

**BLACK & VEATCH****ESTIMATE PLAN AND BASIS****BUSINESS UNIT:** Energy**PROJECT AND PHASE:** 168908.3070**CLIENT:** LG&E/KU**LOCATION:** Mercer County, Kentucky**NAME OF PROJECT:** LG&E / KU – E.W. Brown Station Phase II Air Quality Control Study**BRIEF DESCRIPTION OF PROJECT SCOPE:**

The cost estimates are provided as budgetary estimates for LG&E / KU – E.W. Brown Units 1 - 3 AQCS Retrofit as follows:

- Unit 1 - Pulse Jet Fabric Filter (PJFF), Selective Catalytic Reduction (SCR) with gas-side economizer bypass, Air Heater, Preheat Coil, Forced Draft (FD) Fan, Powder Activated Carbon (PAC) injection, sorbent injection, Fly Ash Transfer System, and neural networks (NN)
- Unit 2 – PJFF, SCR with gas-side economizer bypass, Air Heater, Preheat Coil, FD Fan, Induced Draft (ID) Fan, PAC injection, sorbent injection, Fly Ash Transfer System, and NN
- Unit 3 – PJFF, PAC injection, Fly Ash Transfer System, and NN
- Common Estimate – Fly Ash Storage Silos, and Site Fire protection

Purpose

The purpose of the estimate is to provide LG&E/KU (Owner) sufficient confidence in the costs for use as a budgetary estimate. The desired accuracy range is expected so that the final cost will be within -15% to + 25% of the estimate after applying contingency. Estimates are based on Overnight costs.

B&V Project Team

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## **Estimate Methodology**

This is a budgetary capital cost estimate that involves the use of multiple methods in development of quantities and pricing.

- Major equipment costs may be used in some areas as a basis for application of B&V standard multipliers in the development of costs for bulk or balance of plant pricing for items such as electrical raceway, piping, valves, and civil work, within the battery limits of the equipment.
- Quantities or allowances based on other recent and similar B&V projects may also be used where preliminary design quantities are not available.
- Equipment lists were used to populate the estimate.
- Quotes (Vendor budgetary) were provided for portions of the estimate. The quotes were conditioned or equalized for reasonableness as needed to reflect current designs, and then incorporated into the estimate.
- Estimated bills of quantities based on the conceptual design were developed for portions of the civil/structural work, including foundations, ductwork, and superstructures.
- Bulk quantities were priced using recent similar projects prices or B&V internal database.
- Construction Management is based on a factor of construction direct craft man-hours and reviewing other projects when available.
- Labor productivity factors are included with considerations for retrofit difficulties, working within an existing operating plant, availability of skilled labor, and plant outage constraints.
- Labor man-hours are based on 50 hour work weeks.
- Prevailing wage rates (best rate) for all crafts except Boilermakers, which are union wages, are utilized in the estimate. Prevailing wages for Boilermakers were not published for this area.
- A per diem rate was added to the craft wage rate based on a labor survey, which included an analysis of the availability of skilled labor and potential projects with concurrent schedules.
- Engineering costs are developed using similar projects and including site specifics of this project.
- Construction costs are based on an Engineering, Procurement, and Construction (EPC) contracting philosophy. Estimates are based on one EPC contractor for all four units.

## **Estimate Deliverables**

Client copy will consist of specification level summary.

## **Units of Measure**

The type of units of measure will be imperial.

## **Currency and Exchange Rates**

The currency to be used will be US Dollars \$USD. The exchange rates for foreign purchases will be documented.

## **Equipment Pricing**

Major equipment costs will be based on budget quotes and the remaining equipment costs will use in-house pricing. Freight and vendor representatives for construction (technical assistance), commissioning and start-up must be included.

**Construction Power**

Estimate assumes construction power to be available within the site boundary for distribution as required.

**Construction Lay-down**

Estimate assumes the site will have sufficient area available for construction activities for offices, lay-down and staging within ½ mile of the work area.

