). A breakdown of our budget is as follows:

BUDGET SUMMARY BY CATEGORY AND TASK					
PROJECT MANAGEMENT					
Task	**Description**	**Hours**	**Labor $**	**Expense $**	**Total $**
0	Project Management	116	$21,204	$0	$21,204
	SUB - TOTAL	**116**	**$21,204**	**$0**	**$21,204**

SUBSTATION ENGINEERING					
Task	**Description**	**Hours**	**Labor $**	**Expense $**	**Total $**
1	Project Initiation	16	$3,216	$0	$3,216
2	Major Equipment Specifications	170	$25,882	$0	$25,882
3	Physical Design	376	$51,144	$0	$51,144
4	Civil/Structural Design	270	$40,306	$0	$40,306
5	Control & Relaying Schematics	563	$75,483	$0	$75,483
6	Wiring Diagrams	538	$76,290	$0	$76,290
7	Protective Relay Settings	1,077	$157,547	$0	$157,547
8	Control Building	246	$32,734	$0	$32,734
9	Pre-Construction Activities	198	$28,146	$360	$28,506
10	Construction Activities	104	$14,964	$420	$15,384
11	Post-Construction Activities	152	$19,480	$0	$19,480
12	Commissioning	0	$0	$0	$0
	SUB - TOTAL	**3,710**	**$525,192**	**$ 780**	**$525,972**

DISTRIBUTION ENGINEERING					
Task	**Description**	**Hours**	**Labor $**	**Expense $**	**Total $**
13	Pre-Design Activities	36	$5,040	$720	$5,760
14	Line Design	196	$27,480	$0	$27,480
15	Underground Design	292	$36,968	$280	$37,248
16	Permitting Activities	120	$13,536	$0	$13,536
17	Material Procurement	120	$17,064	$0	$17,064
18	Construction Drawings	168	$19,904	$0	$19,904
19	Quality Assurance	128	$19,976	$0	$19,976
20	Pre-Construction Activities	145	$21,461	$0	$21,461
21	Construction Activities	112	$16,764	$1,440	$18,204
22	Post-Construction Activities	144	$19,168	$0	$19,168
	SUB - TOTAL	**1,461**	**$197,361**	**$2,440**	**$ 199,801**
	GRAND TOTAL	**5,287**	**$ 743,757**	**$3,220**	**$ 746,977**