**Demolition / Removal**

Demolition / removal cost estimates will be based on demolition and off-site disposal. Scope of work does not require removal and reuse of existing equipment or structures. Demolition scope of work includes the following:

- Unit 1 – Demolition and off-site disposal of Selected ductwork, portions of Boiler Building wall, existing abandoned Water Treatment Area & Equipment, parking lot, and original Oil Storage Building.
- Unit 2 – Demolition and off site disposal of Selected ductwork, portions of Boiler Building Wall, and existing abandoned Water Treatment Area & Equipment, parking lot, original Oil Storage Building, and Unit 2 ID Fans.
- Unit 3 – Demolition and off site disposal of Selected ductwork, sections of the Electrostatic Precipitators (ESPs), and existing Warehouse No. 3.

**List of major equipment:**

## Common

- Fire Protection including 1 – 100,000 gal. fire water storage tank
- Fly Ash Storage Silos - 2

## Unit 1

- SCR System with Ammonia Injection
- FD Fan (1 x 100%)
- Pulse Jet Fabric Filter
- Air Heater
- Air Preheat Coil
- Fly Ash Transfer System
- Sorbent Injection System (Common for U1 & U2)
- PAC Injection System (Common for U1 & U2)
- Neural Network
- AQCS 13.2kV Main Auxiliary Power Transformer (Common for U1 & U2)
- AQCS 13.2kV Switchgear (Common for U1 & U2)
- AQCS 4.16kV Switchgear (Common for U1 & U2)
- AQCS 2.4 kV Auxiliary Power (Existing Power Feed to Unit 1 FD Fan)

## Unit 2

- SCR System with Ammonia Injection
- FD Fan (1 x 100%)
- ID Fan (1 x 100%)
- Pulse Jet Fabric Filter
- Air Heater

- Air Preheat Coil
- Fly Ash Transfer System
- Sorbent Injection System (Common for U1 & U2)
- PAC Injection System (Common for U1 & U2)
- Neural Network
- AQCS 13.2kV Main Auxiliary Power Transformer (Common for U1 & U2)
- AQCS 13.2kV Switchgear (Common for U1 & U2)
- AQCS 4.16kV Switchgear (Common for U1 & U2)
- AQCS 2.4 kV Auxiliary Power (Existing Power Feed to Unit 2 FD Fan)

### Unit 3

- PAC Injection System
- Pulse Jet Fabric Filter
- Fly Ash Transfer System
- Neural Network
- AQCS 4.16 kV Auxiliary Power

### **Estimate Inclusions:**

- Other equipment modifications and tie-ins as required for the AQCS retrofit.
- Labor productivity factors.
- Fully burdened labor rates.
- Construction Management and Construction Indirects.
- Construction Indirects include the following:
  - Local Staff
  - Field Office Expenses
  - Temporary Facilities
  - Temporary Utilities
  - Heavy Haul
  - Heavy equipment
  - Small Tools and Consumables
  - Site Services
  - Safety
  - Pre-operational start-up and testing
  - Twelve (12) months Warranty Administration
  - Sub-contractor's profit
  - EPC fee.
- Sales tax at 6% of indirect materials and services for Construction Management local staff, field office expenses, temporary facilities, fuels and oil, site services materials, safety materials.
- Builder's risk and general liability insurance.
- Performance bond.
- Engineering.
- Contingency
- Start- up spares

- Labor and material costs resulting from underground interferences for each unit is included as follows: Unit 1, 2 & 3 \$50,000 each

**Estimate Exclusions:**

- Testing for environmental hazards including remediation, removal or disposal of but not limited to: asbestos, lead paint, underground contamination, PCBs.
- Work diversions from unplanned outages.
- O&M costs (provided separately. Refer to O&M Costs 41.0805.1).
- Salvaging, storage, or re-sale of equipment and materials.
- Scrap values are not included.
- De-energizing, draining, and tagging out plant systems.
- Upgrade or repairs to off-site roads and bridges.
- Boiler stiffening for any of the units is not included.
- Escalation.
- Sales tax for direct equipment and bulk commodities. Method for calculating tax for those items will be determined by LG&E / KU at a later date.
- Owner's costs to be developed by LG&E/KU.
- Temporary facilities for the Owner.
- Construction / contractor's permits.
- Operating Spares

**Estimate Clarifications:**

- Owner will supply Operators to support initial equipment operation through tuning of the AQCS equipment.
- Vendor Terms and Agreements will provide Commissioning support on the Fans, Fabric Filter Baghouses, and SCR equipment as necessary and appropriate.
- The new FD fans for Units 1 and 2 would reuse the existing Unit 2 ID fan two-speed 2400 volt motors
- It is assumed that the existing Unit 1 and 2 2400 V switchgear will be available, and require minimum modification to power the new Unit 1 and 2 FD Fans.
- It is assumed that the existing FGD 13.2kV switchgear will be available, have adequate capacity, and require minimum modification to power the new Unit 3, 4160V switchgear and secondary unit substation transformers.
- It is assumed that existing structures have enough reserve capacity to accept the cable tray, conduit, and cable bus loads.
- Pricing information for the mobilization of the crew to tap into the isolated phase bus duct (IPB) is based on a Calvert proposal to tap into the IPB at West County Unit 3. This proposal is less than 24 months old.
- It is assumed that a grounding study will be done during detail design and that the new grounding can be tied into the existing mat as required by the grounding study.
- An electrical system study will be required to prove that the conceptual design can be employed.

**Attachments:**

- Request for Cost Estimate Clarifications (1/24/11 Rev. 1)

## **REPORT LIMITATIONS**

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## LG&E/KU Mill Creek, Ghent, and Brown AQC Budgetary Cost Estimates

### Request for Cost Estimate Clarifications: 1/24/11. rev. 1

Please provide your responses to the questions listed below. Clarification of these items will help ensure the development of an accurate cost estimate.

1. Does LG&E/KU want the cost estimates based on Union or Open shop labor?  
**Agreed direction:** B&V estimate will use best value labor in development of capital cost estimates.
2. Contracting Strategy: Should the cost estimate be based on EPC (Engineering, Procurement and Construction) or Multiple subcontracts to be administered by LG&E/KU?  
**Agreed direction:** Cost estimate will be based on EPC philosophy.
3. Contingency. Does LG&E/KU want contingency included in the cost estimate? This contingency is for the direct capital cost unknowns such as labor, materials and indirect costs.  
**Agreed Direction:** B&V will include contingency in the cost estimate and identify the assumed percentage and basis in the report.
4. Is sales tax on materials and services to be included? If so, at what rate?  
**Agreed direction:** B&V will include a 6% sales tax on indirect material and services costs. Direct materials are exempt.
5. Is the estimate to include insurance premiums for builder's risk and general liability (CSIP, OSIP)?  
**Agreed direction:** B&V will include in EPC estimates.
6. Is the cost of a Performance Bond, including work estimated as a subcontract, to be included in the estimate?  
**Agreed direction:** B&V will include in EPC estimates.
7. Is the cost estimate to be based on "Overnight costs" (current day March 2011 dollars) or is escalation to be applied?  
**Agreed direction:** Estimates will be based on Overnight costs.
8. Please identify the scope of LG&E/KU supplied services for construction indirects such as construction trailers, construction water, sewer, electrical power, telephone, internet connection. Is the cost for any of the utilities to be included in the estimate?  
**Agreed direction:** Construction indirects will be included as line items in cost estimates.

9. Owner's costs. Please provide a list of Owner's costs that are to be included in the cost estimates. Or, confirm if Owner's costs should be based on a percentage of the total capital cost estimates and if that percentage will be provided by LG&E/KU or as developed by B&V.

**Agreed direction:** LG&E/KU will be responsible for estimating Owner's costs.

10. If the construction execution solution is multiple subcontracts, will Construction Management (CM) be by LG&E/KU? Do CM costs need to be included in the estimate?

**Agreed direction:** N/A, as execution solution is EPC (see second question regarding contracting strategy).

11. What will LG&E/KU's role in startup be? Hand's off? Supply operators only, etc?

**Agreed direction:** Commissioning costs will be included in EPC estimate.

12. Demolition/Removal

**Agreed direction:** Demolition/removal cost estimates will be based on demolition and off-site disposal. Scope of work does not require removal and reuse of existing equipment or structures.